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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/601,340	Filing Date 01/21/2015	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	NUMBER FILED (Column 1)	NUMBER EXTRA (Column 2)	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	01/26/2016	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 57	Minus	** 62	= 0	x $40 =	0
	Independent (37 CFR 1.16(h))	* 5	Minus	***5	= 0	x $210 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	**0**

AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/TAMARA DARKO/

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT3803298

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	LIEN

CONVEYING PARTY DATA

Name	Execution Date
OXYGENATOR WATER TECHNOLOGIES, INC.	03/13/2016

RECEIVING PARTY DATA

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State/Country:	MINNESOTA
Postal Code:	55402

PROPERTY NUMBERS Total: 4

Property Type	Number
Application Number:	12023431
Application Number:	14601340
Application Number:	13247241
Application Number:	13657311

CORRESPONDENCE DATA

Fax Number: (612)642-8407

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ATTORNEY DOCKET NUMBER:	2010-0164
NAME OF SUBMITTER:	STEVEN W. LUNDBERG
SIGNATURE:	/Steven W. Lundberg/
DATE SIGNED:	03/28/2016
	This document serves as an Oath/Declaration (37 CFR 1.63).

Total Attachments: 2
source=OWT Lien#page1.tif
source=Oxygenator - Ex. A list of patents#page1.tif

NOTICE OF ATTORNEYS' LIEN IN PATENTS

NOTICE IS HEREBY GIVEN that the law firm of Schwegman, Lundberg & Woessner, P.A. ("Law Firm"), with its principal place of business at 1600 TCF Tower, 121 South Eighth Street, Minneapolis, Minnesota, duly authorized to practice as such in the State of Minnesota, claims and holds a lien in and to all of the patents listed on Exhibit A, and all of the applications and registrations associated therewith, together with all proceeds thereof, of Oxygenator Water Technologies, Inc., a Minnesota corporation ("Client"), with its registered address at 1660 S Hwy 100 #598, St Louis Park, MN 55416. Said lien is claimed for legal services rendered by Law Firm to Client for representation of Client in proceedings involving and affecting the ownership and title to the property upon which this lien is claimed for the reasonable and agreed upon value of $257,609.80 of which the sum of $43,977.30 remains unpaid.

SCHWEGMAN, LUNDBERG & WOESSNER, P.A.

Steven W. Lundberg
Shareholder

STATE OF MINNESOTA)
) ss.
COUNTY OF HENNEPIN)

On this 23rd day of March, 2016, before me personally came Steven W. Lundberg, who being duly sworn did depose and say that he is a shareholder of the Law Firm described in and which executed the foregoing instrument.

THERESA A. HATHAWAY
NOTARY PUBLIC - MINNESOTA
My Commission Expires
January 31, 2018

Theresa A. Hathaway
NOTARY PUBLIC

Exhibit A

SLW FILE NUMBER	MATTER TYPE	TITLE	COUNTRY	FILING DATE	APPLICATION NUMBER	STATUS	ISSUE DATE	PATENT NUMBER	PRIORITY DATE	PUBLICATION NUMBER	INVENTORS
3406.002US1	Utility - DIV	FLOW-THROUGH OXYGEN	United States of America	Jan 31, 2008	12/023,431	Issued	Mar 2, 2010	7,670,495	Feb 22, 2002	US 2008-0179259 A1	James Andrew Senkiw
3406.005US2	Utility - REIS	FLOW-THROUGH OXYGEN	United States of America	Jan 21, 2015	14/601,340	Transferred			Sep 28, 2011		James Andrew Senkiw
3406.005USR	Utility - REIS	FLOW-THROUGH OXYGEN	United States of America	Sep 28, 2011	13/247,241	Issued	Mar 17, 2015	RE45,415			James Andrew Senkiw
3406.006US1	Utility - NPREG	ENHANCED RESIN REGEN	United States of America	Oct 22, 2012	13/657,311	Pending			Oct 24, 2011	US-2013-0098819-A1	Mark Rolfes

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/601,340	01/21/2015	James Andrew Senkiw	3406.005US2	1069

38846 7590 10/05/2016
Carlson, Caspers, Vandenburgh, Lindquist & Schuman, PA
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EXAMINER	
JOHNSON, JERRY D	

ART UNIT	PAPER NUMBER
3991	

MAIL DATE	DELIVERY MODE
10/05/2016	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Office Action Summary	**Application No.** 14/601,340	**Applicant(s)** SENKIW, JAMES ANDREW	
	Examiner JERRY D. JOHNSON	**Art Unit** 3991	**AIA (First Inventor to File) Status** No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *January 26, 2016*.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *13-69* is/are pending in the application.
5a) Of the above claim(s) _____ is/are withdrawn from consideration.
6)☐ Claim(s) _____ is/are allowed.
7)☒ Claim(s) *13-69* is/are rejected.
8)☐ Claim(s) _____ is/are objected to.
9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.
11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a)☐ All b)☐ Some** c)☐ None of the:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.
3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
4) ☐ Other: _____.

OWT Ex. 2119
Tennant Company v. OWT
IPR2021-00625

The present application is being examined under the pre-AIA first to invent provisions.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 26, 2016 has been entered.

Reissue Applications

For reissue applications filed on or after September 16, 2012, all references to 35 U.S.C. 251 and 37 CFR 1.172, 1.175, and 3.73 are to the current provisions.

This is a Request for Continued Examination (RCE), filed January 26, 2016, of continuation reissue application 14/601,340 of U.S. Patent No. 7,670,495 (the ‘495 patent) which issued from U.S. Patent Application No. 12/023,431 (the ‘431 application) with claims 1-12 on March 2, 2010. The ‘495 patent was previously reissued as U.S. RE45,415 on March 17, 2015, based on U.S. Application No. 13/247,241 (the ‘241 reissue application) filed September 28, 2011. The ‘495 patent is a division of U.S. Patent No. 7,396,441, (the ‘441 patent) which issued from U.S. Application No. 10/732,326 (the '326 application) which is a continuation-in-part of U.S. Patent No. 6,689,262 (the ‘262 patent).

Notice

If the patent reissue application issues without any cross reference to the continuation reissue application, amendment to the parent reissue application to include a cross-reference to the continuation reissue application must be done at the time of allowance of the continuation reissue application by Certificate of Correction. See MPEP 1451(II)(March 2014).

Reissue Declaration

The reissue oath/declaration filed with this application is defective (see 37 CFR 1.175 and MPEP § 1414) because of the following:

The declaration does not identify the alleged error to be corrected by this continuation reissue application. More specifically, the reissue declaration states "[t]he '495 emitter claim 2, for example, is too broad in that it does not recite certain features of the disclosed emitter embodiment corresponding to FIGS. 7A and 7B and include, for example: the electrodes are positioned in the outer perimeter of the oxygenation chamber; this positioning of the electrodes provides an unobstructed passageway for water to flow; in that unobstructed passageway, water may flow from the water inlet to the water outlet without passing through a space between the electrodes of opposite polarity; and a portion of at least one of the first and second electrodes is in contact with a wall of the tubular housing." (Paragraph 7).

Claim 2 of the '495 patent recites:

2. An emitter for electrolytic generation of microbubbles of oxygen in an aqueous medium comprising:
an anode separated at a critical distance from a cathode,
a nonconductive spacer maintaining the separation of the anode and cathode,

the nonconductive spacer having a spacer thickness between 0.005 to 0.050 inches such that the critical distance is less than 0.060 inches and a power source all in electrical communication with each other,

wherein the critical distance results in the formation of oxygen bubbles having a bubble diameter less than 0.0006 inches, said oxygen bubble being incapable of breading [sic] the surface tension of the aqueous medium such that said aqueous medium is supersaturated with oxygen.

The '495 patent **does not** contain claims to an emitter positioned within a conduit (as shown in Fig. 7), rather, it is the '441 divisional patent which claims an emitter positioned within a conduit. During prosecution of the '441 patent application, applicant specifically cited to Fig. 7 as support for the '441 patent claims. The present continuation reissue application cannot broaden the claims of the ‘441 divisional patent (which issued July 8, 2008). Nor can the present continuation reissue application recapture subject matter that was surrendered during the prosecution of the '441 divisional patent.

Claims 13-69 are rejected as being based upon a defective reissue declaration under 35 U.S.C. 251 as set forth above. See 37 CFR 1.175.

The nature of the defect(s) in the declaration is set forth in the discussion above in this Office action.

Amendment

The amendment filed January 26, 2016 is improper. Specifically, pursuant to 37 CFR 1.173(c), each claim amendment must be accompanied by an explanation of the support in the disclosure of the patent for the amendment (i.e., support for all changes made in the claim(s), whether insertions or deletions). The failure to submit an explanation will generally result in a notification to applicant that the amendment *before final rejection* is not completely responsive (see 37 CFR 1.135(c)). Such an amendment *after final rejection* will not be entered.

Scope of Claims

The present reissue application seeks to broaden previously patented claim 2 directed to an emitter for electrolytic generation of microbubbles of oxygen in an aqueous medium. Claim 13 is representative:

> 13. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:
>
> a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;
> at least two electrodes comprising a first electrode and a second electrode, at least portions of the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches up to 0.140 inches within the tubular housing;
>
> each electrode of the emitter is positioned so that substantially all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing and so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;
>
> a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;
>
> the power source being operable to delivery electric current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

The '495 patent specification contains the following definitions:

"O_2 emitter" means a cell comprised of at least one anode and at least one cathode separated by the critical distance. (Column 4, lines 7-8)

"Critical distance" means the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles. (Column 4, lines 1-3)

Column 3, lines 11-13 of the '495 patent teach "[i]n order to form microbubbles and nanobubbles, the anode and cathode are separated by a critical distance. The critical distance ranges from 0.005 inches to 0.140 inches."

An "O_2 emitter" is "[a]n emitter for electrolytic generation of bubbles of oxygen" as recited in claims 13-69. Accordingly, the emitter of claims 13-69 comprises at least one anode and at least one cathode separate by the critical distance of from 0.005 to 0.140 inches.

Claims 13-69 recite "a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet" (claim 13); "a tubular housing defining an oxygenation chamber and having a water inlet, a water outlet, a longitudinal water flow axis from the inlet to the outlet" (claim 27); "a tubular housing defining an oxygenation chamber and having a water inlet, and a water outlet" (claim 37); "a tubular housing defining an oxygenation chamber, and having an inward-facing surface that defines at least in part the oxygenation chamber, a water inlet, and a water outlet" (claim 50) and; "a tubular housing defining an oxygenation chamber, said housing having an outer wall that runs parallel to a longitudinal center axis of the housing, said housing having a water inlet and water outlet" (claim 62).

The "tubular housing" recited in claims 13-69 is a "fluid conduit" as recited in claims 1-15 of the 441 patent, i.e., "a fluid conduit having a fluid inlet and a fluid outlet fluidily connected with a conduit lumen" ('441 patent, claim 1).

Claims 13-69 are thus directed to an emitter for electrolytic generation of microbubbles of oxygen comprising at least one anode and at least one cathode separated by a distance of 0.005 to 0.140 inches wherein the emitter is positioned with a conduit having an inlet and an outlet.

35 U.S.C. § 112, 1st paragraph

The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 13-69 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

There is no support for claiming “at least portions of the first and second electrodes being positioned in the tubular housing”; “each electrode of the emitter is positioned so that substantially all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing”; “at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes”; “each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing”; “the electrodes are positioned away from a longitudinal center axis of the tubular housing"; "the passageway running longitudinally for at least the length of that portion of one of the electrodes positioned within the tubular housing"; "the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing”; “the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is substantially less than a cross-sectional area of the unobstructed passageway”; “the passageway running for at least the length of that portion of one of the electrodes positioned within the housing"; “the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is substantially less than a cross-sectional area of the unobstructed passageway"; "a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing"; "the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing" and; "the unobstructed passageway having a substantially uniform cross-sectional area along that length.”

To the extent that applicant's Reissue Declaration references Figures 7A and 7B as support for the above claim limitations, e.g., “it was an error not to include emitter claims that include varying combinations of the features disclosed in the emitter embodiment corresponding to FIGS. 7A and 7B of the ‘495 patent” (Page 1 of the Declaration filed January 26, 2016), Figures 7A and 7B are NOT taught as being to scale. Accordingly, Figures 7A and 7B do not provide support for limitations which are not otherwise disclosed in the ‘495 patent specification. Nor do Figures 7A and 7B disclose features that are now being claimed. For example, Figures 7A and 7B do not disclose an emitter wherein “**at least portions** of the first and second electrodes being positioned in the tubular housing” (i.e., the first and second electrodes are positioned entirely within the tubular housing of Figures 7A and 7B), or an emitter wherein "a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing". Likewise, Figures 7A and 7B do not provide written description support for reciting “substantially” in said claim limitations.

35 U.S.C. § 112, 2nd paragraph

The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 13-27, 31, 38, 55, 56 and 62-69 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

In claims 13, 19, 20, 31, 38, 55 and 62, the term "substantially" is subjective and indefinite.

35 U.S.C. § 112, 4th paragraph

The following is a quotation of 35 U.S.C. 112(d):

(d) REFERENCE IN DEPENDENT FORMS.—Subject to subsection (e), a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

The following is a quotation of pre-AIA 35 U.S.C. 112, fourth paragraph:

Subject to the following paragraph [i.e., the fifth paragraph of pre-AIA 35 U.S.C. 112], a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

Claims 23, 26, 36, 46, 49, 58, 61 and 69 are rejected under 35 U.S.C. 112(d) or pre-AIA 35 U.S.C. 112, 4th paragraph, as being of improper dependent form for failing to further limit the subject matter of the claim upon which it depends, or for failing to include all the limitations of the claim upon which it depends.

The '495 patent teaches that a "critical distance" separating the anode and cathode ranging from 0.005 inches to 0.140 inches is the distance at which evolved oxygen forms microbubbles and nanobubbles. As each of the claims from which claims 23, 26, 36, 46 and 49 depend are already limited to the critical distance, the recitation in claims 23, 26, 36, 46 and 49 to forming microbubbles or nanobubbles is not a further limitation to these claims. In like manner, the recitation in dependent claims 58, 61 and 69 that the emitter is "operable" to create microbubbles or nanobubbles is not a further limitation to the claims.

Applicant may cancel the claim(s), amend the claim(s) to place the claim(s) in proper dependent form, rewrite the claim(s) in independent form, or present a sufficient showing that the dependent claim(s) complies with the statutory requirements.

Recapture

Claims 13-69 are rejected under 35 U.S.C. 251 as being an improper recapture of broadened claimed subject matter surrendered in the application for the patent upon which the present reissue is based. See *Greenliant Systems, Inc. et al v. Xicor LLC*, 692 F.3d 1261, 103 USPQ2d 1951 (Fed. Cir. 2012); *In re Shahram Mostafazadeh and Joseph O. Smith*, 643 F.3d 1353, 98 USPQ2d 1639 (Fed. Cir. 2011); *North American Container, Inc. v. Plastipak Packaging, Inc.*, 415 F.3d 1335, 75 USPQ2d 1545 (Fed. Cir. 2005); *Pannu v. Storz Instruments Inc.*, 258 F.3d 1366, 59 USPQ2d 1597 (Fed. Cir. 2001); *Hester Industries, Inc. v. Stein, Inc.*, 142 F.3d 1472, 46 USPQ2d 1641 (Fed. Cir. 1998); *In re Clement*, 131 F.3d 1464, 45 USPQ2d 1161 (Fed. Cir. 1997); *Ball Corp. v. United States*, 729 F.2d 1429, 1436, 221 USPQ 289, 295 (Fed. Cir. 1984). A broadening aspect is present in the reissue which was not present in the application for patent. The record of the application for the patent shows that the broadening aspect (in the reissue) relates to claimed subject matter that applicant previously surrendered during the prosecution of the application. Accordingly, the narrow scope of the claims in the patent was not an error within the meaning of 35 U.S.C. 251, and the broader scope of claim subject matter surrendered in the application for the patent cannot be recaptured by the filing of the present reissue application.

During prosecution of the '326 application, which became the '441 patent, claims 1-3 were rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,328,875 to Zappi. The examiner stated "the electrolytic apparatus as taught by Zappi is place [sic] adjacent to a conduit for flowing water" (page 4 of the Office Action mailed May 24, 2007). Claim 1-4 were also rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,225,401 to Divisek et al. (page 6 of the Office Action mailed May 24, 2007). The examiner stated "[e]ven though Divisek does not explicitly teach that its electrolyzer is place [sic] within or adjacent to a conduit for flowing water, one of ordinary skill in the art would have found the position of Divisek's electrolyzer at least adjacent to a water conduit obvious since water is added/fed to Devisek's [sic] electrolyzer for electrolysis to take place" (page 7 of the Office Action mailed May 24, 2007).

In a response filed August 17, 2007, applicant amended the claims to recite:

1. (Currently Amended) A flow through oxygenator ~~consisting of~~ comprising:
a fluid conduit having a fluid inlet and a fluid outlet with a conduit lumen;

an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen ~~comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other,~~; and

a power source ~~all~~ in electrical communication with ~~each other, wherein~~ the oxygen emitter ~~is placed within or adjacent to a conduit for flowing water~~.

As to the amendment, applicant argued “Applicant has amended independent claim 1 to clarify the presently claimed flow through oxygenator as comprising an oxygen emitter positioned within a conduit lumen of a fluid conduit”. “Zappi et al. is absent any disclosure relative to the positioning of an oxygen emitter directly within the conduit lumen of a fluid conduit as presently claimed” and; “Divisek does not teach an electrolyzer placed directly within a conduit as presently claimed in amended independent claim 1” (Remarks, pages 7 and 8). Applicant also added new claims 13-26. New claim 14 read:

> 14. (New) The flow through oxygenator of claim 1, wherein the plurality of matched sets comprises three matched sets of anodes and cathodes attached to the stabilizing hardware in adjacent relation such that each matched set resides at a 120° angle to the adjacent matched sets.

Applicant cited page 4, lines 18-28; page 13, line 22 to page 15, line 12 and Figure 7 as support for the amendment (Remarks, page 6). Page 13, lines 24-26 of the ‘326 application state:

> [i]n Figure 7 (A), the oxygenation chamber is comprised of three anodes 1 and cathodes 2, of appropriate size to fit inside a tube or hose and separated by the critical distance are placed within a tube or hose 3 at 102° angles to each other.

As to new independent claims 25 and 26, applicant argued “[a]s discussed previously with respect to the present rejections to independent claim 1, none of the presently cited art considered individually or in combination teaches the positioning of an oxygen emitter directly within a conduit lumen of a fluid conduit'" (Remarks, page 9)

The examiner responded to applicant's arguments and amendment in an Office Action mailed November 1, 2007, the examiner stating "[t]he rejection of claims 1-3 under 35 U.S.C. 102(e) as being anticipated by Zappi et al. US 6,328,875 B1 (Zappi) is withdrawn in view of applicant's claim amendment filed 17 August 2007." The examiner also withdrew the rejection of claims 1-4 over Divisek et al. stating "[t]he rejection of claims 1-4 under 35 U.S.C. 103(a) as being unpatentable over Divisek et al. US 4,225,401 (Divisek) is withdrawn in view of applicant's claim amendment filed 17 August 2007."

The examiner additionally entered new grounds of rejection over U.S. Patent Publication 2002/0074237 to Takesako et al (Takesako) and U.S. Patent 6,171,469 to Hough et al. (Hough). As to Takesako, the examiner rejected claims 1-3, 13, 15 and 17-22 under 35 U.S.C. 102(b) as being anticipated, stating:

> Takesako teaches a water electrolyzer comprising a fluid conduit having a fluid inlet and a fluid outlet connected with a conduit lumen (Fig. 1(a)-(b), #1, 21, 22). Takesako also teaches an electrolysis cell positioned within the conduit lumen and parallel to a flow axis of the conduit lumen (Fig. 1(b), paragraph [0021]). The electrolysis cell as taught by Takesako comprises a plurality of matched sets of anodes and cathodes and secured to electrode connecting rods by conductive bolts and spacers (Figs. 2-3, #2, 4, 25-27 and 31-33, paragraph [0056]). In addition, the electrodes are expanded metal mesh (paragraphs [0012, 0062] and the distance between the electrodes does not exceed 3.0 mm (paragraph [0017]. Takesako further teaches that the electrolysis cell in the conduit lumen is connected to a power source (Fig. 1(b)). (Office Action, page 4 and 5).

As to Hough, the examiner rejected claims 1-3, 13, 17 and 20-22 under 35 U.S.C. 102(b) as being anticipated, stating:

> Hough teaches a water electrolyzer for increasing oxygen content of water (abstract, title), wherein the water electrolyzer comprises a flow conduit having an inlet and an outlet connected to the conduit lumen (Fig. 1 #11-12). Hough also teaches a plurality of matched sets of anodes and cathodes mounted to stabilizing hardware and positioned within the conduit lumen (Fig. 2C). The electrodes are connected to a power source (Fig. 1 #14, col. 3 lines 6-11). The electrodes in the water electrolyzer of Hough are metal (col. 3 lines 1-5) and are positioned parallel to the flow axis of the conduit (Fig. 2C) (Office Action, pages 6 and 7).

The examiner also objected to claim 14 as being dependent up a rejected base claim but allowable if rewritten in independent form. The examiner stated "[t]he prior art of record does not teach or fairly suggest, either alone or in combination, the claimed flow through oxygenator comprising three matched sets of anodes and cathodes attached to stabilizing hardware in adjacent relation such that each matched set resides at a 120° angle to the adjacent matched sets.” (Office Action, page 13)

In a response filed March 3, 2008, applicant amended the claims to recite:

1. (Currently Amended) A flow through oxygenator comprising:
a fluid conduit having a fluid inlet and a fluid outlet with a conduit lumen;

an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including ~~a plurality of~~ three matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen and each matched set resides at a 120° angle to the adjacent matched sets; and

a power source in electrical communication with the oxygen emitter.

25. (Currently Amended) A flow through oxygenator comprising:
a watering hose having a hose lumen; and
an oxygen emitter operably mounted with the hose lumen, the oxygen emitter including three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets.

26. (Currently Amended) A flow through oxygenator comprising:
a hydroponic circulating system having a circulating lumen; and
an oxygen emitter operably mounted within the circulating lumen, the oxygen emitter including three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets.

Applicant thus limited all the claims to include the limitation shown in Figure 7A, i.e., "three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets."

Applicant argued "[b]y way of the present amendment to independent claim 1, Applicant has incorporated the previously indicated allowable subject matter of former dependent claim 14. As such, Applicant requests said rejections be withdrawn." (Remarks, page 11)

The narrow scope of the claims in the '411 patent which recite "three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets" was done to overcome a prior art rejection and was not an error within the meaning of 35 U.S.C. 251, and the broader scope of claim subject matter surrendered in the application for the '411 patent cannot be recaptured by the filing of the present reissue application.

Response to Arguments

Applicant's arguments filed January 26, 2016 have been fully considered but they are not persuasive for the reasons as stated in the above rejections.

Duty to Disclose

Applicant is reminded of the continuing obligation under 37 CFR 1.178(b), to timely apprise the Office of any prior or concurrent proceeding in which Patent No. 7,670,495 is or was involved. These proceedings would include interferences, reissues, reexaminations, and litigation.

Applicant is further reminded of the continuing obligation under 37 CFR 1.56, to timely apprise the Office of any information which is material to patentability of the claims under consideration in this reissue application.

These obligations rest with each individual associated with the filing and prosecution of this application for reissue. See also MPEP §§ 1404, 1442.01 and 1442.04.

Correspondence

Any inquiry concerning this communication or earlier communications from the specialist should be directed to Jerry D. Johnson whose telephone number is (571) 272-1448. The specialist can normally be reached on 5:30-3:00, M-F, alternate Fridays off.

If attempts to reach the specialist by telephone are unsuccessful, the specialist's supervisor, Stephen Stein can be reached on (571) 272-1544.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Telephone Numbers for reexamination inquiries:
Central Reexam Unit (CRU) (571) 272-7705

Please mail any communications to:
Attn: Mail Stop "Ex Parte Reexam"
Central Reexamination Unit
Commissioner for Patents
P. O. Box 1450
Alexandria VA 22313-1450

Please hand-deliver any communications to:
Customer Service Window
Attn: Central Reexamination Unit
Randolph Building, Lobby Level

401 Dulany Street
Alexandria, VA 22314

By EFS: Registered users may submit via the electronic filing system EFS-Web at
https://efs.uspto.gov/efile/myportal/efs-registered

Signed:

/Jerry D. Johnson/
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/Alan Diamond/
Patent Reexamination Specialist
Central Reexamination Unit 3991

/Jean C. Witz/
Supervisory Patent Reexamination Specialist
Central Reexamination Unit 3991

Search Notes	Application/Control No. 14601340	Applicant(s)/Patent Under Reexamination SENKIW, JAMES ANDREW
	Examiner JERRY D JOHNSON	Art Unit 3991

CPC- SEARCHED

Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED

Symbol	Date	Examiner

US CLASSIFICATION SEARCHED

Class	Subclass	Date	Examiner

SEARCH NOTES

Search Notes	Date	Examiner
Reviewed prosecution history in 6,689,262; 7,396,441; 7,670,495; RE45,415	05/06/15	JDJ

INTERFERENCE SEARCH

US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

Index of Claims	Application/Control No. 14601340	Applicant(s)/Patent Under Reexamination SENKIW, JAMES ANDREW
	Examiner JERRY D JOHNSON	Art Unit 3991

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	05/06/2015	10/21/2015	09/19/2016						
	1	-	-	-						
	2	-	-	-						
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	9	-	-	-						
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	12	-	-	-						
	13	✓	✓	✓						
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	33	✓	✓	✓						
	34	✓	✓	✓						
	35	✓	✓	✓						
	36	✓	✓	✓						

Index of Claims	Application/Control No. 14601340	Applicant(s)/Patent Under Reexamination SENKIW, JAMES ANDREW
	Examiner JERRY D JOHNSON	Art Unit 3991

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE									
Final	Original	05/06/2015	10/21/2015	09/19/2016							
	37	✓	✓	✓							
	38	✓	✓	✓							
	39	✓	✓	✓							
	40	✓	✓	✓							
	41	✓	✓	✓							
	42	✓	✓	✓							
	43	✓	✓	✓							
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	65	✓	✓	✓							
	66	✓	✓	✓							
	67	✓	✓	✓							
	68	✓	✓	✓							
	69	✓	✓	✓							

IN THE UNITED STATES PATENT AND TRADEMARK

S/N 14/601,340 **CONTINUATION REISSUE PATENT**

Applicant(s)	James Andrew Senkiw	**Amendment And Response**
Serial No.	14/601,340	
Filing Date	January 21, 2015	
Continuation Reissue of U.S. Patent No.	7,670,495	
Issued:	March 2, 2010	
Examiner Name	Jerry D. Johnson	
Group Art Unit	3991	
Attorney Docket No.	3406.005US2	
Customer Number:	38846	
Confirmation No.	1069	
Title:	FLOW-THROUGH OXYGENATOR	

Mail Stop Reissue
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

This amendment responds to the PTO action mailed on October 5, 2016 for Application Serial No. 14/601,340.

The Applicant petitions the Director of the United States Patent and Trademark Office to extend the time for reply to the Office action dated October 5, 2016 for any periods necessary for entry of this amendment. It is believed that only a one-month extension of time is necessary because February 5th fell on a Sunday. Nevertheless, please grant any extension of time necessary for entry, and charge any fee due to Deposit Account No. 502880.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of claims

1. (Canceled)
2. (Canceled)
3. (Canceled)
4. (Canceled)
5. (Canceled)
6. (Canceled)
7. (Canceled)
8. (Canceled)
9. (Canceled)
10. (Canceled)
11. (Canceled)
12. (Canceled)

13. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;

at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches within the tubular housing;

each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing and so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power

source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

14. (New) The emitter of claim 13 wherein the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis; wherein the electrodes extend in a direction that is parallel to the longitudinal axis; and wherein at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes.

15. (New) The emitter of claim 13 wherein the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis; wherein said electrodes extend in a direction parallel to the longitudinal axis; and wherein each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing.

16. (New) The emitter of claim 13 wherein at least one of the electrodes is a stainless steel mesh or screen.

17. (New) The emitter of claim 13 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing.

18. (New) The emitter of claim 17 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing.

19. (New) The emitter of claim 17 wherein the first and second electrodes comprise an outside electrode and an inside electrode, wherein the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing,

the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is,

wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway.

20. (New) The emitter of claim 13 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to and including the center axis, the passageway running for at least the length of one of the electrodes positioned within the housing;

wherein the first and second electrodes comprise an outside electrode and an inside electrode;

wherein the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing;

the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is;

wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway; and

wherein the tubular housing of the emitter is round.

21. (New) The emitter of claim 19 wherein said inward-facing surface is a concave surface.

22. (New) The emitter of claim 13 further including first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing.

23. (New) The emitter of claim 13 wherein the oxygen produced comprises microbubbles.

24. (New) The emitter of claim 13 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

25. (New) The emitter of claim 13 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

26. (New) The emitter of claim 13 wherein the oxygen produced comprises nanobubbles.

27. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing defining an oxygenation chamber and having a water inlet, a water outlet, a longitudinal water flow axis from the inlet to the outlet, and an inward-facing surface that runs parallel to the water flow axis and defines at least in part the oxygenation chamber;

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that is parallel to the longitudinal axis, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber,

wherein the position and size of each electrode within the chamber defines a cross-section of the chamber that has a water flow area within the oxygenation chamber through which water may flow without passing between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches, wherein the water flow area is greater than an area at the cross-section equal to the total area between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches,

wherein at least a portion of the outside electrode positioned in the chamber is closer to the inward-facing surface of the oxygenation chamber than said distance separating the inside electrode from the outside electrode; and

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power

source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the chamber of the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

28. (New) The emitter of claim 27 wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a longitudinal center axis of the oxygenation chamber.

29. (New) The emitter of claim 27 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber.

30. (New) The emitter of claim 29 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber.

31. (New) The emitter of claim 30 wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway.

32. (New) The emitter of claim 27 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing.

33. (New) The emitter of claim 27 wherein the oxygen produced comprises nanobubbles.

34. (New) The emitter of claim 27 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

35. (New) The emitter of claim 27 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

36. (New) The emitter of claim 35 wherein the oxygen produced comprises nanobubbles.

37. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing defining an oxygenation chamber and having a water inlet, and a water outlet;

at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the oxygenation chamber, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches, a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber, said portion being a portion that opposes the other of the first and second electrodes, wherein each electrode is positioned within the oxygenation chamber so that a cross section of the oxygenation chamber includes a water flow area that allows water to avoid passing between electrodes separated by 0.005 inches to 0.140 inches;

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

38. (New) The emitter of claim 37 wherein the tubular housing has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal center axis; and wherein each electrode of the emitter is positioned so that all points midway between all opposing electrodes inside the chamber are closer to said inwardly-facing surface than to the longitudinal center axis.

39. (New) The emitter of claim 37 wherein the chamber has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal axis, wherein the electrodes extend in a direction that is parallel to the longitudinal axis, and wherein at least one of the first and second electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes.

40. (New) The emitter of claim 39 wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to the longitudinal center axis of the oxygenation chamber.

41. (New) The emitter of claim 37 wherein the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing.

42. (New) The emitter of claim 37 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber.

43. (New) The emitter of claim 42 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the chamber.

44. (New) The emitter of claim 42 wherein the chamber has an inward-facing surface that runs parallel to the longitudinal axis; wherein the first and second electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is; and wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway.

45. (New) The emitter of claim 37 further including first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a

radial direction relative to a longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing.

46. (New) The emitter of claim 37 wherein the oxygen comprises microbubbles.

47. (New) The emitter of claim 37 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

48. (New) The emitter of claim 37 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

49. (New) The emitter of claim 37 wherein the oxygen produced comprises nanobubbles.

50. (New) An emitter for electrolytic generation of bubbles of oxygen in an aqueous medium comprising:

a tubular housing defining an oxygenation chamber, and having an inward-facing surface that defines at least in part the oxygenation chamber, a water inlet, and a water outlet;

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that runs parallel to the inward-facing surface, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the inward-facing surface of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber;

wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a midpoint of the tubular housing and so that at least some water may flow through an unobstructed passageway from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches.

51. (New) The emitter of claim 50 wherein at least one of the inside and outside electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes, and wherein the tubular housing defines a longitudinal center axis that lies in the oxygenation chamber and wherein the unobstructed passageway includes the longitudinal center axis.

52. (New) The emitter of claim 50 wherein at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber.

53. (New) The emitter of claim 52 wherein the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing.

54. (New) The emitter of claim 50 wherein the unobstructed passageway is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber.

55. (New) The emitter of claim 54 wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway.

56. (New) The emitter of claim 55 wherein said inward-facing surface is a concave surface.

57. (New) The emitter of claim 50 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing.

58. (New) The emitter of claim 50 wherein the emitter is operable when connected to a power source to create microbubbles of oxygen in water flowing through the oxygenation chamber.

59. (New) The emitter of claim 50 coupled to a power source wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

60. (New) The emitter of claim 50 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

61. (New) The emitter of claim 50 wherein the emitter is operable when connected to a power source to create nanobubbles of oxygen in water flowing through the oxygenation chamber.

62. (New) An emitter for electrolytic generation of bubbles of oxygen in an aqueous medium comprising:

a tubular housing defining an oxygenation chamber, said housing having an outer wall that runs parallel to a longitudinal center axis of the housing, said housing having a water inlet and a water outlet,

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches;

the electrodes being positioned away from the center axis and maintaining a longitudinal, unobstructed passageway parallel to and including the center axis that runs for at least the length of one of the electrodes positioned within the chamber, the unobstructed passageway having a uniform cross-sectional area along that length, the electrodes being positioned so that water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;

wherein the outside electrode defines a cross-sectional area between the outside electrode and the outer wall of the chamber that is less than said cross-sectional area of the unobstructed passageway.

63. (New) The emitter of claim 62 wherein at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber.

64. (New) The emitter of claim 63 wherein the electrode in contact with a wall of the tubular housing is in contact with the outer wall which is a curved wall of the tubular housing.

65. (New) The emitter of claim 62 wherein the unobstructed passageway is multiple times wider than the distance separating the opposing outside and inside electrodes within the chamber.

66. (New) The emitter of claim 62 wherein said outer wall includes an inwardly-facing concave surface.

67. (New) The emitter of claim 62 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing.

68. (New) The emitter of claim 62 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

69. (New) The emitter of claim 68 wherein the emitter is operable when connected to a power source to create nanobubbles of oxygen in water flowing through the oxygenation chamber.

REMARKS

Claims 13-69 are pending in this application. Claims 1-12 were previously canceled. The claims are marked with respect to the claims of the original patent being reissued, U.S. Patent No. 7,670,495. Claims 13-15, 17, 19, 20, 27, 29, 31, 37-39, 42, 44, 50, 55, 61 and 62 have been amended as discussed herein. Reconsideration of claims 13-69 is respectfully requested in light of the amendments and the following remarks.

Defective Oath

The office action sates that the reissue oath/declaration is defective because it does not identify an alleged error to be corrected by this continuation reissue application. Applicant respectfully traverses this rejection. Paragraphs 5-10 of the inventor's reissue declaration identifies multiple errors, including:

(i) claim 2 of the '495 patent is <u>too narrow</u> in that it requires a spacer separating the electrodes (see 1/11/16 Reissue Declaration at ¶ 9), the present reissue claims do not include this limitation;

(ii) claim 2 of the '495 patent is <u>too narrow</u> in that it requires that water be "supersaturated" (see 1/11/16 Reissue Declaration at ¶ 9), the present reissue claims do not include this limitation; and

(iii) claim 2 of the '495 patent is <u>too broad</u> in that it did not recite certain features of the arrangement of the electrodes that are shown in FIGS. 7A and 7B (see 1/11/16 Reissue Declaration at ¶¶7-8).

First, the office action appears to have overlooked and does not address the errors identified in paragraphs i and ii above (spacer, supersaturated). There is no basis for finding that these do not identify an error to be corrected by this reissue.

With respect to the third category, that these narrowing limitations relate to how the electrodes of the emitter are positioned within a housing or chamber does not make these narrowing limitations improper for reissue. These limitations were never previously presented or abandoned. It was an error not to include these limitations, and claim 2 of the '495 patent is too broad in that it was not limited in these respects.

The office action states that the claims of the '441 patent cannot be broadened by this reissue, and that the present continuation reissue cannot recapture subject matter surrendered during prosecution of the '441 patent. The applicant respectfully notes that it is claim 2 of the '495 patent that is being reissued, not the '441 patent claims. In addition, claim 2 of the '495 patent itself was already broader than the claims of the '441 patent. Further, the limitations that seem to be causing the most concern for the examiner (the limitations relating to how the emitter electrodes are positioned inside a housing or chamber) are narrowing limitations, they do not broaden claim 2 of the '495 patent at all. That other, different features shown in FIG. 7 may have been claimed in the '441 patent is not a basis to find the present reissue oath to be defective here. The same features are not being claimed. Finally, as discussed below under the specific recapture heading, the present claims are not recapturing surrendered subject matter.

Scope of the Claims

The office action includes a section under the heading "Scope of the Claims." No rejection of the claims is made in this section, but Applicants note the following. Applicants agree that the pending claims are limited to emitters having electrodes separated by a distance of from 0.005 to 0.140 inches. Applicants, however, respectfully disagree that the pending claims are limited by the defined terms "critical distance," or "O_2 emitter." These two phrases do not appear in the pending claims. The claims should, therefore, be examined based on a scope commensurate with the limitations of the claims as written, not based on definitions of these two terms that do not appear in the claims.

Applicants also respectfully disagree with the further characterization of what claims 13-69 are "directed to". The characterization omits substantial material limitations in the pending claims and uses terms that are not present in the claims (e.g., "conduit"). While there are certainly some similarities between limited portions of the presently pending claims and the claims of the '441 patent, such should be expected where they are related applications, based on the same specification, and especially where during original prosecution the claims of the '495 patent were issued a double-patenting rejection in light of the '441 patent claims. Any similarity of phrases, without more, does not form a basis for rejecting the present claims, nor does any similarity warrant construing the claims differently than as presently written. The claims should be examined based on a scope commensurate with the limitations of the claims as written, not based on any similarity of certain phrases to phrases used in related patent claims.

Explanation of Support

The office action states that the amendment filed January 26, 2016 is improper and notes that each claim amendment must be accompanied by an explanation of support in the disclosure. At page 14 of the January 26, 2016 amendment, Applicants noted the changes to the claims as compared to the claims previously considered by the examiner. Specifically, the preamble of the claims was amended to use the alternate phrasing of an "emitter for electrolytic generation of bubbles of oxygen" instead of an "electrolysis system for generating oxygenated water" or an "electrolysis cell," and conforming amendments were made to the body of the claims, for example, to refer back to "the emitter" instead of to "the system."[1] Support for this amendment can be found, for example, in the disclosure of the patent at the Abstract ("An oxygen emitter which is an electrolytic cell is disclosed…"); col. 1:15-21 ("This invention relates to the electrolytic generation of microbubbles of oxygen…"); col. 2:63-67 ("This invention provides an oxygen emitter which is an electroliytic cell which generates very small microbubbles and nanobubbles of oxygen in an aqueous medium…"); 4:58 ("Oxygen Emitter"); 5:44-45 ("Attempts were made to measure the diameter of the O_2 bubbles emitted by the device…"); 6:6 ("Other Models of Oxygen Emitter"); 9:3-18 ("Flow-through Emitter for Agricultural Use…"); 10:31-32 ("An emitter for electrolytic generation of microbubbles of oxygen in an aqueous medium…"); as well as throughout the specification.

Also, as compared to the claims previously considered by the examiner, the January 26, 2016 amendment amended dependent claims 26, 33, 36, 49, 61, and 69 to call out nanobubbles instead of microbubbles. Support for this amended language can be found, for example, at column 2, lines 63-65 ("This invention provides an oxygen emitter which is an electrolytic cell which generates very small microbubbles and nanobubbles of oxygen in an aqueous medium…"). No new matter was entered by the amendment filed January 26, 2016. To aid the examiner in finding support for each and every claim limitation found in the claims, applicants have prepared the following chart mapping every claim limitation to exemplary specification

1 One additional such conforming amendment to claim 61 is made herein, replacing "electrolysis cell" with "emitter" which was overlooked at the time of the January 26, 2016 amendment.

support.

Claim Limitations	Support Location
Claim 13	
an emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;	3:26-32 9:7-11 FIGS. 7A-7B
at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches within the tubular housing;	FIG. 7A 3:11-14 4:54 5:4-11
each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing	FIG. 7A 9:5-33
and so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 9:5-33 3:23-30 3:11-14
a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;	9:35-45
the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.	3:27-35 2:63-67
Claim 14	
the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis	FIG. 7A 9:7-12
the electrodes extend in a direction that is parallel to the longitudinal axis	FIG. 7A FIG. 7B

	9:7-12 3:25-30
at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes	FIG. 7A 9:7-12
Claim 15	
the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis	FIG. 7A 9:7-12
electrodes extend in a direction parallel to the longitudinal axis	FIG. 7A FIG. 7B 9:7-12 3:25-30
each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing	FIG. 7A 9:7-12
Claim 16	
at least one of the electrodes is a stainless steel mesh or screen	3:6-8 4:63-64
Claim 17	
the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing	FIG. 7A FIG. 7B 9:7-18
Claim 18	
the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing	FIG. 7A
Claim 19	
the first and second electrodes comprise an outside electrode and an inside electrode, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is	3:25-28 FIG 7A 9:7-18
the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis	FIGS. 7A-7B 9:7-12 3:25-30
the first and second electrodes extend in a longitudinal direction parallel to an inward-facing surface of the tubular housing	FIG. 7A 9:7-12
the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is	FIG. 7A 9:7-18

less than a cross-sectional area of the unobstructed passageway	
Claim 20	
the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to and including the center axis, the passageway running for at least the length of one of the electrodes positioned within the housing	FIG. 7A FIG. 7B 9:7-18
the first and second electrodes comprise an outside electrode and an inside electrode, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is	3:25-28 FIG 7A 9:7-18
the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing	FIGS. 7A-7B 9:7-12 3:25-30
the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway	FIG. 7A 9:7-18
the tubular housing of the emitter is round	FIG. 7A
Claim 21	
said inward-facing surface is a concave surface	FIG. 7A
Claim 22	
first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing	FIG 7A 9:11-17
Claim 23	
the oxygen produced comprises microbubbles	2:63-67 3:11-14 4:10-11 4:27-28
Claim 24	
the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode	9:35-45 (Table III)
Claim 25	
a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions	FIG. 7A 9:7-11 3:25-28
Claim 26	
the oxygen produced comprises nanobubbles	2:63-67

	3:11-14 4:12-15 4:27-28
Claim 27	
An emitter for electrolytic generation of bubbles of oxygen in water	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing defining an oxygenation chamber and having a water inlet, a water outlet, a longitudinal water flow axis from the inlet to the outlet, and an inward-facing surface that runs parallel to the water flow axis and defines at least in part the oxygenation chamber	3:26-32 9:7-12 FIG. 7A
at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that is parallel to the longitudinal axis	3:25-30 FIG. 7A FIG. 7B 9:7-18
the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber	FIG. 7A 3:11-14 4:54 5:4-11
the position and size of each electrode within the chamber defines a cross-section of the chamber that has a water flow area within the oxygenation chamber through which water may flow without passing between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches, wherein the water flow area is greater than an area at the cross-section equal to the total area between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 9:5-33 3:23-30 3:11-14
a portion of the outside electrode positioned in the chamber is closer to the inward-facing surface of the oxygenation chamber than said distance separating the inside electrode from the outside electrode	FIG. 7A 3:25-28
a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps	9:35-45
the power source being operable to deliver electrical current to the electrodes while water flows through the chamber of the tubular	3:27-35 2:63-67

housing and is in contact with the electrodes to produce oxygen in said water via electrolysis	
Claim 28	
each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a longitudinal center axis of the oxygenation chamber	FIG. 7A 9:7-12
Claim 29	
electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber	FIG. 7A FIG. 7B 9:7-18
Claim 30	
the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber	FIG. 7A
Claim 31	
the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway	FIG. 7A 9:7-18
Claim 32	
first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing	FIG 7A 9:11-17
Claim 33	
the oxygen produced comprises nanobubbles	2:63-67 3:11-14 4:12-15 4:27-28
Claim 34	
the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode	9:35-45 (Table III)
Claim 35	
the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions	FIG. 7A 9:7-11 3:25-28
Claim 36	
the oxygen produced comprises nanobubbles	2:63-67 3:11-14 4:12-15 4:27-28

Claim 37	
an emitter for electrolytic generation of bubbles of oxygen in water	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing defining an oxygenation chamber and having a water inlet, and a water outlet	3:26-32 9:7-12 FIG. 7A
at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the oxygenation chamber, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 3:11-14 4:54 5:4-11
a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber, said portion being a portion that opposes the other of the first and second electrodes	FIG. 7A
each electrode is positioned within the oxygenation chamber so that a cross section of the oxygenation chamber includes a water flow area that allows water to avoid passing between electrodes separated by 0.005 inches to 0.140 inches	FIG. 7A 9:5-33 3:11-14
a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps	9:35-45
the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis	3:27-35 2:63-67
Claim 38	
the tubular housing has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal center axis	FIG. 7A 3:26-32 9:7-12
each electrode of the emitter is positioned so that all points midway between all opposing electrodes inside the chamber are closer to said inwardly-facing surface than to the longitudinal center axis	FIG. 7A
Claim 39	

the chamber has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal axis, wherein the electrodes extend in a direction that is parallel to the longitudinal axis	3:26-32 9:7-12 FIG. 7A
at least one of the first and second electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes	FIG. 7A 9:7-12
Claim 40	
each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to the longitudinal center axis of the oxygenation chamber	FIG. 7A 9:7-12
Claim 41	
the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing	FIG. 7A
Claim 42	
the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber	FIG. 7A FIG. 7B 9:7-18
Claim 43	
the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the chamber	FIG. 7A
Claim 44	
the chamber has an inward-facing surface that runs parallel to the longitudinal axis	FIG. 7A 3:26-32 9:7-12
the first and second electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is	3:25-28 FIG 7A 9:7-18
the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway	FIG. 7A 9:7-18
Claim 45	
first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing	FIG 7A 9:11-17
Claim 46	

the oxygen comprises microbubbles	2:63-67 3:11-14 4:10-11 4:27-28
Claim 47	
the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode	9:35-45 (Table III)
Claim 48	
the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions	FIG. 7A 9:7-11 3:25-28
Claim 49	
the oxygen produced comprises nanobubbles	2:63-67 3:11-14 4:12-15 4:27-28
Claim 50	
an emitter for electrolytic generation of bubbles of oxygen in an aqueous medium	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing defining an oxygenation chamber, and having an inward-facing surface that defines at least in part the oxygenation chamber, a water inlet, and a water outlet	3:26-32 9:7-12 FIGS. 7A-7B
at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that runs parallel to the inward-facing surface, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the inward-facing surface of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is	3:25-28 FIG 7A 9:7-18
the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber	3:11-14 4:54 5:4-11
each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a midpoint of the tubular housing and	FIGS. 7A-7B 9:7-11

so that at least some water may flow through an unobstructed passageway from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches	3:23-30 3:11-14
Claim 51	
at least one of the inside and outside electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes	FIG. 7A 9:7-11
the tubular housing defines a longitudinal center axis that lies in the oxygenation chamber and wherein the unobstructed passageway includes the longitudinal center axis	FIG. 7A 9:7-11
Claim 52	
at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber	FIG. 7A
Claim 53	
the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing	FIG. 7A
Claim 54	
the unobstructed passageway is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber	FIG. 7A
Claim 55	
the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway	FIG. 7A 9:7-18
Claim 56	
the inward-facing surface is a concave surface	FIG. 7A
Claim 57	
first and second conductors coupled to the outside and inside electrodes, respectively, and exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing	FIG 7A 9:11-17
Claim 58	
the emitter is operable when connected to a power source to create microbubbles of oxygen in water flowing through the oxygenation chamber	2:63-67 3:11-14 4:10-11 4:27-28
Claim 59	
a power source wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode	9:35-45 (Table III)
Claim 60	
a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each	FIG. 7A 9:7-11

being parallel to respective opposing cathode electrode portions	3:25-28
Claim 61	
the emitter is operable when connected to a power source to create nanobubbles of oxygen in water flowing through the oxygenation chamber.	2:63-67 3:11-14 4:10-11 4:27-28
Claim 62	
an emitter for electrolytic generation of bubbles of oxygen in an aqueous medium	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing defining an oxygenation chamber, said housing having an outer wall that runs parallel to a longitudinal center axis of the housing, said housing having a water inlet and a water outlet	3:26-32 9:7-12 FIGS. 7A-7B
at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is	3:25-28 FIG 7A 9:7-18
the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 3:11-14 4:54 5:4-11
the electrodes being positioned away from the center axis and maintaining a longitudinal, unobstructed passageway parallel to and including the center axis that runs for at least the length of one of the electrodes positioned within the chamber, the unobstructed passageway having a uniform cross-sectional area along that length	FIG. 7A FIG. 7B 9:7-18
the electrodes being positioned so that water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 9:7-12 3:23-30 3:11-14
the outside electrode defines a cross-sectional area between the outside electrode and the outer wall of the chamber that is less than said cross-sectional area of the unobstructed passageway	FIG. 7A 9:7-18
Claim 63	

at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber	FIG. 7A
Claim 64	
the electrode in contact with a wall of the tubular housing is in contact with the outer wall which is a curved wall of the tubular housing	FIG. 7A
Claim 65	
the unobstructed passageway is multiple times wider than the distance separating the opposing outside and inside electrodes within the chamber	FIG. 7A
Claim 66	
said outer wall includes an inwardly-facing concave surface	FIG. 7A
Claim 67	
first and second conductors coupled to the outside and inside electrodes, respectively, and exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing	FIG 7A 9:11-17
Claim 68	
at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions	FIG. 7A 9:7-11 3:25-28
Claim 69	
the emitter is operable when connected to a power source to create nanobubbles of oxygen in water flowing through the oxygenation chamber	2:63-67 3:11-14 4:10-11 4:27-28

35 U.S.C. §112, 1st Paragraph

Claims 13-69 were rejected as failing to comply with the written description requirement. The Office Action lists thirteen phrases as containing subject matter which was not described in the specification. See Action at p. 8. Each of these limitations is addressed below. As a preliminary point, however, Applicant notes that to satisfy the written description requirement, a patent specification need only describe the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention. Further, even the figures of a patent may satisfy the written description requirement of §112 when they allow persons of ordinary skill in the art to recognize that he invented what is claimed. See Vas-Cath, Inc. v. Mahurkar, 935 F.2d 1555, 1563-64, 19 USPQ2d 1111 (Fed. Cir. 1991) (finding that utility application claim limitations relating to the relative size and shape of a catheter lumen were adequately disclosed by the drawings of a design patent). In other words, the description of an article pictured can be relied on, in combination with the drawings, for what they would reasonably teach one of ordinary skill in the art. See also MPEP 2163.[2]

1. "at least portions of the first and second electrodes being positioned in the tubular housing"

Although Applicant does not agree with the premise of this rejection, to expedite prosecution, the phrase "at least portions of" where it precedes "the first and second electrodes being positioned in the tubular housing" has been removed from the claims. Applicant notes that the scope of the claims will reach any emitter having electrodes that satisfy the claim limitations, and this claim amendment is not intended to and does not narrow the scope of the claims.

2-4. "each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing"

"the electrodes are positioned away from a longitudinal center axis of the tubular housing"

"each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing" [3]

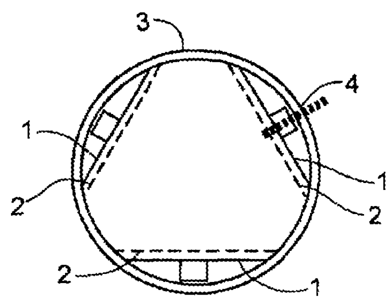
Each of these limitations relates to positioning the electrodes inside the housing so that the electrodes are arranged toward the outside, away from the centerpoint of the housing. This arrangement is clearly shown in FIG. 7A. As shown in FIG. 7A, three sets of electrodes (1, 2) are arranged along the lines of a triangle. The written description confirms that the three sets of anode and cathode pairs are each at the same 120 degree angle with respect to each other (i.e. the

[2] MPEP 2163 states: "An applicant may show possession of an invention by disclosure of drawings or structural chemical formulas that are sufficiently detailed to show that applicant was in possession of the claimed invention as a whole. See, e.g., Vas-Cath,935 F.2d at 1565, 19 USPQ2d at 1118 ("drawings alone may provide a 'written description' of an invention as required by Sec. 112"); In re Wolfensperger, 302 F.2d 950, 133 USPQ 537 (CCPA 1962) (the drawings of applicant's specification provided sufficient written descriptive support for the claim limitation at issue); Autogiro Co. of Am. v. United States, 384 F.2d 391, 398, 155 USPQ 697, 703 (Ct. Cl. 1967) ("In those instances where a visual representation can flesh out words, drawings may be used in the same manner and with the same limitations as the specification.")"

[3] Claims 13 and 38 have been amended to omit the term "substantially" that had modified "all points midway…".

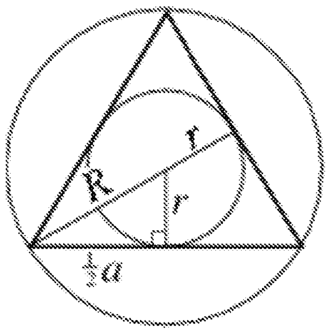
triangle is an equilateral triangle). See Col. 9:10-11. FIG. 7A also shows that the electrodes terminate at the inside surface of the tube wall, and the electrodes do not complete the corners of the triangle. In other words, the points of the triangle would fall outside the tube 3.

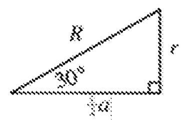
Fig. 7A



The electrodes shown in FIG. 7A do not pass through the center axis of the tube but instead are positioned away from the center axis and closer to the wall of the tube than they are to the center axis of the tube. Therefore, the figure clearly supports each of the limitations listed above.

These limitations do not rely on the scale of the drawing. Geometry mathematically dictates that electrodes positioned along the lines of an equilateral triangle centered on a round tube with its corners located outside the tube, will necessarily be located closer to the outer wall than to the center point of the tube. It is mathematically impossible for electrodes in this configuration to be closer to the center of the tube than the wall of the tube. It doesn't matter how large or small you make the housing or the electrodes: if the electrodes are arranged as chords of a circle along the sides of an equilateral triangle having its points outside the circle as is clearly shown in FIG 7A and also described at 9:7-11, the electrodes can <u>never</u> be closer to the center point of the tube than to the circular wall of the tube. This is pure math and does not rely on any drawing being to scale. It is dictated by the shapes shown in FIG. 7A (concentric circle and equilateral triangle). Consider the following:





$\sin 30° = ½ = r/R.$

See http://mathworld.wolfram.com/EquilateralTriangle.html. This simple calculation shows that *r* (the distance each side of the triangle is away from the center point of the circle) shrinks to ½ R (half the radius of the outer circle) only when the triangle fits <u>inside</u> the circle. If the corners of the triangle fall outside the circle (as shown in FIG. 7A), then *r* will necessarily be greater than ½ R. In other words, when the corners of the triangle fall outside the circle, the sides of the triangle will always be closer to the outer circle than to the center point or axis of that circle. Therefore, not only does FIG. 7A disclose the relationships recited in these limitations between the electrodes, tube wall and tube center, but even if the scale of the drawing were altered or changed, the relationship would still necessarily be satisfied. The Declaration of Dr. Strykowski filed herewith supports these findings. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 at ¶¶ 4-8.

Nothing in this section is intended to import a limitation that the electrodes be configured in a triangular configuration. This section is merely meant to point out that the limitations noted above are supported by the disclosure and are not dependent on the scale of the figures.

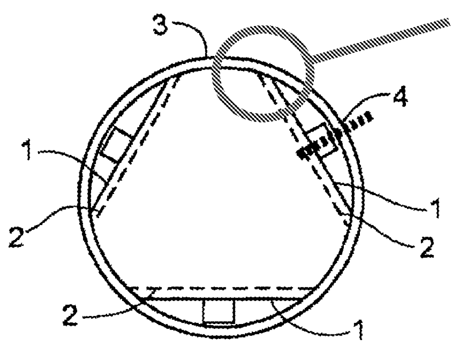
5-7. "a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing"

"the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing"

"at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes"

FIG. 7A shows the electrodes (1, 2) in contact with the curved inner wall of the circular tube 3. Because the electrodes contact the wall, each is closer to that wall than the distance separating the electrodes. Components that are touching or contacting each other are necessarily closer together than components that are separated. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 at ¶¶ 4, 9-10.

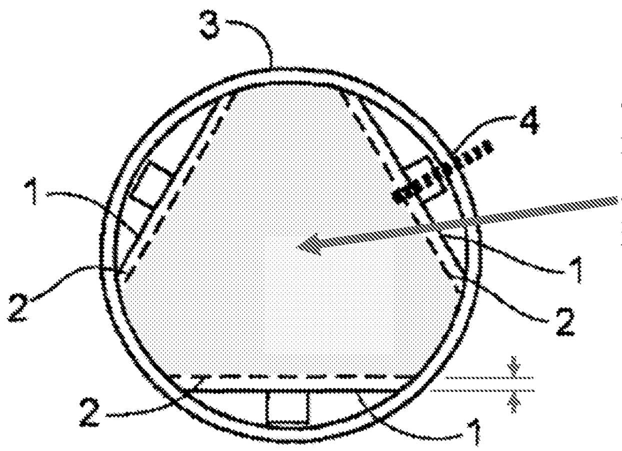
Fig. 7A



The electrodes (e.g., 1, 2) are shown contacting the curved inner wall of tube (3).

7. "the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing"

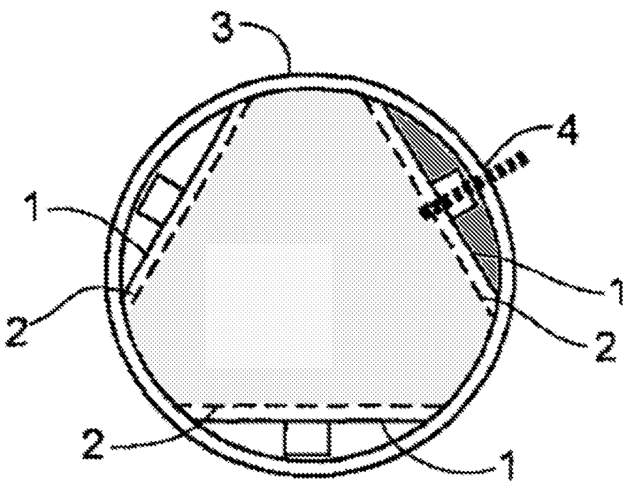
FIG. 7A shows the electrodes supported by stabilizing hardware 4 that does not cross into the center of the tube. Instead, the stabilizing hardware extends generally radially outward to support the electrodes against the wall of the tube. As shown in the figure, this creates an unobstructed passageway through the tube that includes the center axis of the tube. The passageway is dramatically wider than the narrow distance separating the first and second electrodes. One of skill in the art would recognize from FIG. 7A that the electrode pairs are spaced apart to form a water flow passage at the center of the tube that is multiple times wider than the distance between the electrodes of a pair. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 at ¶¶ 4, 11-12.



The unobstructed water flow passageway (highlighted here on FIG. 7A in yellow) includes the longitudinal center axis of the tubular housing 3 and is dramatically wider than the spacing between electrodes 1 and 2.

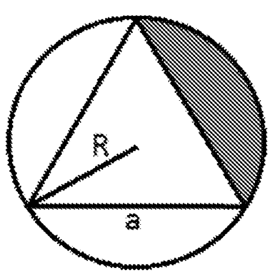
8. "the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway"

Dependent claims 19, 20, 44 have all been amended to remove the word “substantially” where it modifies “less than…” In addition, Applicant notes that FIG. 7A shows the area between the electrodes and the housing (highlighted in red in the figure below) is less than (and is even dramatically less than) the cross-sectional area of the unobstructed passageway (highlighted in yellow in the figure below). One of skill in the art would recognize from FIG. 7A that by positioning the electrode pairs closer to the outer wall of the tube, a larger area for water to flow is created at the center of the tube and there is less area between the electrode and the wall of the tube for water to pass. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 at ¶¶ 4, 13-14.



The area highlighted in red is significantly less than the area highlighted in yellow.

This relationship is not dependent on the scale of the drawing. As noted above, where an equilateral triangle is positioned over a circle with its corners falling outside the circle, the area shown in the above figure will necessarily be less than the area shown in yellow.



1. The area of the equilateral triangle is $\frac{a^2\sqrt{3}}{4} = .43\ a^2$ (rounding)
2. The area of the circle is πR^2.
3. $\cos 30° = \frac{\sqrt{3}}{2} = \frac{a}{2R}$, therefore $R = \frac{a}{\sqrt{3}}$
4. The area of the portion in red $= \frac{1}{3}(\pi R^2 - \frac{a^2\sqrt{3}}{4})$
   $= (\frac{\pi}{9} - \frac{\sqrt{3}}{12})\ a^2$
   $= .20\ a^2$ (rounding)
5. $0.20a^2 < 0.43a^2$

As shown in the equations to the right of the figure, where the triangle is shown to fit precisely within the circle, the area between one of the triangle sides and the circle (shown in red) will necessarily be less than half the area of the triangle. Where the corners of the triangle fall outside the circle, as shown in FIG. 7A of the ‘495 patent, the area shown in red will be an even smaller fraction of the area of the triangle inside the circle. Therefore, not only does FIG. 7A show the relationship recited in the limitation above, but this relationship will necessarily be maintained for any arrangement where there the electrodes are positioned along the sides of any equilateral triangle with its corners located outside the tubular housing, as shown in FIG. 7A. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 at ¶¶ 4, 13-14.

9-11. "the passageway running for at least the length of one of the electrodes positioned within the housing"

"the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing"

"the unobstructed passageway having a uniform cross-sectional area along that length."

As described above, each of claims 17, 20, 29, 42, and 62 have been amended to remove the reference to a "portion" of the electrodes. Further, claim 62 has been amended to remove the term "substantially" modifying "uniform".

FIGS. 7A and 7B are described as showing the oxygenation chamber of an emitter. Col. 3:55-59 ("FIG. 7 shows an oxygenation chamber suitable for flow-through applications. FIG. 7A is a cross section showing arrangement of three plate electrodes. FIG. 7B is a longitudinal section showing the points of connection to the power source."); col. 9:7-17 ("In FIG. 7(A), the oxygenation chamber is comprised of three anodes 1 and cathodes 2, of appropriate size to fit inside a tube or hose and separated by the critical distance are placed within a tube or hose 3 at 120° angles to each other. The anodes and cathodes are positioned with stabilizing hardware 4. …FIG. 7(B) shows a plan view of the oxygenation chamber…with stabilizing hardware 5 serving as a connector to the power source.").

Fig. 7A

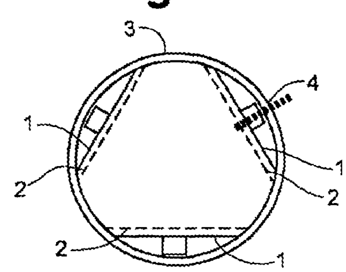
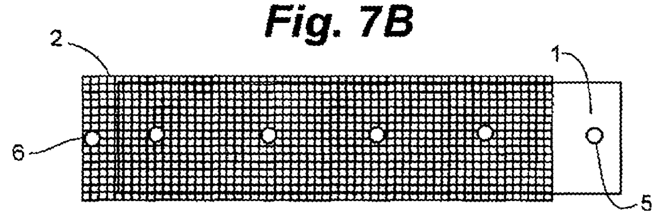


Fig. 7B



As shown in these figures, there is an unobstructed passageway at the center of the tube that runs the length of the electrodes 1, 2. The length of the electrodes is shown in FIG. 7B. FIG. 7A, which shows a cross-sectional view of the oxygenation chamber, shows how hardware is positioned toward the outside of the electrodes so that there are no obstructions in the passageway for the length of the electrodes, and the passageway has a uniform cross sectional area inside the oxygenation chamber. There is no reliance on the scale of the drawings to satisfy these claim limitations. Therefore, the disclosures of FIGS. 7A and 7B and their description in the specification reasonably convey to the artisan that the inventor had possession of the invention at least as of the time the ‘495 patent was filed. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 at ¶¶ 4, 15-17 By disclosing an example emitter oxygenation chamber with a passageway satisfying these limitations, the inventor met the written description requirement of 35 U.S.C. §112.

35 U.S.C. §112, 2nd Paragraph

The examiner rejected claims 13-27, 31, 38, 55, 56, 62-69, because of the use of the term “substantially.” By this amendment the term “substantially” has been deleted from claims 13, 19, 20, 31, 38, 44, 55, 62. It is believed that the rejection of claim 27 on this basis was in error as the word “substantially” does not occur in claim 27.

35 U.S.C. §112, 4th Paragraph

The examiner rejected claims 23, 26, 36, 46, 49, 58, 61 and 69 which specifically call out microbubbles or nanobubbles on the grounds that the claims from which these depend are already limited to a “critical distance” which is defined in the specification at 4:1-3 to be “the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles.” Elsewhere, the specification also states, “The critical distance ranges from 0.005 inches to 0.140 inches.” See 3:12-13. The applicant would agree with the examiner’s rejection had any of the claims used the defined term “critical distance.” None of the claims, however, use the phrase “critical distance.” Claim 13, for example, only recites that the electrodes are “separated by a distance of between 0.005 inches to 0.140 inches.” There is a difference between claiming the configuration of the electrodes and claiming a specific result from operating the electrodes in that configuration. The independent claims where they recite the separation distance are not claiming obtaining oxygen bubbles of a certain size. For example, claim 13 recites that “the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches” and that the power source “is operable to produce oxygen in said water.” By adding a requirement that the oxygen produced by the emitter includes bubbles of a certain size, the dependent claims are narrowing the claims. Infringement of the dependent claims may require different evidence (i.e. evidence indicative of the size of emitted bubbles), whereas there is no such requirement for determining infringement of the claims that recite the distance separating the electrodes.

Recapture

The examiner rejected all claims (13-69) as improperly recapturing subject matter surrendered during prosecution of U.S. Patent No. 7,396,441. The ‘441 patent is not being reissued. The ‘495 patent, however, which is presently being reissued, claims priority to the ‘441 patent. The examiner notes that during prosecution of the ‘441 patent, to overcome a prior art rejection the claims were amended to recite “three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets.” Merely for ease of reference, this limitation will be referred to herein as “the triangle limitation.” This triangle limitation does not appear in pending claims 13-69. Therefore, the examiner has rejected the present claims for recapture. Applicants respectfully traverse this rejection. In short, because the issued claims of the ‘495 patent did not include this limitation, the recapture rejection should be withdrawn.

For reference, the related prosecution history is as follows: (i) Provisional Application No. 60/358,534, filed on February 22, 2002; (ii) Application No. 10/372,017, filed February 21, 2003, now U.S. Patent No. 6,689,262, (i); (iii) continuation-in-part Application No. 10/732,326, filed on December 10, 2003, now U.S. Patent No. 7,396,441; (iv) divisional Application No. 12/023,431, filed January 31, 2008, now U.S. Patent No. 7,670,495, (v) reissue Application No. 13/247,241, filed September 28, 2011, now U.S. Patent No. RE45,415; (vi) continuation reissue Application No. 14/601,340, filed January 21, 2015 (the present application); and (vii) pending continuation reissue Application No. 15/085,741, filed March 30, 2016.

The three part test for analyzing recapture is as follows.[4] First, the reissue claims are analyzed to determine whether and in what aspects the reissue claims are broader than the original patent claims. The original patent is the patent actually being reissued. Second, if the reissue claims are broader in some aspects, it must be determined whether the patentee surrendered subject matter and whether any of the broader aspects of the reissue claim relate to that surrendered subject matter. Note that the second step has two subparts: (i) determine whether the patentee surrendered any subject matter, and (ii) determine whether any of the broader aspects identified in the first step relate to the surrendered subject matter. In the third step, the claims must be analyzed to determine whether the reissued claims were materially narrowed in other respects to avoid the recapture rule.

The first step in the analysis is a comparison of the reissue claims to the claims of the patent being reissued, i.e., the "original" patent.[5] To determine in what respects a reissue claim has been broadened (the first step of the recapture analysis), the reissue claims are not compared to claims in related applications, only to the original patent claims being reissued. It is incorrect in the first step of the analysis to assert that the pending reissue claims are broadened based on a comparison to claims in the other patents not being reissued such as the '441 issued claims. How the claims are "broader" is determined only by a comparison to the claims of the patent actually being reissued.

The issued emitter claims of the '495 patent (the "original" patent) did not include the triangle limitation. Therefore, the pending reissue claims have not "broadened" the '495 patent claims based on any lack of the triangle limitation. In other words, the triangle limitation is not

4 See, e.g., MBO Laboratories, Inc. v. Becton, Dickinson & Co., F.3d 1306 (Fed. Cir. 2010); citing In re Clement, 131 F.3d 1464, 1468 (Fed. Cir. 1997).

5 The MPEP makes clear that the first step of recapture analysis is a comparison to the claims of the patent being reissued. See MPEP 1412.02 ("In every reissue application, the examiner must first review each claim for the presence of broadening, as compared with the scope of the claims of the patent to be reissued.")(emphasis added). By contrast, the MPEP also makes clear that the second step of the recapture analysis looks to the patent family's entire prosecution to determine what may have been surrendered. See MPEP 1412.02 ("Where a claim in a reissue application is broadened in some respect as compared to the patent claims, the examiner must next determine whether the broadening aspect(s) of that reissue claim relate(s) to subject matter that applicant previously surrendered during the prosecution of the original application (which became the patent to be reissued). The "original application" includes the patent family's entire prosecution history.")

one way in which the reissue claims are broader than the claims of the patent being reissued. It is not one of the differences between the reissue claims and the claims of the patent being reissued. In the present case, as identified in the inventors oath, the reissue claims are broader than the original claims being reissued, for example, in that the new claims do not recite a spacer between the electrodes (Senkiw Decl. ¶9), not because the new claims do not recite the triangle limitation. When the proper claim comparison under the first step of recapture analysis is performed, the triangle limitation is not a way or aspect in which the reissue claims are broadening. Because the reissue claims have not broadened the '495 patent claims with respect to the triangle limitation, the recapture rejection based on the triangle limitation should be withdrawn.

It is true that the second step of the analysis—determining what has been surrendered—considers arguments and amendments made during prosecution of related applications. The second step must determine whether any of the broadened aspects of the reissue claims (identified in step 1) relate to subject matter surrendered during prosecution of the patent being reissued or surrendered during any related prosecution. See, e.g., MBO Laboratories, Inc. v. Becton, Dickinson & Co., F.3d 1306 (Fed. Cir. 2010)("The term 'original patent' [for the first step] refers to the patent corrected by reissue; it does not limit the universe of patents and their prosecution histories that can be the basis for surrendered subject matter [under the second step]." Determining what subject matter has been surrendered is based on a review of all related applications.

Even for this second step, however, the Court in MBO Labs. noted that the recapture doctrine, like the doctrine of prosecution history estoppel, looks to related applications for surrendered subject matter when the claims being reissued and the claims in a related application have a limitation in common. That is, an argument related to a limitation in a related application will be binding in subsequent related prosecutions where the claims include that same limitation. MBO Labs. at 1318 (The prosecution history of a related patent can be relevant if, for example, it addresses a limitation in common with the patent in suit. …When multiple patents derive from the same initial application, the prosecution history regarding a claim limitation in any patent that has issued applies with equal force to subsequently issued patents that contain the same claim limitation.") (emphasis added).

In the present case, however, the triangle limitation is not present in both the '441 and the '495 issued claims. It is only found in the '441 claims. Because the applicant continued to pursue and was eventually granted claims that did not include the triangle limitation in a continuing application, the triangle limitation is not surrendered subject matter. In other words, because the claims of the '495 patent did not repeat or include the triangle limitation, there is no basis to conclude that the triangle limitation constitutes surrendered subject matter for purposes of reissuing the '495 patent claims. The Federal Circuit has stated that where a continuing application is filed to pursue broader claims, it is inappropriate to find recapture based on a narrowing amendment in an earlier application:

> Although the recapture rule does not apply in the absence of evidence that the applicant's amendment was "an admission that the scope of that claim was not in fact patentable," "the court may draw inferences from changes in claim scope when other reliable evidence of the patentee's intent is not available." Deliberately canceling or amending a claim in an effort to overcome a reference strongly suggests that the applicant admits that the scope of the claim before the cancellation or amendment is unpatentable, but it is not dispositive because other evidence in the prosecution history may indicate the contrary. n.2 For example, if an applicant amends a broad claim in an effort to distinguish a reference and obtain allowance, but promptly files a continuation application to continue to traverse the prior art rejections, circumstances would suggest that the applicant did not admit that broader claims were not patentable-assuming that the applicant does not ultimately abandon the continuation application because the examiner refuses to withdraw the rejections.

In re Clement, 131 F.3d 1464, 1469 (Fed. Cir. 1997)(citations omitted, emphasis added).

In addition, even assuming for the sake of argument that the triangle limitation were considered surrendered subject matter for the '495 patent, none of the broadening aspects of the reissue claims relate to the triangle limitation. As stated above, the broadened aspects of the pending reissue claims (when properly compared to the claims of the '495 patent being reissued) relate to the spacer between the electrodes and the supersaturated limitation, not to any triangle limitation. Therefore, even assuming the triangle limitation constitutes surrendered subject matter, the broadening aspects of the pending claims do not relate to that subject matter.

Applicants respectfully submit that for at least these reasons, the recapture rejection should be withdrawn.

Response to Statements Suggesting that the '441 Patent (and Not the '495 Patent) is the Reference Patent for Determining Whether the Pending Claims Can Be Pursued in a Reissue Application Filed on the '495 Patent

This office action, and previous office actions, make statements suggesting that the '441 patent (and not the '495 patent) is the reference patent for determining whether the pending claims can be pursued in a reissue application filed on the '495 patent. The current office action at page 4, for example, states:

> The '495 patent does not contain claims to an emitter positioned within a conduit (as shown in Fig. 7), rather, it is the '441 divisional patent which claims an emitter positioned within a conduit. During prosecution of the '441 patent application, applicant specifically cited to Fig. 7 as support for the '441 patent claims. The present continuation reissue application cannot broaden the claims of the '441 divisional patent (which issued July 8, 2008). Nor can the present continuation reissue application recapture subject matter that was surrendered during the prosecution of the '441 divisional patent.
>
> Claims 13-69 are rejected as being based upon a defective reissue declaration under 35 U.S.C. 251 as set forth above. See 37 CPR 1.175.

A. Summary of Response

The process for assessing whether claims can be pursued in a broadening reissue application starts with identifying the "original patent" which, by statute, is the patent being reissued. *MBO Laboratories, Inc. v. Becton, Dickinson & Co.*, 602 F.3d 1306, 1316 (2010) (the Federal Circuit has construed "original patent" to be the actual patent being reissued). Respectfully, by making statements such as "the present continuation reissue application cannot broaden the claims of the '441 divisional patent (which issued July 8, 2008)" this office action and previous office actions appear to confuse the '441 patent with the '495 patent. The '495 patent is in fact the original patent, and it issued March 2, 2010, less than two years from the date applicant filed its application to reissue the '495 patent.

The ultimate question is whether or not there is any point of law which would bar applicant from pursing the pending claims in a reissue application filed on the '495 patent. The examiner has stated or suggested that the pending claims violate three points of law. In the application of each point of law, however, the examiner reverts back to the '441 patent, effectively using it as the original patent in analyzing the legal issues.

First, the examiner has suggested pending claims violate the two year rule for broadening reissues, and references the issue date of the '441 patent. The law, however, makes clear that the reference point for measuring the two year period is the issue date of the original patent which is the '495 patent. The two year rule has been satisfied and does not bar the pending claims.

Second, the examiner has stated that the pending claims violate the *Orita* doctrine and references a restriction requirement that was made in the '441 patent prosecution, not the '495 patent prosecution. As is the case with the application of the two-year rule, the *Orita* analysis starts with the '495 patent and its prosecution, and not the '441 patent. Here, there was no restriction made in the '495 patent prosecution. The examiner in the '495 patent prosecution did not make, repeat or refer to the prior restriction from the '441 patent. MPEP 819 ("A restriction requirement (and election thereto) made in a parent application does not carry over to a continuation, CIP, <u>or divisional</u> application.") (emphasis added). There being no restriction or narrow constructive election in the '495 patent, the *Orita* doctrine does not apply or bar the pending claims.

Third, the examiner states that the pending claims violate the recapture doctrine. Again, the examiner starts with the '441 patent and its prosecution as the starting point. That, again, is a misapplication of the law of recapture. As discussed above, the first and second steps of the recapture analysis starts with the claims of the '495 patent. Here, it is clear that recapture does not apply because the triangle limitation found in the '441 patent claims is not even present in the already issued '495 claims. As a matter of law, because the applicant continued to pursue and was eventually granted claims that did not include the triangle limitation in a continuing application which resulted in the '495 patent, the triangle limitation is <u>not</u> surrendered subject matter.

In the application of each of these three legal principles the examiner has incorrectly used the '441 patent as the reference, instead of the '495 patent which is in fact the original patent. Reconsideration is respectfully requested.

B. Detailed Discussion

Since the office action continues to suggest that the pending claims are barred by the *Orita* doctrine and the two-year rule, applicant includes the details of the prior response to those rejections. The Senkiw Declaration reference below is in the record. It was filed with applicant's request for continued examination.

1. There was no restriction requirement in the '495 patent prosecution that would have precluded the present claims from being prosecuted in the '495 patent.

The Federal Circuit has provided the following guidance on the application of the *Orita* doctrine: (1) restriction requirements from prior related applications do not carry over into continuing applications unless the restriction is specifically repeated or referred to in the continuing application, (2) the *Orita* doctrine is only applied to reject reissue claims that could not have been prosecuted in the patent being reissued, and (3) reissue claims can only be rejected based on the *Orita* doctrine where the reissue claims are identical or substantially identical to claims that were subject to a prior restriction.

While not actually citing the *Orita* doctrine, the office action's reference to the '495 being a divisional of the '411 patent continues to suggest that the *Orita* doctrine is being applied to bar the presently pending claims. Prior rejections were premised on there being a restriction requirement in the '495 patent prosecution that would prevent the present claims from being prosecuted in the '495 case. That premise is false, however, because there was no restriction made in the '495 patent prosecution. The examiner did not make, repeat or refer to the prior restriction from the '441 patent. MPEP 819 ("A restriction requirement (and election thereto) made in a parent application does not carry over to a continuation, CIP, <u>or divisional</u> application.") (emphasis added). There being no restriction or narrow constructive election in the '495 patent, the *Orita* doctrine does not apply and the Applicant should be permitted to pursue the pending claims in a reissue of the '495 patent.

Not only did the examiner of the '495 patent not make a restriction, but he also rejected the claims of the '495 patent for double patenting based on the claims of the '441 patent. The claims of the '441 patent <u>included</u> the "within a conduit" limitation. In effect, the examiner of the '495 patent found that the apparatus claims of the '495 patent, including claim 2 of the '495 patent, were essentially the same invention and should have been prosecuted together with the claims of the '441 patent that included the "within a conduit" limitation. See Senkiw Decl. ¶¶ 13-14, 17. As a result, the Applicant was required to file a terminal disclaimer, forfeiting a portion of the term of the ‘495 patent and to commit the two patents to common ownership to overcome the double patenting rejection. The prosecution record is clear that the examiner of the ‘495 patent did not believe the claims in the ‘495 patent were patentably distinct from claims that included this particular limitation and, in fact, found the ‘495 claims to be essentially the same invention as claims that included this limitation.

The Patent Office cannot assert that the claims of the ‘495 patent are not patentably distinct from claims that include the “within a conduit” limitation during original prosecution of the ‘495 patent, and then take the opposite position that the same claims are patentably distinct on this basis during reissue of the ‘495 patent.

The mere fact of identifying a continuing application as a “divisional,” by itself, does not limit or restrict the scope of claims that may be filed or prosecuted in that application. It is common that applicants, by adding or amending claims, end up with claims in an application filed **as a divisional** that are not patentably distinct from claims prosecuted in the parent application. Such claim sets are said to be **not consonant** with the prior restriction, and the only consequence is that the patent will lose the benefit of Section 121’s safe harbor protection against double patenting findings. The case law is full of examples where applicants filed and were issued claims in divisional applications that later were said to be not consonant with prior restricted claim sets. Symbol Techs., Inc. v. Opticon, Inc., 935 F.2d 1569 (Fed. Cir. 1991); Gerber Garment Tech., Inc. v. Lectra Sys., Inc., 916 F.2d 683 (Fed. Cir. 1990); St. Jude Med., Inc. v. Access Closure, Inc., 729 F.3d 1369, 1377 (Fed. Cir. 2013); Lerner v. Ladd, 216 F. Supp. 81 (D.D.C. 1962).

Significantly, the examiner of the ‘495 patent even had the opportunity to issue a restriction requirement between claims in the ‘495 patent itself on this basis because there were claims in the ‘495 patent application that included the “within a conduit” limitation. To be clear, there were claims in the ‘495 patent both with and without the “within a conduit” limitation. Despite this, the examiner issued no restriction requirement. Claim 1 of the ‘495 patent included the limitation, “providing a flow through oxygenator comprising an emitter…placing the emitter within a conduit…” (emphasis added). By contrast, claim 2 of the ‘495 patent did not include a limitation that the emitter was “within a conduit”. The examiner of the ‘495 patent was squarely presented with the opportunity to restrict claim 1 from claim 2 based on this limitation, but did not do so. Instead, he rejected claim 2 for double patenting based on claims in the '441 patent that included the "within a conduit" limitation. The record cannot be more clear that the examiner of the '495 patent did not restrict out or prevent or bar claims in the '495 patent based on the presence or absence of the limitation that the emitter be positioned "within a conduit".

In all three prosecutions ('262, '441, and '495), the Applicant consistently pursued claims to an emitter for electrolytic generation of bubbles of oxygen. See Senkiw Decl. ¶¶ 13-14. There is no basis for asserting that the present claims which are similarly directed to an emitter for the electrolytic generation of bubbles of oxygen could not have been prosecuted with the claims of the '495 patent. There being no restriction or narrow constructive election in the '495 patent (and instead a double patenting rejection), Applicant should be permitted to pursue the pending claims in a reissue of the '495 patent to correct the error in claim 2 of the '495 patent identified in paragraphs 7 and 8 of the Senkiw declaration.

2. When claiming an emitter for generating oxygen bubbles in water, reciting that the electrodes are "within a conduit" does not make the claims patentably distinct from claims that do not recite that limitation.

It makes sense that the phrase "within a conduit" would not make claims to an emitter for generating oxygen bubbles in water patentably distinct from claims that do not. As explained in the reissue declaration, to generate oxygen bubbles in water, of course, some type of water container or vessel is needed to bring the electrodes into contact with the water. Senkiw Decl. ¶ 15. Therefore, simply adding "within a conduit" is not a patentable step, as it does not add any significant feature that wouldn't already inherently be needed to make an emitter create bubbles in water. Senkiw Decl. ¶ 16.

3. Applicant never argued that the limitation "within a conduit" made claims patentably distinct.

It was also suggested in prior office actions that an argument had been made during prosecution of the '441 patent that placing the electrodes "within a conduit" was a patentably distinct limitation. No such argument was made. See Senkiw Decl. ¶¶ 18-21. In an office action dated May 25, 2007, claim 1 of Application No. 10/732,326 was rejected for double patenting based on claims in the '262 patent. In response, in an amendment dated August 17, 2007, multiple changes were made to the claim, and the Applicant stated that the double patenting rejection no longer applied. The following chart shows the claim both before and after the amendment.

Claim discussed in '441 prosecution **prior to** amendment	Claim discussed in '441 prosecution **after** amendment (with and without markings to show changes)
1. A flow through oxygenator consisting of an emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other, and a power source all in electrical communication with each other, wherein the emitter is placed within or adjacent to a conduit for flowing water.	1. A flow through oxygenator ~~consisting of~~ comprising: a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen; an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen ~~comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other,~~ and a power source ~~all~~ in electrical communication with ~~each other wherein~~ the oxygen emitter ~~is placed within or adjacent to a conduit for flowing water~~. Clean version (without markings) 1. A flow through oxygenator comprising: a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen; an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen; and a power source in electrical communication with the oxygen emitter.

The remarks section filed with the amendment included the generic statement:

> "Applicant respectfully asserts that the need for a Terminal Disclaimer to overcome a non-statutory obviousness-type double patenting rejection has been overcome through the present amendment to independent claim 1… As claims 1 [and others] are patentably distinct from claims 1-6 of U.S. Patent No. 6,689,262, Applicant respectfully requests said rejection be withdrawn."

From the marked changes it is clear that multiple changes were made to the claim. The amendments to the claim included: changing the preamble from "consisting of" to "comprising"; removing any reference to a critical distance between electrodes; adding a limitation that there be a plurality of anodes and a plurality of cathodes; adding a limitation that the electrodes now be arranged in a plurality of "matched sets"; adding features of a fluid conduit; and adding completely new structure, "stabilizing hardware", that was not previously recited. The limitation that the electrodes be "positioned within the conduit lumen" was never called out as being the basis for making the claims patentably distinct. In fact, no one limitation was specifically identified as the basis for making the claim patentably distinct, and there is no more reason in the prosecution history to pin the distinction on the "within a conduit" limitation than there is to pin the distinction on the new "stabilizing hardware" limitation, for example, or the "plurality of matched sets" limitation. In fact, the language that the electrodes be "placed within or adjacent to a conduit" had already been in the claim prior to the amendment which suggests that the "positioned within the conduit" limitation was not the basis for arguing the claim was now patentably distinct.

In addition, in the very next office action, the examiner disagreed that even all of these amendments combined made the claims patentably distinct. The examiner maintained the double patenting rejection. Only after several more later amendments that did not relate to the electrodes being positioned "within a conduit" did the examiner finally withdraw the double patenting rejection. Therefore, the prosecution history of the '441 patent does not support any finding that either the Applicant or the examiner ever argued or asserted that the "positioned within a conduit" limitation made claims patentably distinct from claims that did not recite that limitation.

4. The present claims are not identical or substantially identical to any restricted claims

Since there was no restriction requirement made in the '495 patent application, the *Orita* doctrine does not apply. Further, even assuming that the restriction in the '441 application was referred to and imposed by the examiner in the '495 prosecution (which did not happen), any attempt to apply the *Orita* doctrine by the examiner must include a finding, supported by an articulation of the reasoning therefore, that the claims are identical or substantially identical to claims that were subject to a prior restriction requirement. See *Ex parte Belliveau*, decision of the Board of Patent Appeals and Interferences, Appeal No. 2010-007121, Application No. 10/801,177, Patent No. RE43,017 (Aug. 30, 2010) (reversing examiner's *Orita* rejection for failure to make any finding that the claims were identical or substantially identical to claims subject to the restriction requirement).[1] The office action makes no finding that these claims are identical or substantially identical to the claims that were subject to the '441 restriction requirement. The present claims, while directed to an emitter for electrolytic generation of bubbles of oxygen, are, in fact, not identical or substantially identical to the claims in the '441 patent that were subject to the restriction requirement at least because of the very features and limitations noted in the present reissue oath relating to FIGS. 7A and 7B. The rejection should be withdrawn.

5. The two-year period for filing a broadening reissue is measured from the issue date of the '495 patent, not the prior '441 patent.

In a prior advisory action dated Nov. 25, 2015, the examiner suggested an alternative argument that, if the claims of the '495 patent are not patentably distinct from the earlier-issued '441 patent, then the two year rule for a broadening reissue on the '495 patent is measured from the issue date of the '441 patent.[2] Since the first broadening reissue on the '495 patent was filed

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[1] In addition to being accessible via PAIR, this case is also published on LEXIS at *Ex parte Belliveau*, 2010 Pat. App. LEXIS 17175 (B.P.A.I. Aug. 30, 2010).

[2] While unrelated to examiner's view of the two-year rule, the examiner made a statement characterizing the present reissue claims that is based on flawed logic and goes too far. The examiner stated: "If the '495 oxygen emitter claims are not patentably distinct from the '441 flow-through oxygenator claims, then the instant reissue claims to an emitter positioned within a conduit are also not patentably distinct from the '441 claims." It is true that each of the applications (the '441 case, '495 case, and the present reissue) include claims directed to an

more than two years after the '441 parent patent issue date, the examiner suggests the two-year rule would bar the claims. That is not the law.

As set out in 35 U.S.C. §251, the two year period is measured from the issue date of the "original patent." The Federal Circuit has construed "original patent" to be the actual patent being reissued. *MBO Laboratories, Inc. v. Becton, Dickinson & Co.*, 602 F.3d 1306, 1316 (2010). As explained in the *MBO Labs.*, the patent office may look to other related applications to determine if there has been any recapture, but the two year date runs from the actual patent being reissued. *MBO Laboratories, Inc. v. Becton, Dickinson & Co.*, 602 F.3d 1306, 1316 (2010). Here, that is the issue date of the '495 patent, not the '441 or '262 patent. The error being corrected occurs in the '495 patent, and it is the '495 patent that is being reissued.

The Applicants previously provided a copy of the decision in *Ex Parte Taylor*, 2015 Pat. App. LEXIS 953 (PTAB Feb. 12, 2015)(App. No. 13/067,574) as an example that contradicts the position stated in the advisory action. In *Ex Parte Taylor*, the PTAB expressly found the broadening reissue application to be timely filed, even though the reissue claims were clearly broader than and filed more than two years after the issuance of an earlier related patent. The PTAB expressly finds that "Taylor timely seeks broadening reissue under 35 U.S.C. § 251 n5 of U.S. Patent No. 7,582,597 B1 *Products, methods and equipment for removing stains from fabrics*. n6." In footnote six, the Board's opinion points out that the '597 patent was a continuation claiming priority back to a prior '157 patent which had issued (Sept. 2006) almost five years prior to the filing date of the reissue application (June 2011). Despite this fact, the Board found the broadening reissue application to be timely filed because it was filed within two

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emitter for electrolytic generation of bubbles of oxygen. It is also true adding "within a conduit" **alone** does not render a claim patentably distinct from an emitter claim without that limitation. It does not follow, however that the present reissue claims are not patentably distinct from the claims in the '441 patent. Nor has the Applicant argued that the present reissue claims are not patentably distinct from the claims in the '441 patent. The position taken by the Applicant is that, because the examiner of the '495 patent did not use the "within a conduit" limitation to restrict claims from the '495 patent, the present reissue claims cannot be barred from a reissue of the '495 patent on this basis. In other words, the present reissue claims clearly could have been prosecuted in the '495 patent, which is sufficient to satisfy the *Orita* doctrine.

years of the patent actually being reissued. It is significant to note that the reissue claims were clearly broader than not only the claims of the patent being reissued, but also broader than the claims of the related patent that had issued nearly five years prior to the filing of the reissue.

The finding in *Ex Parte Taylor*, therefore, contradicts the position taken in the advisory action. As long as the claims are careful not to recapture surrendered subject matter, a broadening reissue application is timely if filed within two years of the patent being corrected, regardless whether the reissue claims would be broader than other claims in related cases.

As mentioned in *MBO Labs* the prohibition on recapture, of course, may look to other related applications. The recapture doctrine, however, does not alter how the two year term for broadening is measured. Indeed, if there were a blanket rule prohibiting reissue claims that are broader than claims more than two years old in earlier-issued, related patents, then there would be no need to apply the recapture doctrine in such cases. In other words, that the recapture doctrine is applied in such cases contradicts the legal theory asserted by the examiner.

6. The present reissue claims are directed to the invention disclosed in the '495 patent.

It was also stated in prior office actions that the reissue claims are directed to a "different" invention than the *claims* of the '495 patent. This is not the test for satisfying the requirement in 35 U.S.C. §251 that a reissue patent be "for the invention disclosed in the original patent." MPEP § 1412.01 makes clear that the new claims need only be for the same general invention as measured against the specification disclosure, not the prior claims. If there is support under § 112 for the newly added claims and there is no other indication in the specification of an intent not to claim the invention, then the newly added claims satisfy the requirement of 35 U.S.C. §251 that the reissue patent be issued for the "same invention." Therefore, the prior office action's assertion that the newly added claims are directed to a "different" invention as compared to the claims of the '495 patent is improper and provides no basis for rejecting the claims.

Conclusion

For the foregoing reasons the Applicant respectfully requests reconsideration and withdrawal of the pending rejection.

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Date ________________ By:
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S/N 14/601,340 **CONTINUATION REISSUE PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	James Andrew Senkiw	Examiner: Jerry D. Johnson
Serial No.:	14/601,340	Group Art Unit: 3991
Filed:	January 21, 2015	Atty. Docket No.: 3406.005US2
Continuation Reissue of U.S. Patent No. 7,670,495		Issued March 2, 2010
Title: FLOW-THROUGH OXYGENATOR		Customer Number: 38846

DECLARATION OF DR. PAUL STRYKOWSKI
UNDER 37 C.F.R. §1.132

I, Dr. Paul Strykowski, declare as follows:

1. I hold Ph.D. and M.S. degrees in Mechanical Engineering from Yale University and a B.S. degree in Mechanical Engineering from the University of Wisconsin. I currently teach undergraduate and graduate fluid mechanics as the Morse Alumni Professor in the College of Science & Engineering at the University of Minnesota.

2. In my research I have examined both fundamental flow physics and applied fluid mechanics of nonreacting and reacting free shear flows, and I have performed studies of transitional and turbulent free shear flows experiencing density variation, curvature, compressibility, and heat release. My curriculum vitae is attached as exhibit A.

3. I have read the disclosure of U.S. Patent No. 7,670,495.

4. I can see each of the claim limitations discussed below in the disclosure of the '495 patent, and for the reasons given below, it is my opinion that the claim limitations discussed herein for an electrolysis emitter were sufficiently disclosed in the specification and figures of the '495 patent such that one of ordinary skill in this art would have understood that Mr. Senkiw possessed the invention at the time he filed his application for the '495 patent. Because these features are disclosed and supported in large part merely by understanding the cross sectional drawings of the electrolysis chamber, I believe one of ordinary skill in this art would recognize these elements in the disclosure of the '495 patent even if the level of ordinary skill in this art were to be defined to be relatively low (two years of undergraduate training in mechanical engineering or equivalent work experience). The level of ordinary skill in this art is not less

than this low level of skill which is more than sufficient to understand how to identify the characteristics of the electrolysis chamber shown in cross-sectional drawings discussed herein.

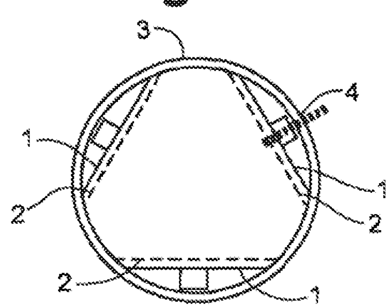
Limitations regarding the Electrodes Being Closer to the Tubular Housing than a Center Axis of the Tubular Housing

5. Each of the following claim limitations are disclosed in the description provided in the '495 patent such that one of ordinary skill in this art would have understood that Mr. Senkiw possessed the invention at the time he filed his application for the '495 patent:

> "each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing"
>
> "the electrodes are positioned away from a longitudinal center axis of the tubular housing"
>
> "each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing"

6. Each of these limitations relates to positioning the electrodes inside the housing so that the electrodes are arranged toward the outside, away from the center point of the housing. This arrangement is clearly shown in FIG. 7A. As shown in FIG. 7A, three sets of electrodes (1, 2) are arranged along the lines of a triangle. The written description confirms that the three sets of anode and cathode pairs are each at the same 120 degree angle with respect to each other (i.e. the triangle is an equilateral triangle). See Col. 9:10-11. FIG. 7A also shows that the electrodes terminate at the inside surface of the tube wall, and the electrodes do not complete the corners of the triangle. In other words, the points of the triangle would fall outside the tube 3.

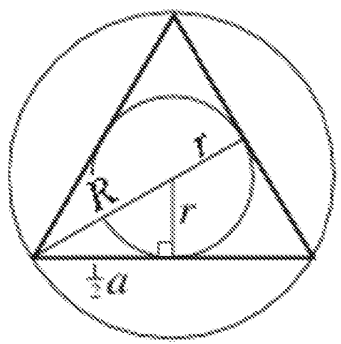
Fig. 7A

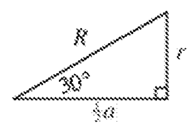


7. The electrodes shown in FIG. 7A do not pass through the center axis of the tube

but instead are positioned away from the center axis and closer to the wall of the tube than they are to the center axis of the tube. Therefore, the figure clearly supports each of the limitations listed above.

8. These limitations do not rely on the scale of the drawing. Geometry mathematically dictates that electrodes positioned along the lines of an equilateral triangle centered on a round tube with its corners located outside the tube, will necessarily be located closer to the outer wall than to the center point of the tube. It is mathematically impossible for electrodes in this configuration to be closer to the center of the tube than the wall of the tube. It does not matter how large or small you make the housing or the electrodes: if the electrodes are arranged as chords of a circle along the sides of an equilateral triangle having its points outside the circle as is clearly shown in FIG 7A and also described at 9:7-11, the electrodes can <u>never</u> be closer to the center point of the tube than to the circular wall of the tube. This is dictated by the shapes shown in FIG. 7A (concentric circle and equilateral triangle). Consider the following:





sin 30° = ½ = r/R.

See http://mathworld.wolfram.com/EquilateralTriangle.html. This simple calculation shows that r (the distance each side of the triangle is away from the center point of the circle) shrinks to ½ R (half the radius of the outer circle) only when the triangle fits inside the circle. If the corners of the triangle fall outside the circle (as shown in FIG. 7A), then r will necessarily be greater than ½ R. In other words, when the corners of the triangle fall outside the circle, the sides of the triangle will always be closer to the outer circle than to the center point or axis of that circle. Therefore, not only does FIG. 7A disclose the relationships recited in these limitations between the electrodes, tube wall and tube center, but even if the scale of the drawing were altered or changed, the relationship would still necessarily be satisfied.

Limitations regarding the Electrodes Being in Contact with the Wall of the Tubular Housing or Closer to the Wall than the Distance Separating the Electrodes

9. Each of the following claim limitations are disclosed in the description provided in the ‘495 patent such that one of ordinary skill in this art would have understood that Mr. Senkiw possessed the invention at the time he filed his application for the ‘495 patent:

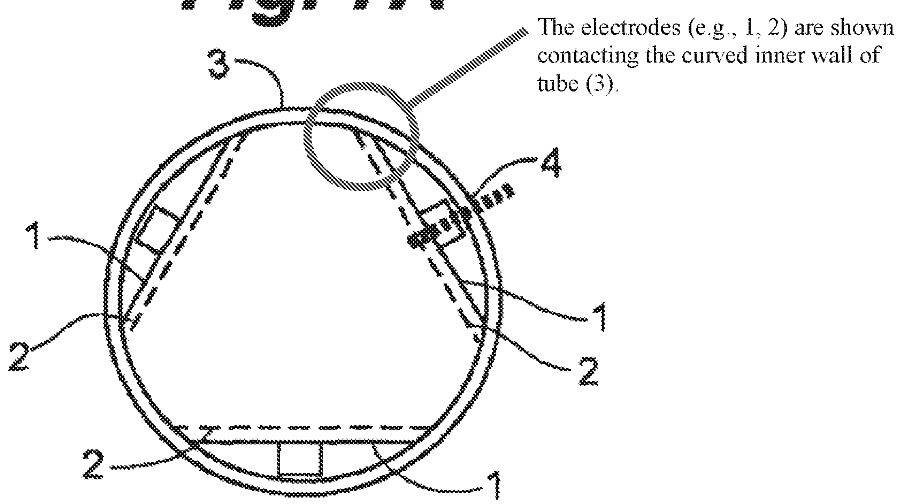
> “a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing”

> “the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing”

> “at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes”

10. FIG. 7A shows the electrodes (1, 2) in contact with the curved inner wall of the circular tube 3. Because the electrodes contact the wall, each is closer to that wall than the distance separating the electrodes. Components that are touching or contacting each other are necessarily closer together than components that are separated.

Fig. 7A

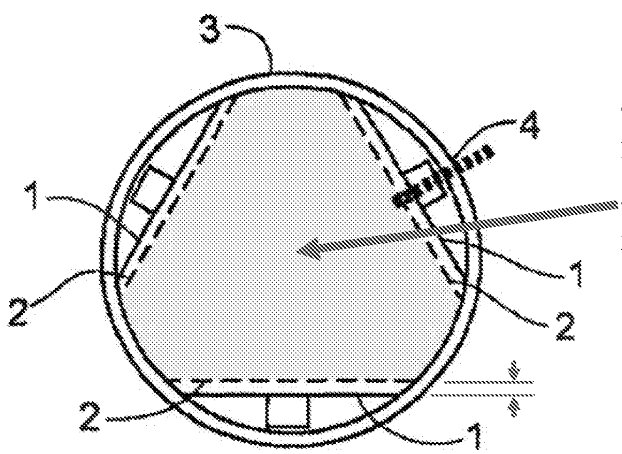


Limitation regarding an Unobstructed Passageway that includes the Center Axis and is Multiple Times Wider than the Electrode Separation Distance

11. The following claim limitation is disclosed in the description provided in the '495 patent such that one of ordinary skill in this art would have understood that Mr. Senkiw possessed the invention at the time he filed his application for the '495 patent:

> "the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing"

12. FIG. 7A shows the electrodes supported by stabilizing hardware 4 that does not cross into the center of the tube. Instead, the stabilizing hardware extends generally radially outward to support the electrodes against the inner wall of the tube. As shown in the figure, this creates an unobstructed passageway through the tube that includes the center axis of the tube. The passageway is dramatically wider than the narrow distance separating the first and second electrodes. One of skill in the art would recognize from FIG. 7A that the electrode pairs are spaced apart to form a water flow passage at the center of the tube that is multiple times wider than the distance between the electrodes of a pair.



The unobstructed water flow passageway (highlighted here on FIG. 7A in yellow) includes the longitudinal center axis of the tubular housing 3 and is dramatically wider than the spacing between electrodes 1 and 2.

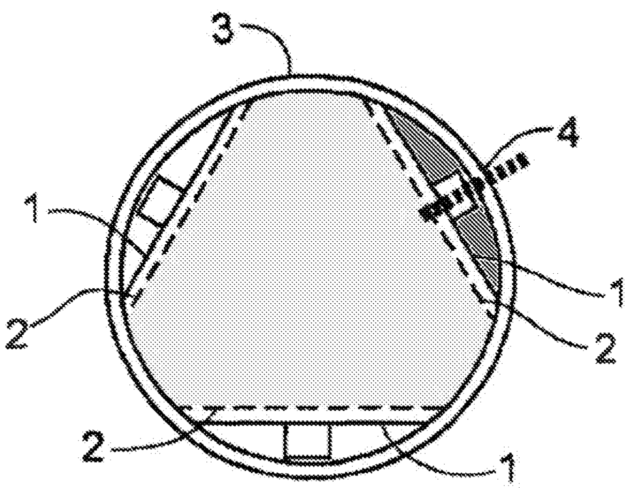
Limitation regarding the Area of the Passageway and the Area between Electrodes and Tube

13. The following claim limitation is disclosed in the description provided in the '495 patent such that one of ordinary skill in this art would have understood that Mr. Senkiw

possessed the invention at the time he filed his application for the '495 patent:

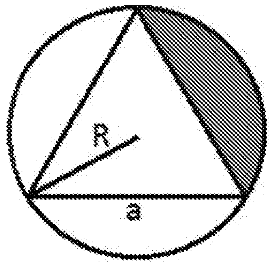
> "the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway"

14. FIG. 7A shows the area between the electrodes and the housing (highlighted in red in the figure below) is less than (and is even dramatically less than) the cross-sectional area of the unobstructed passageway (highlighted in yellow in the figure below). One of skill in the art would recognize from FIG. 7A that by positioning the electrode pairs closer to the outer wall of the tube, a larger area for water to flow is created at the center of the tube and there is considerably less area between the electrodes and the wall of the tube for water to pass.



The area highlighted in red is significantly less than the area highlighted in yellow.

This relationship is not dependent on the scale of the drawing. As noted above, where an equilateral triangle is positioned over a circle with its corners falling outside the circle, the area shown in the above figure will necessarily be less than the area shown in yellow.



1. The area of the equilateral triangle is $\frac{a^2\sqrt{3}}{4} = .43\ a^2$ (rounding)
2. The area of the circle is πR^2.
3. $\cos 30° = \frac{\sqrt{3}}{2} = \frac{a}{2R}$, therefore $R = \frac{a}{\sqrt{3}}$
4. The area of the portion in red $= \frac{1}{3}(\pi R^2 - \frac{a^2\sqrt{3}}{4})$

$$= (\frac{\pi}{9} - \frac{\sqrt{3}}{12})\ a^2$$

$$= .20\ a^2 \qquad \text{(rounding)}$$

5. $0.20a^2 < 0.43a^2$

As shown in the equations to the right of the figure, where the triangle is shown to fit precisely within the circle, the area between one of the triangle sides and the circle (shown in red) will necessarily be less than half the area of the triangle. Where the corners of the triangle fall outside the circle, as shown in FIG. 7A of the '495 patent, the area shown in red will be an even smaller fraction of the area of the triangle inside the circle. Therefore, not only does FIG. 7A show the relationship recited in the limitation above, but this relationship will necessarily be maintained for any arrangement where the electrodes are positioned along the sides of any equilateral triangle with its corners located outside the tubular housing, as shown in FIG. 7A.

Limitations regarding an Unobstructed Passageway Running for the Length of an Electrode and Having a Uniform Cross Sectional Area

15. The following claim limitations are disclosed in the description provided in the '495 patent such that one of ordinary skill in this art would have understood that Mr. Senkiw possessed the invention at the time he filed his application for the '495 patent:

> "the passageway running for at least the length of one of the electrodes positioned within the housing"
>
> "the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing"
>
> "the unobstructed passageway having a uniform cross-sectional area along that length."

16. FIGS. 7A and 7B are described as showing the oxygenation chamber of an emitter. Col. 3:55-59 ("FIG. 7 shows an oxygenation chamber suitable for flow-through

applications. FIG. 7A is a cross section showing arrangement of three plate electrodes. FIG. 7B is a longitudinal section showing the points of connection to the power source."); col. 9:7-17 ("In FIG. 7(A), the oxygenation chamber is comprised of three anodes 1 and cathodes 2, of appropriate size to fit inside a tube or hose and separated by the critical distance are placed within a tube or hose 3 at 120° angles to each other. The anodes and cathodes are positioned with stabilizing hardware 4. …FIG. 7(B) shows a plan view of the oxygenation chamber…with stabilizing hardware 5 serving as a connector to the power source.").

Fig. 7A

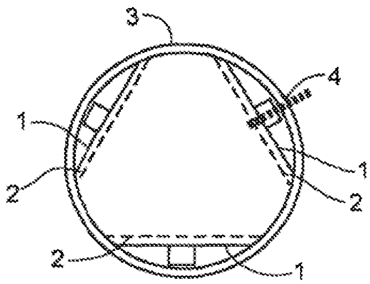
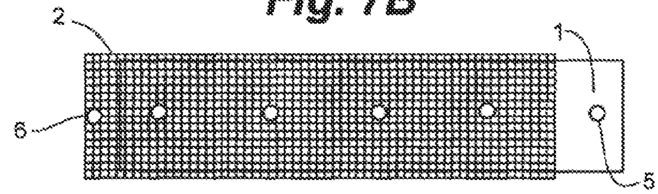


Fig. 7B



17. As shown in these figures, there is an unobstructed passageway at the center of the tube that runs the length of the electrodes 1, 2. The length of the electrodes is shown in FIG. 7B. FIG. 7A, which shows a cross-sectional view of the oxygenation chamber, shows how hardware is positioned toward the <u>outside</u> of the electrodes so that there are no obstructions in the passageway for the length of the electrodes, and the passageway has a uniform cross sectional area inside the oxygenation chamber. FIGS. 7A and 7B and their description in the specification reasonably convey to the artisan that the inventor had possession of the invention at least as of the time the '495 patent was filed.

18. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above referenced application or any patent issuing thereon.

Date: 2/3/17

Dr. Paul Strykowski

Exhibit A

PAUL JOHN STRYKOWSKI
Horace T. Morse Professor
Associate Dean for Undergraduate Programs

College of Science and Engineering
University of Minnesota – Twin Cities
Minneapolis, Minnesota 55455
pstry@umn.edu

EDUCATION

Ph.D.	Mechanical Engineering, Yale University, December 1986
M.Phil.	Mechanical Engineering, Yale University, December 1985
M.S.	Mechanical Engineering, Yale University, December 1983
B.S.	Mechanical Engineering with Distinction, University of Wisconsin, May 1982

PROFESSIONAL EXPERIENCE – UNIVERSITY OF MINNESOTA

Associate Dean for Undergraduate Programs, 2007 –
Professor, Department of Mechanical Engineering, September 1997 –
Associate Professor, Department of Mechanical Engineering, September 1993 – August 1997
Assistant Professor, Department of Mechanical Engineering, September 1988 – August 1993

PROFESSIONAL EXPERIENCE – OTHER ACADEMIC

Doctoral Co-Directive Status, Department of Mechanical Engineering, Florida State University, June 1995 – 2000
Adjunct Professor, Department of Mechanical Engineering, Florida A&M University, June – Aug., 1992 – 1994
Post Doctoral Fellowship, German Aerospace Research Establishment, Göttingen, Germany, Oct. 1986 – June 1988
Graduate Research Assistant, Department of Mechanical Engineering, Yale University, Sept. 1982 – Sept. 1986
Undergraduate Research Assistant, Chemical Engineering, University of Wisconsin, Sept. 1981 – May 1982

RECOGNITIONS AND AWARDS

George W. Taylor Distinguished Teaching Professor, 2011
Seven Wonders of Engineering Awards, Minnesota Society of Professional Engineers, 2004
Distinguished University Teaching Professor – Academy of Distinguished Teachers, 2000
Charles E. Bowers Faculty Teaching Award, 2000
George Taylor Alumni Association Distinguished Teaching Award, 1999
Ralph R. Teetor Educational Award, SAE, 1994
George Taylor Career Development Award, 1993
Minnesota Young Mechanical Engineer of the Year, ASME, 1992
University Scholars Faculty Appreciation Award, 1990, 1992
Outstanding Professor Award, Mechanical Engineering, 1989, 1999
Sheffield Scientific Fellowship, Yale University, 1982

RESEARCH INTERESTS

Fundamental flow physics and applied fluid mechanics of non-reacting and reacting flows. Research includes transitional and turbulent free shear flows experiencing density variation, curvature, compressibility, excitation and heat release. Particular attention is paid to local and global stability characteristics and the extent to which hydrodynamic instability impacts flow control. Spatio-temporal theory is used to understand flow receptivity, most notably in scenarios where absolute instability dictates flow physics. Dynamic conditions range from low-speed liquid flows to supersonic compressible gas flows to reacting flows.

OTHER PROFESSIONAL ACCOMPLISHMENTS

President, Trio Engineering Design, LLC, engineering consulting firm founded 2004
Board Member, St. Paul Partners, a non-profit organization that raises awareness and financial support for the development of potable water delivery systems in rural Tanzania. Technical proposals are written by CSE undergraduates in ME3080, Design for Life: Water in Tanzania.

TEACHING INTERESTS

Primary teaching interests in the following areas: thermodynamics, fluid mechanics, heat transfer, gas dynamics, combustion, experimental methods, gas turbines, and convection.

Courses taught at the University of Minnesota include: ME 3080 (Design for Life: Water in Tanzania), ME 3331 (thermodynamics), ME 3332 (fluid mechanics), ME 4054 (senior design), ME 4331 (thermal engineering laboratory), ME 5344 (gas dynamics); ME 5446 (combustion), ME 5462 (gas turbine engines), ME 8331 (convection), ME 8337 (experimental methods), ME 8390 (turbulent shear layers)

Course development: CSE 1001 (First Year Experience in the College of Science and Engineering)

ASSOCIATE DEAN FOR UNDERGRADUATE PROGRAMS – CURRENT RESPONSIBILITIES

Collegiate Life
- Student recruitment: freshmen and transfer students (in coordination with office of admissions)
- Residential housing opportunities
- Outreach: K-12 and community
- Equity and Diversity
- North Star STEM Alliance (NSF Center)
- Scholarships and student awards
- Undergraduate research opportunities
- Student group involvement and leadership opportunities
- Collegiate Level ABET coordination (engineering programs)
- Collegiate events: Sneak Preview, Welcome Week, Dean's Showcase, Gold Carpet Events, Commencement, CSE Week, CSE Expo
- PLTW Summer Institutes
- International experiences for undergraduates

Academic Advising
- Holistic academic advising for all pre-major students
- Advising/counseling support for students admitted to the major (upper division)
- Advanced placement, course articulation, degree planning
- Summer orientation
- Academic Advising Blog
- Four-Year Plans to graduate
- Probation and suspension
- Major Declaration holds
- Readmission/Leave of Absence
- 13 Credit Exemptions
- APAS questions, updates and corrections
- Transfer admissions
- Admission into major
- CSE Scholastic Committee
- Academic Standards Committee
- Collegiate Curriculum Committee

Career Center for Science and Engineering

Fall and spring career fairs
Interview preparation and facilitation
Job search preparation, resumes, cover letters, follow up conversations
Transition to employment and graduate/professional schools

Other
Develop enrollment management model
Develop new curriculum for First Year Experience Course
Launch e-learning/a-learning initiative in CSE
CSE Curriculum and Academics Standards Committees

SOCIETAL AFFILIATIONS
American Physical Society
American Society of Mechanical Engineers
American Society of Engineering Education
American Institute of Aeronautics and Astronautics

SELECTED SERVICE ACTIVITIES
University
General Research Advisory Committee, 1997 – 2010; Chair 2005 – 2010
Preparing Future Faculty Advisees: A. Fleischer 1998-99, R. Kaszeta 1998-99; L. Cao 1999 – 00; A. Behrens 2004 – 05; V. Srinivasan 2004 – 05; M. Hallberg 2006 – 07; T. Shepard 2008 – 09
Bush Program Resource Teacher, 1998 – 99, Advisees: T. Augst, English, J. Tsai, Psychology; D. Frisbie, Chem. Engr.; P. Novak, Civil E.; S. Kuftinec, Theater Art & Dance; A. Sage, Clinical & Population Sciences
Consultative Committee, 2002 – 2003
Faculty Development Working Group, 2000 – 2001
Tau Beta Pi, Faculty Advisor, 1993 – 1997
Departmental
Post Tenure Review Committee, 2006 – 2010, 2013 –
ABET Review, Chair 2005 – 2008
Thermal Sciences Division Director, 2005 – 2008
Promotion & Tenure Committee, 2006 – 2007
Strategic Planning Committee, 2000 – 2006; Chair 2005 – 2006
Undergraduate Curriculum Committee, Chair 1997 – 2006
Latin Honor's Program, Chair 1997 – 2002
K-12 Outreach
Young Scientists Roundtable (Cable TV) – The Amazing World of Fluid Mechanics
Young Scientists Roundtable (Cable TV) – Why Airplanes Fly and Knuckleballs Dance
Edina Scientific Youth Forum – Introducing Young Scientists to Fun Fluid Mechanics
Center for Fluid Power – The Magic of Fluid Mechanics (Fond du Lac Tribal College; Henry High School)
Zachary Lane Elementary School – Why Things Fly
Other Professional Service Activities
Reviewer: J. Fluid Mech., Phys. Fluids, AIAA J., J. Fluids Engr., J. Comp. Phys., Exp. Fluids, others
Organizer of International Symposium on Combustion and Noise Control, Kauai, Hawaii, Dec. 2008
Review Panel, Northeastern University Graduate Program, Mechanical Engineering, Boston, Feb. 2005
Office Naval Research Program Review, MIT, Cambridge, June 2004
NATO Consultant to Portuguese Air Force Academy – RTA, Lisbon, Portugal 2002
Organizer of 13th Propulsion Conference, Hyatt Hotel Minneapolis, 10-12 August 2000
Organizing Committee, 4th AIAA Shear Flow Control Conference, Snowmass, CO., June 29 – July 2, 1997
NSF Research Panel Equipment Grants, Washington, D.C., May 1992

GRADUATE STUDENT ADVISED — Ph.D.
A. Alshare, "Simulations of flow and heat transfer in a serpentine heat exchanger having dispersed resistance with porous-continuum and continuum models," Ph.D. Thesis, University of Minnesota, April 2007 (co-advised with T. Simon).
A.A. Behrens, "Reacting flow studies in a dump combustor: enhanced volumetric heat release rates and flame anchorability," Ph.D. Thesis, University of Minnesota, January 2007.
D.J. Forliti, "Controlling dump combustor flows using countercurrent shear," Ph.D. Thesis, University of Minnesota, October 2001.
S.B. Lonnes, "Flame speed control using a countercurrent swirl combustor," Ph.D. Thesis, University of Minnesota, May 1998.

A.S.D. Khemakhem, "An experimental study of turbulent countercurrent shear layers," Ph.D. Thesis, University of Minnesota, Sept. 1997.

R.K. Wilcoxon, "Mixing enhancement in an axisymmetric jet with annular counterflow," Ph.D. Thesis, University of Minnesota, Sept. 1996.

S. Jendoubi, "Local and global instability of axisymmetric jets with external flow," Ph.D. Thesis, University of Minnesota, June 1995.

S.G. Russ, "Turbulence and entrainment in plasma and heated jets," Ph.D. Thesis, University of Minnesota, March 1993 (co-advised with E. Pfender).

GRADUATE STUDENTS ADVISED – Master of Science

J. Lutz, "Instantaneous flame anchor measurements behind a rearward-facing step," Master of Science, University of Minnesota, May 2014

D. Vetter, "Enhancement of turbulent mixing in a rearward-facing step geometry using microjets," Master of Science, University of Minnesota, May 2014.

S. Moore, "Frequency scaling and characterization of the isothermal flow in a step combustor," Master of Science, University of Minnesota, September 2013.

S. Beard, "The effect of microjets on heat release rates in an axisymmetric dump combustor," Master of Science, University of Minnesota, June 2011.

V. Yu, M.D., "Resistance-compliance product in parallel fluidic systems in a fluid dynamics model of the inner ear," Master of Science, University of Minnesota, May 2009 (co-advised with R. Odland, M.D.)

D. Kacmarynski, M.D., "An engineering model used to evaluate the nasal airway of a child with vomer flap repair of wide cleft palate deformity," Master of Science, University of Minnesota, May 2007. (co-advised with J.D. Sidman, M.D. and S.C. Levine, M.D.)

T. Gehrett, "Evaluation of recoverable steam turbine efficiency losses: a presentation and critical review of the popular steam path audit," Master of Science, University of Minnesota, August 2006.

T. Horner, "Emission characteristics and performance of a microturbine engine," Master of Science, University of Minnesota, Feb. 2005

N. Sundquist, "Alternative fuel sources for the internal combustion engine: biodiesel," Master of Science, University of Minnesota, May 2004

S. White, "Automating the SR-30 gas turbine engine," Master of Science, University of Minnesota, April 2003.

B.A. Tang, "An experimental investigation of planar countercurrent turbulent shear layers," Master of Science, University of Minnesota, May 2002.

D.A. Wulfman, "Thermo/mechanical design, modeling, and testing of shape memory actuated minimal and micro invasive probe systems, Master of Science, University of Minnesota, May 2002 (co-advised with A. Erdman)

C. Rumchik, "Modeling counterflow thrust vectoring with Fluent," Master of Science, University of Minnesota, August 2002.

A. Witkowski, "Thermodynamic analysis of SR-30 gas turbine engine," Master of Science, University of Minnesota, September 2001.

R.D. Gillgrist, "A fundamental study of thrust vector control using counterflow," Master of Science, University of Minnesota, March 1999.

G. Schmid, "An experimental and modeling study of jet attachment during counterflow thrust vectoring," Master of Science, University of Minnesota, June 1996.

M.R. Van der Veer, "Counterflow thrust vectoring of a subsonic rectangular jet," Master of Science, University of Minnesota, March 1995.

G.L. Dittmann, "Controlling vortex shedding behind bluff objects," Master of Science, University of Minnesota, Jan. 1993.

P.J. Trongard, "Nucleation of supersaturated solutions," Master of Science, University of Minnesota, January 1993.

M.L. Miller, "The universal nature of vortex shedding behind circular cylinders at low Reynolds numbers," Master of Science, University of Minnesota, Sept. 1991.

D.L. Niccum, "The influence of velocity ratio on a counterflowing circular jet," Master of Science, University of Minnesota, Dec. 1990.

UNDERGRADUATE RESEARCH ASSISTANTS

C. Thyen UROP 1989; P. Tuma NSF-UROP 1990; S. Gunderson NSF-UROP 1991; D. Forliti NSF-UROP 1992; M. Walberg NSF-UROP 1992; B. Wilson Research Scholarship 1992; G. King Honor's Thesis 1993; D. Wulfman Honor's Thesis 1994; J. Weiler Honor's Thesis 1994; A. Krolnick Honor's Thesis 1994; D. Wangensteen Honor's Thesis 1995; M. Berrada Research Assistant 1997; C. Lau Presidential Mentoring 1997; M. Anderson Research Assistant 2003; P. Cronin Research Assistant 2004; R. Anderson NSF-UROP 2004; J. Mach NSF-UROP 2004; V. Wang NSF-UROP 2005; J. Lutz Research Assistant 2005; J. Wanner Honor's Thesis 2005; B. Hathaway NSF-UROP 2006; C. McMahon Research Assistant 2006; I. Beavers Research Assistant 2008; D. Lindblom Research Assistant 2008; G. Erzberge Research Assistant 2008; P. Tracy Research Assistant 2009-12 Summa Cum Laude; L. McDonald Research Assistant 2010-11 Summa Cum Laude; B. Yan Research Assistant 2010-11 Latin Honor's Thesis; V. Troutman Research Assistant 2012-13 Latin Honor's Thesis.

INVITED SEMINARS AND LECTURES

Workshop on Fluid Mechanics Research: Historical Review, Present Challenges and Future Prospects, Florida State University. Tallahassee, Florida, October 18-19, 2013. Keynote Lecture: "High-speed flow research: accomplishments made through collaboration."

University of Minnesota – Duluth, Mechanical Engineering Departmental Seminar, Duluth, MN, October 1, 2012, "Experimental and computational studies to advance the operability and performance of combustion systems adopting fluidic control."

Louisiana State University, Mechanical Engineering Departmental Seminar, Baton Rouge, LA, February 6, 2009, "Local and global instabilities: free shear layers and their control."

International Centre for Mechanical Sciences (CISM) Udine, Italy, June 9-13, 2008, " Advanced School: Instabilities of flow with and without heat transfer and chemical reaction." 5-day short course

University of Illinois at Chicago, Mechanical and Industrial Engineering Department, Chicago, IL, February 7, 2006, "On the universality and control of global instabilities in free shear flows."

International Symposium on Recent Advances in Aeroacoustics and Active Flow-Noise Control, Jan. 4-6, 2005, Fort Aguada Beach, Goa, India, "Manipulating free shear layers to control reacting and non-reacting flows."

NASA Langley Research Center, Hypersonic Air Breathing Propulsion Branch, June 30, 2004, Langley, VA, "Low Mach scramjet flameholder stabilization."

University of Virginia, Department of Mechanical and Aerospace Engineering Seminar, Charlottesville, VA, 4 March 2004, "Flow control exploiting shear-layer instabilities."

Florida State University, Tallahassee, FL, 12 November 2003, "Stability of spatial and temporal modes in free shear layers."

Yale University, New Haven, CT, February 5, 2003, "Control of non-reacting and reacting free shear flows."

Naval Air Warfare Center, China Lake, CA, 18 October 2002, "Transitioning fundamental science to technology: thrust vector control at supersonic off-design conditions."

NATO Research and Technology Organization, 28-30 July 2002, Portuguese Air Force Academy, Sintra, Portugal, "Non-Reacting and Reacting Shear Flow Control,"

Science & Technology Workshop for Reducing Naval Aircraft Noise, 30-31 October 2001, Arlington, VA, "Novel Approaches for Noise Abatement."

Naval Air Warfare Center, China Lake, CA, 12 February 2001, "Thrust Vector Control using Counterflow."

Indian Institute of Technology, Recent Advances in Experimental Fluid Mechanics, Kanpur, India, 18-20 December 2000, "Flow Control Applications using Countercurrent Shear."

IEEE International Conference on Control Applications, August 22-26, 1999, Kohala Coast, Hawaii, "Controlling Flame Speed using Countercurrent Shear."

Pratt & Whitney Nozzle Technology Seminar, April 17, 1998, West Palm Beach, Florida. "Counterflow Fluidic Thrust Vector Control for Propulsion Applications."

International Conference on Thermomechanics and Hydrodynamics, June 17-19, 1997, Brno, Czech Republic, "Vectoring Thrust using Shear Layer Control."

Euromech Colloquium -- Dynamics of Localized Disturbances in Engineering Flows, April 1-3, 1996, Karlsruhe, Germany. "Local and Global Instabilities of Jet Flow Fields."

Wright Patterson Air Force Base, 28 February 1996, Dayton, Ohio, "Multiaxis Thrust Vector Control of Supersonic Jets using Counterflow."

Stanford University, Fluid Mechanics Seminar, Feb. 27, 1996, Stanford, California, "Exploring the Connection between Local Stability Concepts and Global Shear Flow Control."

NASA Langley Research Center, Jan. 24, 1996, Hampton, Virginia, "Thrust Vectoring and Mixing of Supersonic Jets using Counterflow."

ASME/JSME Fluids Engineering Conference, Aug. 13-18, 1995, Hilton Head, S.C., "The Role of Velocity Ratio on Supersonic Jet Mixing."

Pratt & Whitney Aircraft Engines, West Palm Beach, Florida, 17 February 1994, "Counterflow Supersonic Nozzle Technology."

McDonnell Douglas Aerospace, St. Louis, Missouri, 28 July 1994, "Fluidic Control of High Temperature Subsonic Jets."

Florida A&M and Florida State Universities, Department of Mechanical Engineering, 3 September 1991, "Self-Excitation and Mixing in Variable-Density Subsonic Jets with Counterflow."

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University of Wisconsin, Engineering Research Center for Plasma-Aided Manufacturing, 14 December 1990, "The Effects of Density and Velocity Ratio on the Stability of Subsonic Jets."

University of Minnesota, Department of Aerospace Engineering & Mechanics, 26 October 1990, "The Global Instability of Countercurrent Mixing Layers."

JOURNAL PUBLICATIONS & BOOK CHAPTERS

T.G. Shepard, J. Lee, B. Yan, and P.J. Strykowski, "Parameters affecting bubble formation and size distribution from porous media," *J. Fluids Engineering*, Volume 138, Number 3, 2016, 031202.

H. Kanchi, K. Russell, M.J. Anderson, S.P. Beard, P.J. Strykowski, and F. Mashayek, "Fluidic control with microjets in dump combustors," *International Journal of Heat and Mass Transfer*, Volume 54, 2011, pp. 5395-5405.

A.A. Alshare, P.J. Strykowski, and T.W. Simon, "Modeling of unsteady and steady fluid flow, heat transfer and dispersion in porous media using unit cell scale," *International Journal of Heat and Mass Transfer*, Volume 53, 2010, pp. 2294-2310.

V.M. Yu, P.J. Strykowski, and R.M. Odland, "A preliminary theoretical model of hydrodynamics in the inner ear," *Ear, Nose and Throat Journal*, Volume 89, Number 4, 2010, pp 164-168.

V. Srinivasan, M.P. Hallberg, and P.J. Strykowski, "Viscous linear stability of axisymmetric low-density jets: parameters influencing absolute instability," *Physics of Fluids*, Volume 22, Number 2, 2010, 024103.

A.A. Alshare, T.W. Simon, and P.J. Strykowski, "Simulations of flow and heat transfer in a serpentine heat exchanger having dispersed resistance with porous-continuum and continuum models," *International Journal of Heat and Mass Transfer*, Volume 53, 2010, pp. 1088-1099.

A.A. Behrens, J.M Lutz, and P.J. Strykowski, "Instantaneous flame anchor measurements behind a rearward-facing step," *AIAA Journal*, Volume 47, Number 6, 2009, pp. 1350-1357.

M.P. Hallberg and P.J. Strykowski, "Open-loop control of fully nonlinear self-excited oscillations," *Physics of Fluids*, Volume 20, 2008, 041703.

A.A. Behrens and P.J. Strykowski, "Controlling volumetric heat release rates in a dump combustor using countercurrent shear," *AIAA Journal*, Volume 45, Number 6, 2007, pp. 1317-1323.

M.P. Hallberg, V. Srinivasan, P. Gorse, and P.J. Strykowski, "Suppression of global modes in low-density axisymmetric jets using coflow," *Physics of Fluids*, Volume 19, 2007, 014102.

R.D. Gillgrist, D.J. Forliti, and P.J. Strykowski, "On the mechanisms affecting fluidic vectoring using suction," *Journal of Fluids Engineering*, Volume 129, Number 1, 2007, pp. 91-99.

M.P. Hallberg and P.J. Strykowski, "On the universality of global modes in low-density jets," *Journal of Fluid Mechanics*, Volume 569, 2006, pp. 493-507.

D.J. Forliti, A.A. Behrens, B.A. Tang, and P.J. Strykowski, "Prevaporized JP-10 combustion and the enhanced production of turbulence using countercurrent shear," *Combustion Processes in Propulsion*, Chapter 8, Elsevier Press, 2006, pp. 75-86.

D.J. Forliti, B.A. Tang, and P.J. Strykowski, "An experimental investigation of planar countercurrent turbulent shear layers," *Journal of Fluid Mechanics*, Volume 530, 2005, pp. 241-264.

D.J. Forliti and P.J. Strykowski, "Controlling turbulence in a rearward-facing combustor using countercurrent shear," *Journal of Fluids Engineering*, Volume 127, Number 5, 2005, pp. 438-448.

A.A. Behrens, M.P. Hallberg, D.J. Forliti, and P.J. Strykowski, "Combustion control of premixed & prevaporized JP-10 in air downstream of a backward-facing step using steady counterflow," *Advances in Combustion and Noise Control*, Chapter 7, Cranfield University Press, 2005, pp. 99-114.

S. Lonnes, D. Hofeldt, and P. Strykowski, "Flame speed control using a countercurrent swirl combustor," *Advances in Chemical Propulsion: Science to Technology*, Chapter 17, CRC Press, 2002, pp. 277-290.

F.S. Alvi, P.J. Strykowski, A. Krothapalli, and D.J. Forliti, "Vectoring thrust in multiaxes using confined shear layers," *Journal of Fluids Engineering*, Volume 122, Number 3, 2000, pp. 3-13.

D.J. Forliti, P.J. Strykowski and K. Debatin, "Bias and precision errors of digital particle image velocimetry," *Experiments in Fluids*, Volume 28, Number 5, 2000, pp. 436-447.

P.J. Strykowski, and A. Krothapalli, "Vectoring thrust using confined shear layers," *Naval Research Reviews*, Volume 51, Numbers 3-4, 1999, pp. 24-34.

F.S. Alvi and P.J. Strykowski, "Forward flight effects on counterflow thrust vector control of a supersonic jet," *AIAA Journal*, Volume 37, Number 2, 1999, pp. 279-281.

A. Krothapalli, P.J. Strykowski, and C.J. King, "Origin of streamwise vortices in supersonic jets," *AIAA Journal*, Volume 36, Number 5, 1998, pp. 869-872.

M.R. Van der Veer and P.J. Strykowski, "Counterflow thrust vector control of subsonic jets: continuous and bistable regimes," *AIAA Journal of Propulsion and Power*, Volume 13, Number 3, 1997, pp. 412-420.

P.J. Strykowski, A. Krothapalli and D.J. Forliti, "Counterflow thrust vectoring of supersonic jets," *AIAA Journal*, Volume 34, Number 11, 1996, pp. 2306-2314.

D.M. Washington, F.S. Alvi, P.J. Strykowski and A. Krothapalli, "Multiaxis fluidic thrust vector control of a supersonic jet using counterflow," *AIAA Journal*, Volume 34, Number 8, 1996, pp. 1734-1736.

P.J. Strykowski, A. Krothapalli, and S. Jendoubi, "The effect of counterflow on the development of compressible shear layers," *Journal of Fluid Mechanics*, Volume 308, 1996, pp. 63-96.

S. Russ, E. Pfender, and P.J. Strykowski, "Unsteadiness and mixing in thermal plasma jets," *Plasma Chemistry and Plasma Processing*, Volume 14, Number 4, 1994, pp. 425-436.

S. Jendoubi and P.J. Strykowski, "Absolute and convective instability of axisymmetric jets with external flow," *Physics of Fluids*, Volume 6, Number 9, 1994, pp. 3000-3009.

S. Russ, P.J. Strykowski, and E. Pfender, "Mixing in plasma and low density jets," *Experiments in Fluids*, Volume 16, 1994, pp. 297-307.

S. Russ and P.J. Strykowski, "Turbulent structure and entrainment in heated jets: the effect of initial conditions," *Physics of Fluids A*, Volume 5, Number 12, 1993, pp. 3216-3225.

P.J. Strykowski, A. Krothapalli, and D. Wishart, "The enhancement of mixing in high-speed heated jets using a counterflowing nozzle." *AIAA Journal,* Volume 31, Number 11, 1993, pp. 2033-2038.

P.J. Strykowski and R.K. Wilcoxon, "Mixing enhancement due to global oscillations in jets with annular counterflow." *AIAA Journal,* Volume 31, Number 3, 1993, pp. 564-570.

P.J. Strykowski and S. Russ, "The effect of boundary-layer turbulence on mixing in heated jets." *Physics of Fluids A,* Volume 4, Number 5, 1992, pp. 865-868.

P.J. Strykowski and D.L. Niccum, "The influence of velocity and density ratio on the dynamics of spatially developing mixing layers." *Physics of Fluids A,* Volume 4, Number 4, 1992, pp. 770-781.

P.J. Strykowski and D.L. Niccum, "The stability of countercurrent mixing layers in circular jets." *Journal of Fluid Mechanics,* Volume 227, 1991, pp. 309-343.

P.J. Strykowski and K. Hannemann, "Temporal simulation of the wake behind a circular cylinder in the neighborhood of the critical Reynolds number." *Acta Mechanica,* Volume 90, 1991, pp. 1-20.

P.J. Strykowski and K.R. Sreenivasan, "On the formation and suppression of vortex 'shedding' at low Reynolds numbers." *Journal of Fluid Mechanics,* Volume 218, 1990, pp. 71-107.

K.R. Sreenivasan and P.J. Strykowski, "Stabilization effects in flow through helically coiled pipes." *Experiments in Fluids,* Volume 1, 1983, pp. 31-36.

K.R. Sreenivasan and P.J. Strykowski, "An instability associated with a sudden expansion in a pipe flow." *Physics of Fluids,* Volume 26, Number 10, 1983, pp. 2766-2768.

CONFERENCE PROCEEDINGS

D. Law, T. Shepard, and P.J. Strykowski, "Numerical simulations of near-nozzle exit characteristics for an effervescent atomizer at low gas to liquid mass flow ratio," Proceedings of ASME 2014 4th Joint US-European Fluids Engineering Division Summer Meeting, Paper FEDSM2014-21290, Chicago, IL, 3-7 August, 2014.

H. Kanchi, K. Russell, S. Hedeyat, F. Mashayek, M.J. Anderson, S.P. Beard, and P.J. Strykowski, "Experimental and computational studies to advance operability and performance of combustion systems adopting fluidic control," Proceedings 23rd Propulsion Conference, Washington, DC, September 13-15, 2011, pp. 1-49.

P. Kalghatgi, S. Acharya, and P.J. Strykowski, "Mean flow characteristics of planar countercurrent shear flow in dump geometry," Proceedings ASME International Mechanical Engineering Congress and Exposition, Paper IMECE2011-63312, Denver, CO, 11-17 November, 2011.

H. Kanchi, K. Russell, F. Mashayek, M.J. Anderson, S.P. Beard, and P.J. Strykowski, "Experimental and computational studies to advance operability and performance of combustion systems adopting fluidic control," Proceedings 22nd Propulsion Conference, Washington, DC, June 22-25, 2010.

M.J. Anderson and P.J. Strykowski, "Exploiting global instabilities for efficient flame anchoring and compact combustion," Proceedings 21st Propulsion Conference, Monterey, CA, June 9-11, 2009.

J.M. Lutz, A.B. Hoxie, and P.J. Strykowski, "Performance of suction-based counterflow in reacting step geometries," Proceedings 20th Propulsion Conference, Alexandria, VA, Dec. 12-14, 2007.

D. Outcalt, M. Hallberg, G. Yang, J. Heberlein, P. Strykowski, and E. Pfender, "Diagnostics and control of instabilities in a plasma spray torch," 18th International Symposium on Plasma Chemistry, Kyoto, Japan, Aug. 26-31, 2007.

A.A. Behrens, J.M. Lutz, and P.J. Strykowski, "Instantaneous flame anchor measurements behind bluff bodies," Proceedings 19th Propulsion Conference, Costa Mesa, CA, Dec. 18-20, 2006.

M.P. Hallberg and P.J. Strykowski, "Stability and control of very low density axisymmetric jets," 3rd AIAA Flow Control Conference, paper AIAA-2006-3704, San Francisco, CA, 5-8 June 2006.

J. Heberlein, J.P. Trelles, D. Outcalt, M. Hallberg, P. Strykowski and E. Pfender, "Control of fluid dynamic instabilities in plasma torches – key to reproducible atmospheric pressure plasma spray coatings," 9th Materials Science Workshop, Technical University Chemnitz, Chemnitz, Germany, Sept. 7 and 8, 2006, Proceedings pp. 257-262.

D. Dores, M. Madruga Santos, A., Krothapalli, L. Lourenco, E. Collins Jr., F. Alvi, and P.J. Strykowski, "Characterization of a counterflow thrust vectoring scheme on a gas turbine engine exhaust jet," 3rd AIAA Flow Control Conference, paper AIAA-2006-3516, San Francisco, CA, 5-8 June 2006.

D. Outcalt, M. Hallberg, G. Yang, J. Heberlein, E. Pfender, P. Strykowski, "Instabilities in plasma spray jets," International Thermal Spray Conference, Seattle, WA, 15-18 May 2006.

D.J. Forliti, A.A. Behrens, P.J. Strykowski, and B.A. Tang, "Enhancing combustion in a dump combustor using countercurrent shear. Part I: nonreacting flow control and preliminary combustion results," Proceedings ASME International Mechanical Engineering Congress and Exposition, Paper IMECE2005-81267, Orlando, FL., 5-11 Nov. 2005.

A.A. Behrens, M.J. Anderson, P.J. Strykowski, and D.J. Forliti, "Enhancing combustion in a dump combustor using countercurrent shear. Part II: heat release rate measurements and geometry effects," Proceedings ASME International Mechanical Engineering Congress and Exposition, Paper IMECE2005-81274, Orlando, FL., 5-11 Nov. 2005.

J. Heberlein, D. Outcalt, M. Hallberg, G. Yang, P. Strykowski, E. Pfender, "Fluid dynamic stability of plasma spray jets," International Thermal Spray Conference and Exposition, Basil, Switzerland, 2-4 May 2005.

A.A. Behrens, M.J. Anderson, and P.J. Strykowski, "PIV measurements in a premixed JP10/air dump combustor: role of counterflow on turbulence and heat release," Proceedings 18th Propulsion Conference, Monterey, CA, Aug. 24-26, 2005, pp. 143-148.

A.A. Behrens, M.J. Anderson, D.J. Forliti, and P.J. Strykowski, "The role of enhanced recirculation in controlling turbulent combustion and flame anchoring in a step combustor," Proceedings of 17th Propulsion Conference, Cambridge, MA, June 16-18, 2004, pp. 27-32.

E.G. Collins, Jr., Y. Zhao, F. Alvi, M. Alidu, and P.J. Strykowski, "Feedback control for counterflow thrust vectoring," Proceedings of the American Control Conference, Vol. 4, 2004, pp. 3654-3659.

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numerous

REVIEWS
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RESEARCH SUPPORT

National Science Foundation, "North Star STEM Alliance: advancing to a mid-level alliance," (PI P.J. Strykowski, Co-PIs R. Wright, A. Ponce de Leon) 8/15/12 – 7/31/17. $2,497,916

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3M Foundation, "Experiential learning faculty pilot grant," 01/04/11 – 01/03/13. $250,000

Office of Naval Research, "Experimental & computational studies to advance operability and performance of combustion systems adopting fluidic control – continuation award," N00014-12-1-0057 (PI P.J. Strykowski, Co-PI F. Mashayek University of Illinois, Chicago) 10/01/11 – 09/30/12. $151,323

National Science Foundation, "A comprehensive approach to broadening participation in STEM: North Star Alliance," (PI R. Jones, Co-PIs P.J. Strykowski, R. Wright, A. Ponce de Leon) 7/01/07 – 6/30/12. $2,454,845

Office of Naval Research, "Experimental & computational studies to advance operability and performance of combustion systems adopting fluidic control," N00014-08-1-0612 (PI P.J. Strykowski, Co-PI F. Mashayek University of Illinois, Chicago) 02/26/08 – 02/25/11 $451,908

3M Foundation, "A retention initiative," (P.I. P.J. Strykowski, Co-PIs: S. Kubitschek, A. Hornickel) 7/01/09 – 12/31/10. $300,000

Office of Naval Research, "Efficient turbulent flame stabilization for advanced propulsion," N00014-05-1-0253 (PI P.J. Strykowski, Co-PI F. Mashayek UIC) 1/01/05 – 12/31/08. $449,460

IREE, "Improved utilization of Minnesota biofuels," (PI D. Kittelson, Co-PI P.J. Strykowski) 10/01/05 – 9/30/08. $270,000

H2 Diesel, "Atomization and ignition testing," (PI P.J. Strykowski, Co-PI D. Zarling) 1/01/08 – 5/31/08. $28,000

Xcel Renewable Development Fund, "Biomass-derived fuels for turbo-generators," (PI K. Bickel CDR, Co-PI P.J. Strykowski) 10/01/05 – 12/31/07. $416,681

National Science Foundation, "Fluid Dynamic Characterization and Control of Turbulent Plasma Jets," (PI J. Heberlein, Co-PI P.J. Strykowski & E. Pfender). 9/01/03 – 8/31/07. $449,456

NASA-SBIR Phase I, "Low Mach Scramjet Cavity Flameholder Stabilization," PI J. Nabity, Co-PI P.J. Strykowski, TDA Research and Rocketdyne Propulsion. 1/16/04 – 7/15/04. $100,000

IREE: Renewable Energy and the Environment, "Combustion Studies of Biomass-Derived Oil Sprays," PI K. Bickel, Co-PI P.J. Strykowski, CDR, University of Minnesota. 2/15/04 – 11/15/04. $25,000

Office of Naval Research, "Performance and Control of Dump Combustors using Countercurrent Shear," N00014-01-1-0644, 5/01/01 – 12/31/04. $473,233

Air Force Office of Scientific Research, "Feedback Control Design for Counterflow Thrust Vectoring," (PI E. Collins, Co-PI P.J. Strykowski, Florida State and Florida A&M Universities). 5/01/01 – 4/30/04. $301,333

National Science Foundation, "High Speed Digital Video Camera for Investigations of Fluid/Plasma Dynamic Instabilities," (PI J. Heberlein, Co-PI P.J. Strykowski, University of Minnesota). 5/01/02 – 4/30/03. $57,000

Department of Defense – Core Technology Accelerated Program, "Counterflow Thrust Vector Control: Transitioning Fundamental Science to Technology," 1/01/99 – 12/31/00. $138,037

Office of Naval Research, "Control of Flame Characteristics and Performance of a Countercurrent-Swirl Combustor," N00014-98-1-0737, 5/24/98 – 12/31/00. $252,934

Department of Defense, Augmentation Awards for Science and Engineering Research Training, "Controlling Flame Characteristics in a Dynamic Containment Combustor using Countercurrent Shear," 7/01/97 – 6/30/00. $113,563

Office of International Technology Cooperation, "Experimental and Mathematical Modeling of Transport Phenomena in Atomizers and Sprays in Combustors and Engines," (PI M. Jicha, Co-PIs P.J. Strykowski, D. Hofeldt, S. Patankar), 11/01/95 – 4/30/99. $34,600

Fluoroware, Inc., "Dynamic Modeling of Teflon Coriolis Meters," (PI A. Erdman, Co-PI P.J. Strykowski), 6/16/97 – 9/15/97. $36,587

NASA Langley Research Center, "An Experimental & Modeling Study of Jet Attachment during Counterflow Thrust Vectoring." 7/01/95 – 6/30/96. $49,167

Office of Naval Research, "Experimental Studies in Mixing Enhancement for Combustion Applications," 1/01/95 – 12/31/97. $285,860

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Office of Naval Research, "Self-excitation and mixing in high-speed heated jets using counterflow (PI A. Krothapalli, Co-PI P.J. Strykowski, Florida A&M and Florida State Universities), 1/01/92 – 12/31/94. $330,325

American Chemical Society, "The effect of counterflow on the stability and mixing of variable density jets," 3/01/92 – 8/31/94. $18,000

Air Force Office of Scientific Research, "An experimental investigation of active control of thrust vectoring nozzle flow fields," 7/15/92 – 7/14/93. $36,570

IBM Corporation, "Subcooled jet impingement boiling with local condensation control," (PI A. Bar-Cohen, Co-PI P.J. Strykowski), 3/01/92 – 2/28/93. $59,789

Engineering Foundation, "Wake-body interactions and the formation of vortex shedding behind bluff bodies." 9/01/90 – 8/31/91. $20,000

Rosemount Aerospace, "Flow measurement experiments," (P.I. T. Simon) 7/05/90 – 10/01/91. $35,000

Electronic Patent Application Fee Transmittal

Application Number:	14601340
Filing Date:	21-Jan-2015
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Filer:	Philip Peter Caspers
Attorney Docket Number:	3406.005US2

Filed as Large Entity

Filing Fees for **Utility under 35 USC 111(a)**

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 1 month with $0 paid	1251	1	200	200
Miscellaneous:				
		Total in USD ($)		**200**

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First Named Inventor/Applicant Name:	James Andrew Senkiw
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1	Amendment/Req. Reconsideration-After Non-Final Reject	Amendment_and_Response_to_Nonfinal_Office_Action.pdf	957503 a5006f5614c93514302548bead78aba471eeda4a	no	49

Warnings:

Information:					
2	Affidavit-traversing rejectns or objectns rule 132	Declaration_of_Dr_Strykowski132.pdf	751094 79d3d61d4392c6925a5ab80b34476189595c34be	no	27
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30417 528f09af5e44f35a498979df41d72e3451359eed	no	2
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National Stage of an International Application under 35 U.S.C. 371
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New International Application Filed with the USPTO as a Receiving Office
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/601,340	Filing Date 01/21/2015	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	02/06/2017	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 57	Minus	** 62	= 0	x $40 =	0
	Independent (37 CFR 1.16(h))	* 5	Minus	***5	= 0	x $210 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

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United States Patent and Trademark Office
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		01	FC : 2251	100.00 DA		

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

CONTINUATION REISSUE APPLICATION

<table>
<tr><td>Applicant(s)</td><td>James Andrew Senkiw</td><td rowspan="10">Signature Ratification for Applicant's Amendment and Response Submitted February 6, 2017</td></tr>
<tr><td>Serial No.</td><td>14/601,340</td></tr>
<tr><td>Filing Date</td><td>January 21, 2015</td></tr>
<tr><td>Continuation Reissue of U.S. Patent No.</td><td>7,670,495</td></tr>
<tr><td>Issued:</td><td>March 2, 2010</td></tr>
<tr><td>Examiner Name</td><td>Jerry D. Johnson</td></tr>
<tr><td>Group Art Unit</td><td>3991</td></tr>
<tr><td>Attorney Docket No.</td><td>3406.005US2</td></tr>
<tr><td>Customer Number:</td><td>38846</td></tr>
<tr><td>Confirmation No.</td><td>1069</td></tr>
<tr><td>Title:</td><td colspan="2">FLOW-THROUGH OXYGENATOR</td></tr>
</table>

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Applicant's Amendment and Response submitted on February 6, 2017 was inadvertently submitted in an unsigned form. The Amendment and Response was complete except for the missing signature. Applicant believes it is clear from the record that the Amendment and Response was a bona fide attempt to advance the application to final action and is a substantially complete reply to the outstanding Office Action dated October 5, 2016.

To address the missing signature, practitioner of record, Philip P. Caspers, hereby ratifies the Applicant's Amendment and Response submitted in U.S. Reissue Application No. 14/601,340 on February 6, 2017 and satisfies the signature requirements of 37 C.F.R. 1.4 for that Amendment and Response by submission of this paper with his signature below. Applicant respectfully requests contacting the undersigned at the phone number listed below if anything else is deemed necessary to satisfy the signature requirement of, or otherwise for entry of, the Amendment and Response of February 6, 2017.

As the Amendment and Response of February 6, 2017 was a bona fide attempt to respond, Applicant believes no further fees are due for any extension of time past the February 6, 2017 date. Nevertheless, please grant any extension of time necessary for entry, and charge any fee due to Deposit Account No. 502880.

Respectfully submitted,

CARLSON, CASPERS, VANDENBURGH,
LINDQUIST & SCHUMAN, P.A.
225 South Sixth Street, Suite 4200
Minneapolis, MN 55402
(612) 436-9617

Date: March 21, 2017

By: /Philip Caspers/
Philip P. Caspers
Reg. No. 33,227

Electronic Acknowledgement Receipt	
EFS ID:	28696755
Application Number:	14601340
International Application Number:	
Confirmation Number:	1069
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Customer Number:	38846
Filer:	Aaron Wesley Pederson
Filer Authorized By:	
Attorney Docket Number:	3406.005US2
Receipt Date:	21-MAR-2017
Filing Date:	21-JAN-2015
Time Stamp:	17:24:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	App_No_14601340_Sig_Ratify.pdf	87882 3a10b84f37ebdfd6d0c79772a6007293e251e5e3	no	2

Warnings:

JA2104

OWT Ex. 2119
Tennant Company v. OWT
IPR2021-00625

Information:	
Total Files Size (in bytes):	87882

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New Applications Under 35 U.S.C. 111
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New International Application Filed with the USPTO as a Receiving Office
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IN THE UNITED STATES PATENT AND TRADEMARK

S/N 14/601,340 **CONTINUATION REISSUE PATENT**

Applicant(s)	James Andrew Senkiw	**Applicant's Interview Summary**
Serial No.	14/601,340	
Filing Date	January 21, 2015	
Continuation Reissue of U.S. Patent No.	7,670,495	
Issued:	March 2, 2010	
Examiner Name	Jerry D. Johnson	
Group Art Unit	3991	
Attorney Docket No.	3406.005US2	
Customer Number:	38846	
Confirmation No.	1069	
Title:	FLOW-THROUGH OXYGENATOR	

Mail Stop Reissue
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Applicant's Interview Summary

Applicant thanks examiners Alan Diamond and Stephen Stein for the helpful interview on May 16, 2017. Phil Caspers (Reg. No. 33,227) and Sam Hamer (Reg. No. 46,754) attended on behalf of the applicant. The discussion focused on the recapture and *Orita* doctrines as applied in the most recent office action to reject all the claims. The discussion also briefly touched on three section 112 support issues. No agreement was reached in the interview, but the examiners indicated that the points of fact and law noted by applicant's representatives would be considered prior to the next office action. Attached hereto as Exhibit A are the slides that were shown and discussed by applicant's representatives during the interview to help explain applicant's position. The slides show the arguments made by applicants and identify the section 112 issues address by applicant's representatives. Applicants respectfully submit that the slides explain why neither the recapture nor the *Orita* doctrine bars the pending claims.

In light of the discussion at the interview, Applicant submits the following additional comments to assist the examiners in resolving the recapture and *Orita* issues.

Recapture

1. Recapture applies to broadening changes, and the limitation in question "being positioned in the tubular housing" is a narrowing change. Recapture does not apply. See MPEP 1412.02 ("determine whether the **broader** aspects of the reissue claims relate to subject matter surrendered in the original prosecution")(emphasis added)

2. Recapture is a three part test. The pending office action does not explain how that three part test is applied to these facts. Ultimately, it's about determining whether there was impermissible broadening (not narrowing).

3. The typical recapture question: whether a limitation added by amendment can be removed in a reissue, i.e., to obtain broader coverage. That is not the case here. The change in question, the electrodes of the emitter "being positioned in the tubular housing," is a narrowing change.

Orita Doctrine

1. The *Orita* doctrine is about restriction requirements, and does not apply.

2. In the '441 patent prosecution, **none of the restrictions drew a line between "emitters" and "emitters positioned within a conduit"**. Instead, the opposite happened, the examiner in the '441 patent prosecution found the '441 patent emitter claims with the "positioned within a conduit" limitation not to be patentably distinct from the '262 emitter claims without that limitation.

3. At the interview, it was contended that the applicant in the '441 patent prosecution distinguished the "art" including the '262 patent claims based on the "within a conduit" limitation. Applicant respectfully submits that is not correct. See, e.g., Inventorship Declaration by James Senkiw filed Jan. 26, 2016 at ¶12-25. The sentence mentioned by the examiners in the interview appears near the bottom of page 9 of the Amendment filed on 8/17/07 in the '441 patent prosecution, which states:

> As discussed previously with respect to the present rejections to independent claim 1, **none of the presently cited art** considered individually or in combination **teaches** the positioning of an oxygen emitter directly within a conduit lumen of a fluid conduit.

(emphasis added). Applicant notes that this sentence immediately follows the discussion of the prior art 102 and 103 rejections based on the Zappi, Cairns and Divisek references, not the discussion of the double patenting rejection which is separately addressed on page 6 of that amendment. Further evidence that this was not a statement about the double patenting rejection can be found in that the sentence refers to **what the art "teaches"**,

not what the art claims. In addition, it would make no sense for applicants to assert that the '262 patent does not "teach" this limitation in light of '262 patent disclosure (including original claim 11 which issued as '262 patent claim 7) that teaches "passing polluted water through a vessel containing the emitter". Given the context of the statement and that the '262 patent discloses "passing water through a vessel containing the emitter", it is not reasonable to conclude that the 8/17/07 statement mentioned by the examiners is about the '262 patent.

4. Even if it were true that applicant during prosecution of the '441 patent distinguished the "the art" including the '262 patent as suggested during the interview, such a fact would be relevant at best to a recapture analysis (whether an argued limitation can be removed in a reissue to obtain broader coverage), not to the *Orita* analysis.

5. The *Orita* doctrine is triggered by restriction requirements and addresses the question whether during prosecution applicant failed to file a timely divisional application to pursue claims that were cancelled in response to a restriction requirement.

6. Thus, a critical point to consider is that in the '495 patent prosecution, no restriction was made, repeated, or referred to. The opposite happened -- the '495 patent claims were issued a double patenting rejection based on the prior parent patents including the '441 and '262 patent claims. See App. Serial No. 12/023,431, 3/27/2009 Office Action at pgs. 2-3. This is important because the examiner in the '495 patent prosecution has thereby concluded that the applicant could have prosecuted any of the '441 or '262 patent claims along with the claims of the '495 patent, including the '441 patent claims that have a "within a conduit" limitation (in fact, claim 1 of the '495 patent did include the "within a conduit" limitation). Importantly, this was the same position taken by the examiner in the '441 patent prosecution, i.e., that the '441 patent claims with the "within a conduit" limitation were not patentably distinct from the '262 claims without that limitation.

7. In view of the foregoing, and as discussed in the interview, it has been particularly difficult to explain to our client what basis or rule of law the Patent Office is relying on to reject the pending reissue. None of the (a) two year rule, (b) recapture doctrine, or (c) *Orita* apply.

8. If the examiners contend that recapture bars the pending reissue claims, then it should be explained how recapture (which is a bar to impermissible broadening) applies to a narrowing reissue change to the claims.

9. If the examiners contend that *Orita* bars the pending reissue claims, then it should be explained how *Orita* applies when no restriction was made, repeated, or referred to in the '495 patent prosecution (noting also that restriction requirements from parent cases do not carry over to subsequent cases unless repeated or referred to -- see MPEP 819). Also,

if *Orita* is to be applied, then applicant is entitled to an explanation as to how the pending reissue claims are identical or substantially similar to any claim previously restricted in the '441 patent prosecution. This is a requirement under the *Orita* analysis. See *In re Doyle*, 293 F.3d 1355 (Fed. Cir. 2002). In this regard, it is not enough to point out that the present reissue claims have one limitation in common with claims in a previous case. Here, the present reissue claims have further claim limitations that are materially different than any previously presented claim. As a separate and independent reason for why *Orita* does not apply, applicant submits that the present reissue claims have never been presented and are not identical or substantially similar to any claim previously restricted in the '441 patent prosecution.

Respectfully Submitted,
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Date May 17, 2017

By: /Philip Caspers/
Philip P. Caspers
Reg. No. 33,227

IN THE UNITED STATES PATENT AND TRADEMARK

S/N 14/601,340 **CONTINUATION REISSUE PATENT**

Applicant(s)	James Andrew Senkiw
Serial No.	14/601,340
Filing Date	January 21, 2015
Continuation Reissue of U.S. Patent No.	7,670,495
Issued:	March 2, 2010
Title:	FLOW-THROUGH OXYGENATOR

SLIDES FOR INTERVIEW

(May 16, 2017)

Agenda for Interview

A. Applications and Patents in Chain up to '495 Patent

B. Bars to Broadening: Discuss Relevant Prosecution Facts for Each Issue

   1. Two year Rule

   2. Recapture Doctrine

   3. *Orita* Doctrine

C. 112 Rejections

A. Applications and Patents in Chain up to '495 Patent

Application No. (filed as)	Filing Date	Issued As	Issued Date	Reissue of '495 Filing Date
60/358,534 (provisional)	02/22/2002			
10/372,017 (utility)	02/21/2003	6,689,262	02/10/2004	
10/732,326 (CIP)	12/10/2003	**7,396,441**	07/08/2008	
12/023,431 (continuing div)	01/31/2008	**7,670,495**	03/10/2010	

B. Bars to Broadening

Application No. (filed as)	Filing Date	Issued As	Issued Date	Reissue of '495 Filing Date
60/358,534 (provisional)	02/22/2002			
10/372,017 (utility)	02/21/2003	6,689,262	02/10/2004	
10/732,326 (CIP)	12/10/2003	**7,396,441**	07/08/2008	
Prosecution Facts for 441 Patent (parent to patent being reissued)				
12/023,431 (continuing div)	01/31/2008	**7,670,495**	03/10/2010	09/28/2011
Prosecution Facts for 495 Patent (parent to patent being reissued)	1. *Two Year Rule:* reissue application filed on 495 patent within two years of 495 patent issue date.			

B. Bars to Broadening

Application No. (filed as)	Filing Date	Issued As	Issued Date	Reissue of '495 Filing Date
60/358,534 (provisional)	02/22/2002			
10/372,017 (utility)	02/21/2003	6,689,262	02/10/2004	
10/732,326 (CIP)	12/10/2003	**7,396,441**	07/08/2008	
Prosecution Facts for 441 Patent (parent to patent being reissued)	**Recapture:** (a) requires examination of prosecution of all patents in family; (b) certain limitations were argued in 441 patent prosecution; and therefore, (c) we need to assess whether the applicant **surrendered** the right to pursue claims without those limitations.			
12/023,431 (continuing div)	01/31/2008	**7,670,495**	**03/10/2010**	**09/28/2011**
Prosecution Facts for 495 Patent (parent to patent being reissued)	1. *Two Year Rule:* reissue application filed on 495 patent within two years of 495 patent issue date 2. *Recapture:* in 495 patent, broad and diverse set of claims were pursued without limitations argued in 441 patent. Regarding the "within a conduit" limitation, claims were filed and issued both with and without that limitation.			

Interview in Reissue Application No. 14/601,340 -- Reissue of 7,670,495 ***Slide 5***

B. Bars to Broadening

Application No. (filed as)	Filing Date	Issued As	Issued Date	Reissue of '495 Filing Date
60/358,534 (provisional)	02/22/2002			
10/372,017 (utility)	02/21/2003	6,689,262	02/10/2004	
10/732,326 (CIP)	12/10/2003	**7,396,441**	07/08/2008	
Prosecution Facts for 441 Patent (parent to patent being reissued)				
12/023,431 (continuing div)	01/31/2008	**7,670,495**	**03/10/2010**	**09/28/2011**
Prosecution Facts for 495 Patent (parent to patent being reissued)	1. *Two Year Rule:* reissue application filed on 495 patent within two years of 495 patent issue date 2. *Recapture:* in 495 patent, broad and diverse set of claims were pursued without limitations argued in 441 patent. Regarding the "within a conduit" limitation, claims were filed and issued both with and without that limitation. 3. *Orita:* No restriction made in 495 patent. Instead, claims were rejected for double patenting based on the claims in '441 & '262 patents.			

Recapture Rejection

The recapture rejection: The most recent office action asserted that by arguing the **"triangle"** and **"within a conduit"** limitations in the parent '441 patent prosecution to overcome prior art, broader claim coverage was surrendered and cannot be recaptured in a reissue of the '495 patent.

For reference, here is the rejection based on the "Triangle" limitation.

"The narrow scope of the claims in the '441 patent which recite 'three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets' [referred to herein as the "triangle" limitation] was done to overcome a prior art rejection and was not an error within the meaning of 35 U.S.C. 251, and the broader scope of claim subject matter surrendered in the application for the '441 patent cannot be recaptured by the filing of the present reissue application." -- ***10/5/2016 Office Action, p. 16.***

The recapture rejection based on "within a conduit" limitation is less clear.

While less clear in the most recent office action, it has been asserted that because the "within a conduit" limitation was also argued in the '441 patent prosecution to overcome prior art, the recapture doctrine also applies. **See *10/5/2016 Office Action, pgs. 4, 13-14*.**

B. Bars to Broadening: Recapture Doctrine

Recapture Rejection

Framing the issue under recapture: Whether the broader scope of claim subject matter (i.e., claims **without** the "triangle" or "within a conduit" limitations that applicant gave up in the '441 patent prosecution) was, in fact, forever surrendered under recapture doctrine, barring claims of broader scope in a reissue of the '495 patent.

Discussion of prosecution facts relevant to recapture

1. **That the limitations were argued in '441 patent prosecution is not dispositive of recapture issue, i.e.,** whether the applicant **surrendered** the right to pursue claims without those limitations.

2. **In the '495 patent, claims were filed and issued <u>without</u> the "triangle" and "within a conduit" limitations,** so it cannot be said that applicant **surrendered** the right to pursue claims in the '495 patent without those limitations. It is noted that, regarding the "within a conduit" limitation, claims were filed and issued both with and without that limitation. (Compare '495 patent independent claim 1 to independent claim 2.)

3. **When claims are filed and issued in a continuing application without the limitations argued in a parent application, the Federal Circuit has stated that such facts show that Applicant has <u>not surrendered</u> the subject matter.** Where the applicant pursues claims without the limitations added during prior prosecution, the applicant has not "surrendered" that claim scope for recapture analysis when reissuing the subsequent continuing patent. <u>In re Clement</u>, 131 F.3d 1464, 1469 (Fed. Cir. 1997); see also <u>MBO Labs.</u>, F.3d 1306, 1318 (Fed. Cir. 2010)

B. Bars to Broadening: Orita Doctrine

The recapture doctrine compared to *Orita* doctrine

1. Prosecution facts that trigger an inquiry under recapture doctrine: during prosecution claim limitations are added and argued to overcome prior art, and those argued limitations are included in the patent being reissued.

Facts that dispose of recapture issue in this case. The '495 patent being reissued includes claims (as filed and issued) without the "triangle" and "within a conduit" limitations. Therefore, recapture does not apply.

2. Prosecution facts that trigger an inquiry under *Orita* Doctrine: during prosecution, applicant fails to file a timely divisional application to pursue claims that were cancelled in response to a **restriction requirement**.

Facts that dispose of Orita issue in this case. In the '495 patent prosecution, no restriction was made, repeated, or referred to. **The opposite happened -- the '495 patent claims were issued a double patenting rejection based on** the prior parent patents including **the '441 and '262 patent.** *See App. Serial No. 12/023,431, 3/27/2009 Office Action at pgs. 2-3.* **Why important?** Examiner is saying applicant could have prosecuted any of 441 or 262 claims in 495 prosecution, including claims for example that include "within a conduit" limitation (which were in fact included in the claim set).

It is noted that under MPEP 819 a "restriction requirement (and election thereto) made in a parent application does not carry over to a continuation, CIP, or divisional application."

Applicant seeks clarity on how recapture rejection is applied to the "within a conduit" limitation

A. The rejection cannot be based on Recapture

Typical recapture question: whether an argued limitation can be removed in a reissue, i.e., to obtain broader coverage.

Here, recapture is oddly relied on to find that applicant cannot pursue claims that include the argued "within a conduit" limitation.

In effect, the **recapture doctrine (MPEP 1412.02) is being relied on to**

(a) **create an additional *de facto* restriction requirement in the '441 patent prosecution**, and

(a) **import this additional *de facto* restriction into further continuing prosecutions**.

That's not an application of recapture doctrine. Under recapture analysis, by pursuing in the 495 patent claims without certain limitations said to be argued in parent 441 patent, applicant demonstrated intent not to surrender such broader coverage. There is no recapture. In re Clement, 131 F.3d 1464, 1469 (Fed. Cir. 1997).

B. Bars to Broadening: Orita Doctrine

Applicant seeks clarity on how recapture rejection is applied to the "within a conduit" limitation

B. The rejection cannot be based on *Orita*. The rejection may be an attempt to make an *Orita* rejection. But it's not permitted under *Orita* either. *Orita* does not apply to these facts:

1. **No restriction** was made in 495 patent prosecution
2. **Instead, opposite happened**. Claims were rejected for double patenting based on the claims in '441 & '262 patents. Thus, according to 495 examiner, any of claims '441, '262, or '495 could have been prosecuted in 495 patent.
3. **Restriction requirements do not carry over** from parent applications unless expressly repeated or referred to. MPEP 819. To now import restrictions from 441 prosecutions would not be permitted.
4. **Present reissue claims** have never been presented and **are not identical or substantially similar to any claim previously restricted in 441 prosecution.** *In re Doyle, 293 F.3d 1355 (Fed. Cir. 2002).*
5. **Broad and diverse set of claims were pursued in the '495 patent**, applicant included claims that include the "within a conduit" limitation and claims that do not include the "within a conduit" limitation.
6. **The pending reissue claims are for "the same general invention"** as required under MPEP 1412.01, which is measured by the written description and enablement requirement, not based on prior issued claims.

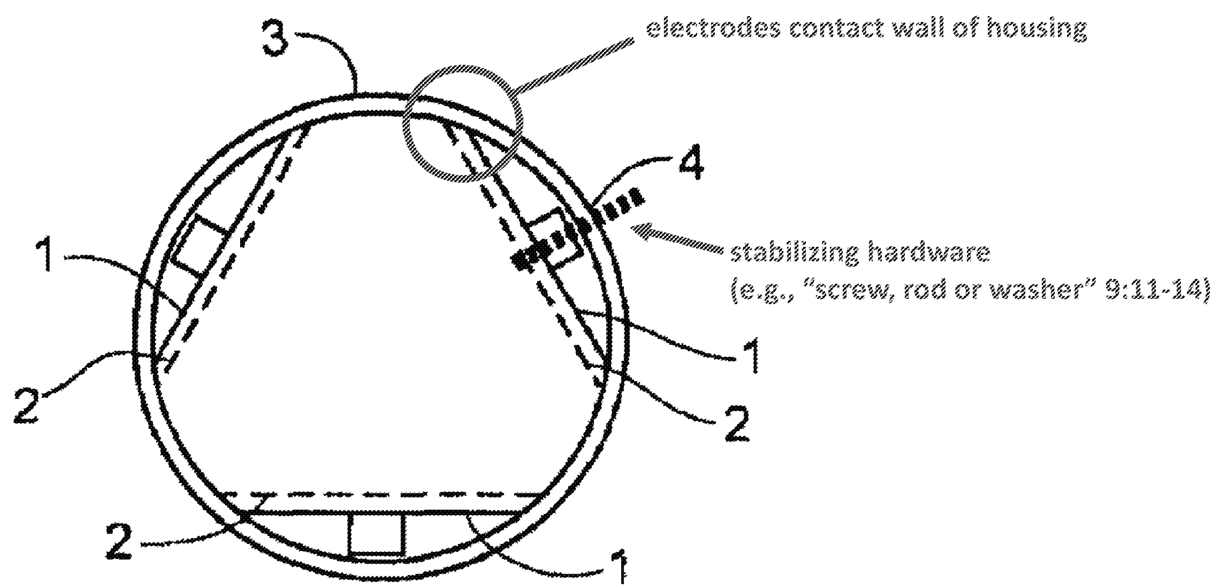
C. 112 Rejections

112, ¶1 Support in Specification

"a portion of at least one of the first and second electrodes **being in contact with** at least one wall of the tubular housing" (see, e.g., claims 37, 52, 63; see also 41, 53, 64 (in contact with a curved wall))

"at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes" (see claim 14, 39, 51; see also claim 27)

Fig. 7A Decl. of Dr. Strykowski ¶¶ 4, 9-10)



C. 112 Rejections

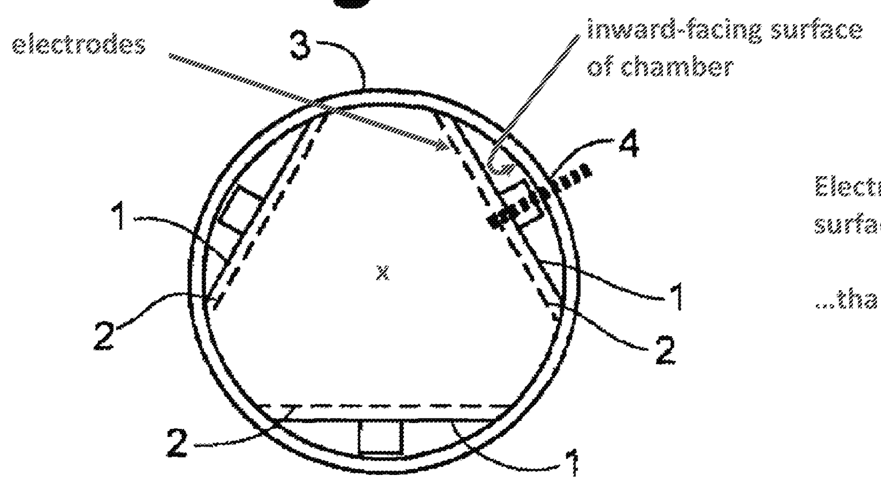
112, ¶1 Support in Specification

"each electrode of the emitter is positioned **closer to the inward-facing surface** of the chamber than to a longitudinal center axis of the oxygenation chamber" (see, e.g., claim 28; see also claims 15, 40, 50)

"the electrodes are positioned **away from** a longitudinal center axis of the tubular housing" (see, e.g., claim 17, see also claims 20, 29, 42, 62)

"each electrode of the emitter is positioned so that all points midway between all opposing electrodes **are closer to a surface of the tubular housing** than to a center point within the tubular housing" (see, e.g., claim 13, see also 38)

Fig. 7A



Electrodes are closer to inward-facing surface of the chamber...

...than to the center axis.

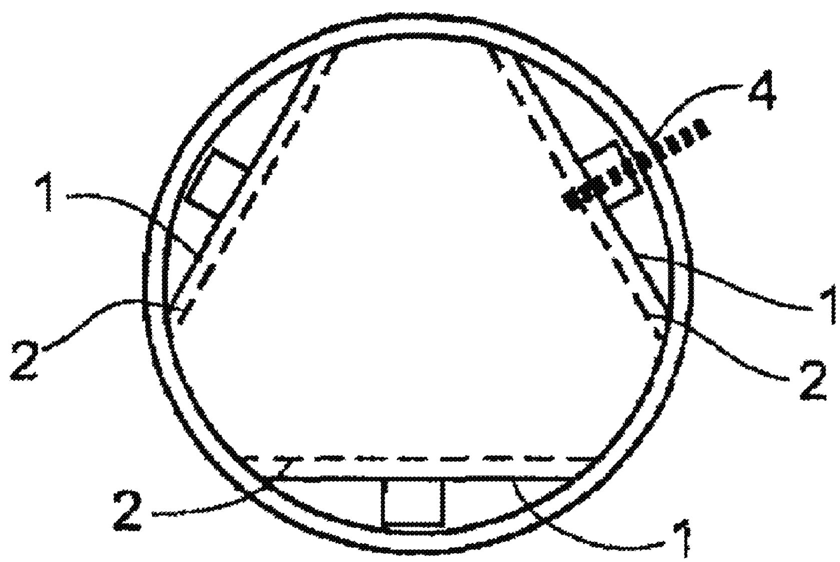
C. 112 Rejections

112, ¶1 Support in Specification

"each electrode of the emitter is positioned **closer to the inward-facing surface** of the chamber than to a longitudinal center axis of the oxygenation chamber" (see, e.g., claim 28; see also claims 15, 40, 50)

Does not rely on scale of drawing. (See Decl. of Dr. Strykowski, ¶4-8)

The sides of all equilateral triangles on a concentric circle will necessarily be closer to the circle than to the center when the triangle's corners lie outside the circle, i.e. the full triangle does not fit within the circle as shown in FIG. 7A.

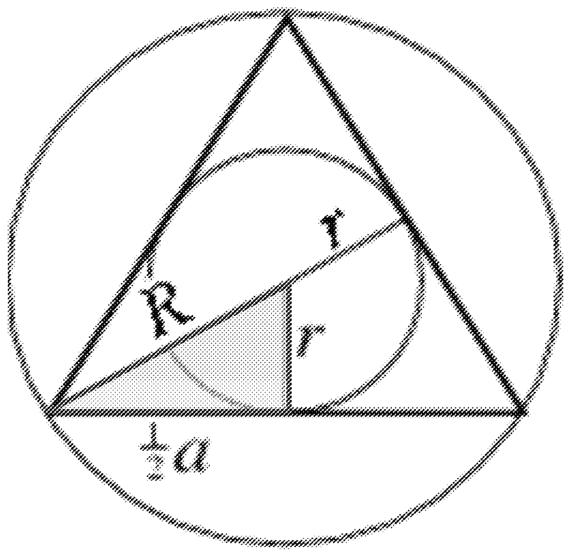


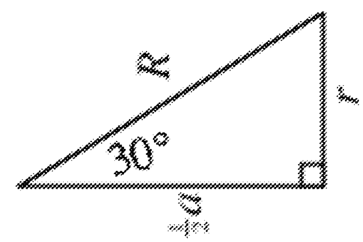
112, ¶1 Support in Specification

"each electrode of the emitter is positioned **closer to the inward-facing surface** of the chamber than to a longitudinal center axis of the oxygenation chamber" (see, e.g., claim 28; see also claims 15, 40, 50)

Does not rely on scale of drawing. (See Decl. of Dr. Strykowski, ¶4-8)

The sides of all equilateral triangles on a concentric circle will necessarily be closer to the circle than to the center when the triangle's corners lie outside the circle, i.e. the full triangle does not fit within the circle as shown in FIG. 7A.





$$\sin 30° = \tfrac{1}{2} = r/R.$$

The distance each side of the triangle is away from the center point of the circle shrinks to ½ R (half the radius of the outer circle) only when the triangle fits inside the circle.

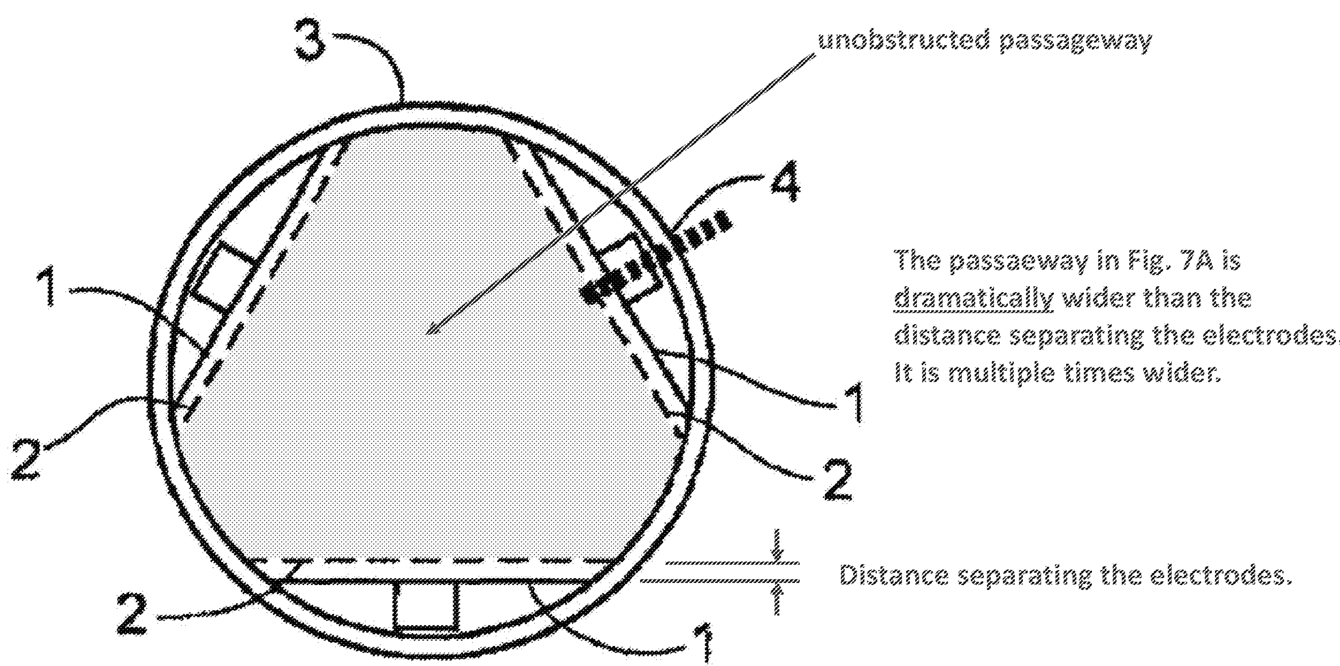
C. 112 Rejections

112, ¶1 Support in Specification

"the unobstructed passageway **includes the center axis and is multiple times wider** than the distance separating the opposing first and second electrodes within the tubular housing" (see claim 18, see also claims 30, 43, 54, 65)

Fig. 7A

See Decl. of Dr. Strykowski, ¶4, 11-12



Slide 18

END

Interview in Reissue Application No. 14/601,340 -- Reissue of 7,670,495

Electronic Acknowledgement Receipt

EFS ID:	29241445
Application Number:	14601340
International Application Number:	
Confirmation Number:	1069
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Customer Number:	38846
Filer:	Aaron Wesley Pederson
Filer Authorized By:	
Attorney Docket Number:	3406.005US2
Receipt Date:	17-MAY-2017
Filing Date:	21-JAN-2015
Time Stamp:	18:33:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant summary of interview with examiner	Applicant_Interview_Summary.pdf	700067 21f96a9acceb0e95ccfd400f70aaddc5d98e40a6	no	22

Warnings:

JA2128

OWT Ex. 2119
Tennant Company v. OWT
IPR2021-00625

Information:	
Total Files Size (in bytes):	700067

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/601,340	01/21/2015	James Andrew Senkiw	3406.005US2	1069

38846 7590 05/22/2017
Carlson, Caspers, Vandenburgh, Lindquist &
Schuman
225 South 6th Street
Suite 4200
Minneapolis, MN 55402

EXAMINER	
JOHNSON, JERRY D	

ART UNIT	PAPER NUMBER
3991	

MAIL DATE	DELIVERY MODE
05/22/2017	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Applicant-Initiated Interview Summary	**Application No.** 14/601,340	**Applicant(s)** SENKIW, JAMES ANDREW	
	Examiner Jerry Johnson	**Art Unit** 3991	

All participants (applicant, applicant's representative, PTO personnel):

(1) *ALAN DIAMOND*. (3) *Philip Caspers*.

(2) *Stephen Stein*. (4) *Samuel Hamer*.

Date of Interview: *16 May 2017*.

Type: ☐ Telephonic ☐ Video Conference
☒ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: ______.

Issues Discussed ☐101 ☒112 ☐102 ☐103 ☒Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *Claims of record*.

Identification of prior art discussed: ______.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

See Continuation Sheet.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☒ Attachment

/Alan Diamond/
Patent Reexamination Specialist
Central Reexamination Unit 3991

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
– Application Number (Series Code and Serial Number)
– Name of applicant
– Name of examiner
– Date of interview
– Type of interview (telephonic, video-conference, or personal)
– Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
– An indication whether or not an exhibit was shown or a demonstration conducted
– An identification of the specific prior art discussed
– An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
– The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

Continuation of Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments:

Applicant argued that within 2 years after the '495 patent issued, they filed the instant reissue application, and that claims 2-12 of the '495 patent do not contain the 120 degree (triangle limitation) of the '441 patent, and thus, the instant reissue claims do not need to have this limitation. Applicant cited the Orita doctrine and further argued there was no restriction requirement during prosecution of the '495 patent and the restriction requirement made during prosecution of the '441 patent does not carry over to the '495 patent.

The Examiner noted that claim 2 in '495 patent is directed to an emitter, like the claims that issued in grandparent U.S. Patent 6,689,262 patent. During prosecution of the '441 patent, in the Remarks dated August 17, 2007, Applicant stated on p. 6 that "claims 1, 25 and 26 [which recite the emitter in a conduit] are patentably distinct from claims 1-6 of U.S. Patent No. 6,689,262[, whose claims are directed to the emitter]. The specialists noted that it follows from this statement by Applicant that in the instant reissue application, new claims 13-69, which recite the emitter in a tubular housing, are patentably distinct from claim 2 of the '495 patent, which is directed to the emitter. It was further noted on p. 9 of said Remarks, Applicant stated that the newly added claims, which were directed to an emitter in the conduit, are distinguished because "none of the presently cited art considered individually or in combination teaches the positioning of an oxygen emitter directly within a conduit lumen of a fluid conduit." The Examiner noted that claims 13-69 of the instant reissue application are subject to recapture evaluation with respect to the emitter in conduit claims of the '441 patent, which require said triangle limitation, and that claims 13-69 can be no broader than the '441 patent claims since the instant reissue application was filed more than two years after the '441 patent issued. No agreement was reached.

Applicant further argued that issued claim 1 of the '495 patent has an emitter in a conduit. This was found unpersuasive since it was noted that claim 1 is directed to a different statutory class of invention, i.e., a method.

The 35 USC 112, first paragraph, rejection was also discussed. Applicant pointed to Fig. 7A for support of the limitations pointed to in the Office Action as lacking written description support, in particular the recitation that the electrode contacts the wall of the tubular housing. No agreement was reached.

Attached is an agenda for the interview and the slides presented at the interview.

IN THE UNITED STATES PATENT AND TRADEMARK

S/N 14/601,340 **CONTINUATION REISSUE PATENT**

Applicant(s)	James Andrew Senkiw
Serial No.	14/601,340
Filing Date	January 21, 2015
Continuation Reissue of U.S. Patent No.	7,670,495
Issued:	March 2, 2010
Title:	FLOW-THROUGH OXYGENATOR

SLIDES FOR INTERVIEW

(May 16, 2017)

Agenda for Interview

A. **Applications and Patents in Chain up to '495 Patent**

B. **Bars to Broadening: Discuss Relevant Prosecution Facts for Each Issue**

   1. **Two year Rule**

   2. **Recapture Doctrine**

   3. ***Orita* Doctrine**

C. **112 Rejections**

A. *Applications and Patents in Chain up to '495 Patent*

Application No. (filed as)	Filing Date	Issued As	Issued Date	Reissue of '495 Filing Date
60/358,534 (provisional)	02/22/2002			
10/372,017 (utility)	02/21/2003	6,689,262	02/10/2004	
10/732,326 (CIP)	12/10/2003	**7,396,441**	07/08/2008	
12/023,431 (continuing div)	01/31/2008	**7,670,495**	03/10/2010	

B. Bars to Broadening

Application No. (filed as)	Filing Date	Issued As	Issued Date	Reissue of '495 Filing Date
60/358,534 (provisional)	02/22/2002			
10/372,017 (utility)	02/21/2003	6,689,262	02/10/2004	
10/732,326 (CIP)	12/10/2003	7,396,441	07/08/2008	
Prosecution Facts for 441 Patent (parent to patent being reissued)				
12/023,431 (continuing div)	01/31/2008	**7,670,495**	**03/10/2010**	**09/28/2011**
Prosecution Facts for 495 Patent (parent to patent being reissued)	**1. Two Year Rule:** reissue application filed on 495 patent within two years of 495 patent issue date.			

Interview in Reissue Application No. 14/601,340 -- Reissue of 7,670,495 ***Slide 4***

B. *Bars to Broadening*

Application No. (filed as)	Filing Date	Issued As	Issued Date	Reissue of '495 Filing Date
60/358,534 (provisional)	02/22/2002			
10/372,017 (utility)	02/21/2003	6,689,262	02/10/2004	
10/732,326 (CIP)	12/10/2003	7,396,441	07/08/2008	
Prosecution Facts for 441 Patent (parent to patent being reissued)	**Recapture:** (a) requires examination of prosecution of all patents in family; (b) certain limitations were argued in 441 patent prosecution; and therefore, (c) we need to assess whether the applicant **surrendered** the right to pursue claims without those limitations.			
12/023,431 (continuing div)	01/31/2008	**7,670,495**	**03/10/2010**	**09/28/2011**
Prosecution Facts for 495 Patent (parent to patent being reissued)	**1. Two Year Rule:** reissue application filed on 495 patent within two years of 495 patent issue date **2. Recapture:** in 495 patent, broad and diverse set of claims were pursued without limitations argued in 441 patent. Regarding the "within a conduit" limitation, claims were filed and issued both with and without that limitation.			

B. Bars to Broadening

Application No. (filed as)	Filing Date	Issued As	Issued Date	Reissue of '495 Filing Date
60/358,534 (provisional)	02/22/2002			
10/372,017 (utility)	02/21/2003	6,689,262	02/10/2004	
10/732,326 (CIP)	12/10/2003	7,396,441	07/08/2008	
Prosecution Facts for 441 Patent (parent to patent being reissued)				
12/023,431 (continuing div)	01/31/2008	**7,670,495**	**03/10/2010**	**09/28/2011**
Prosecution Facts for 495 Patent (parent to patent being reissued)	**1. Two Year Rule:** reissue application filed on 495 patent within two years of 495 patent issue date **2. Recapture:** in 495 patent, broad and diverse set of claims were pursued without limitations argued in 441 patent. Regarding the "within a conduit" limitation, claims were filed and issued both with and without that limitation. ***3. Orita*:** No restriction made in 495 patent. Instead, claims were rejected for double patenting based on the claims in '441 & '262 patents.			

Interview in Reissue Application No. 14/601,340 -- Reissue of 7,670,495 ***Slide 6***

B. Bars to Broadening: Recapture Doctrine

Recapture Rejection

The recapture rejection: The most recent office action asserted that by arguing the **"triangle"** and **"within a conduit"** limitations in the parent '441 patent prosecution to overcome prior art, broader claim coverage was surrendered and cannot be recaptured in a reissue of the '495 patent.

For reference, here is the rejection based on the "Triangle" limitation.

"The narrow scope of the claims in the '441 patent which recite 'three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets' [referred to herein as the "triangle" limitation] was done to overcome a prior art rejection and was not an error within the meaning of 35 U.S.C. 251, and the broader scope of claim subject matter surrendered in the application for the '441 patent cannot be recaptured by the filing of the present reissue application." -- ***10/5/2016 Office Action, p. 16.***

The recapture rejection based on "within a conduit" limitation is less clear.

While less clear in the most recent office action, it has been asserted that because the "within a conduit" limitation was also argued in the '441 patent prosecution to overcome prior art, the recapture doctrine also applies. **See *10/5/2016 Office Action, pgs. 4, 13-14.***

B. Bars to Broadening: Recapture Doctrine

Recapture Rejection

Framing the issue under recapture: Whether the broader scope of claim subject matter (i.e., claims **without** the "triangle" or "within a conduit" limitations that applicant gave up in the '441 patent prosecution) was, in fact, forever surrendered under recapture doctrine, barring claims of broader scope in a reissue of the '495 patent.

B. Bars to Broadening: Recapture Doctrine

Discussion of prosecution facts relevant to recapture

1. **That the limitations were argued in '441 patent prosecution is not dispositive of recapture issue, i.e.,** whether the applicant **surrendered** the right to pursue claims without those limitations.

2. **In the '495 patent, claims were filed and issued <u>without</u> the "triangle" and "within a conduit" limitations,** so it cannot be said that applicant **surrendered** the right to pursue claims in the '495 patent without those limitations. It is noted that, regarding the "within a conduit" limitation, claims were filed and issued both with and without that limitation. (Compare '495 patent independent claim 1 to independent claim 2.)

3. **When claims are filed and issued in a continuing application without the limitations argued in a parent application, the Federal Circuit has stated that such facts show that Applicant has <u>not surrendered</u> the subject matter.** Where the applicant pursues claims without the limitations added during prior prosecution, the applicant has not "surrendered" that claim scope for recapture analysis when reissuing the subsequent continuing patent. <u>In re Clement</u>, 131 F.3d 1464, 1469 (Fed. Cir. 1997); see also <u>MBO Labs.</u>, F.3d 1306, 1318 (Fed. Cir. 2010)

B. Bars to Broadening: Orita Doctrine

The recapture doctrine compared to *Orita* doctrine

1. Prosecution facts that trigger an inquiry under recapture doctrine: during prosecution claim limitations are added and argued to overcome prior art, and those argued limitations are included in the patent being reissued.

Facts that dispose of recapture issue in this case. The '495 patent being reissued includes claims (as filed and issued) without the "triangle" and "within a conduit" limitations. Therefore, recapture does not apply.

2. Prosecution facts that trigger an inquiry under *Orita* Doctrine: during prosecution, applicant fails to file a timely divisional application to pursue claims that were cancelled in response to a **restriction requirement**.

Facts that dispose of Orita issue in this case. In the '495 patent prosecution, no restriction was made, repeated, or referred to. **The opposite happened -- the '495 patent claims were issued a double patenting rejection based on** the prior parent patents including **the '441 and '262 patent.** *See App. Serial No. 12/023,431, 3/27/2009 Office Action at pgs. 2-3.* **Why important?** Examiner is saying applicant could have prosecuted any of 441 or 262 claims in 495 prosecution, including claims for example that include "within a conduit" limitation (which were in fact included in the claim set).

It is noted that under MPEP 819 a "restriction requirement (and election thereto) made in a parent application does not carry over to a continuation, CIP, or divisional application."

B. Bars to Broadening: Orita Doctrine

Applicant seeks clarity on how recapture rejection is applied to the "within a conduit" limitation.

A. The rejection cannot be based on Recapture

Typical recapture question: whether an argued limitation can be removed in a reissue, i.e., to obtain broader coverage.

Here, recapture is oddly relied on to find that applicant cannot pursue claims that include the argued "within a conduit" limitation.

In effect, the **recapture doctrine (MPEP 1412.02) is being relied on to**

(a) create an additional *de facto* restriction requirement in the '441 patent prosecution, and

(a) import this additional *de facto* restriction into further continuing prosecutions.

That's not an application of recapture doctrine. Under recapture analysis, by pursuing in the 495 patent claims without certain limitations said to be argued in parent 441 patent, applicant demonstrated intent not to surrender such broader coverage. There is no recapture. In re Clement, 131 F.3d 1464, 1469 (Fed. Cir. 1997).

B. Bars to Broadening: Orita Doctrine

Applicant seeks clarity on how recapture rejection is applied to the "within a conduit" limitation

B. **The rejection cannot be based on *Orita*.** The rejection may be an attempt to make an *Orita* rejection. But it's not permitted under *Orita* either. *Orita* does not apply to these facts:

1. **No restriction** was made in 495 patent prosecution
2. **Instead, opposite happened.** Claims were rejected for double patenting based on the claims in '441 & '262 patents. Thus, according to 495 examiner, any of claims '441, '262, or '495 could have been prosecuted in 495 patent.
3. **Restriction requirements do not carry over** from parent applications unless expressly repeated or referred to. MPEP 819. To now import restrictions from 441 prosecutions would not be permitted.
4. **Present reissue claims** have never been presented and **are not identical or substantially similar to any claim previously restricted in 441 prosecution.** *In re Doyle, 293 F.3d 1355 (Fed. Cir. 2002).*
5. **Broad and diverse set of claims were pursued in the '495 patent**, applicant included claims that include the "within a conduit" limitation and claims that do not include the "within a conduit" limitation.
6. **The pending reissue claims are for "the same general invention"** as required under MPEP 1412.01, which is measured by the written description and enablement requirement, not based on prior issued claims.

Interview in Reissue Application No. 14/601,340 -- Reissue of 7,670,495 ***Slide 12***

C. 112 Rejections

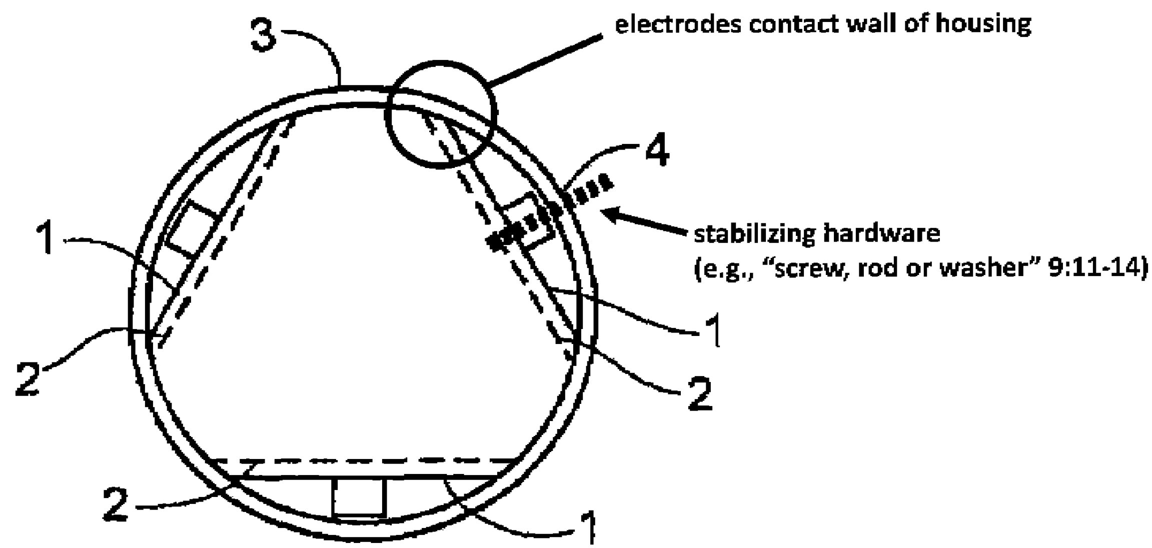
112, ¶1 Support in Specification

"a portion of at least one of the first and second electrodes **being in contact with** at least one wall of the tubular housing" (see, e.g., claims 37, 52, 63; see also 41, 53, 64 (in contact with a curved wall))

"at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes" (see claim 14, 39, 51; see also claim 27)

Fig. 7A

Decl. of Dr. Strykowski ¶¶ 4, 9-10)



Interview in Reissue Application No. 14/601,340 -- Reissue of 7,670,495 **Slide 13**

C. 112 Rejections

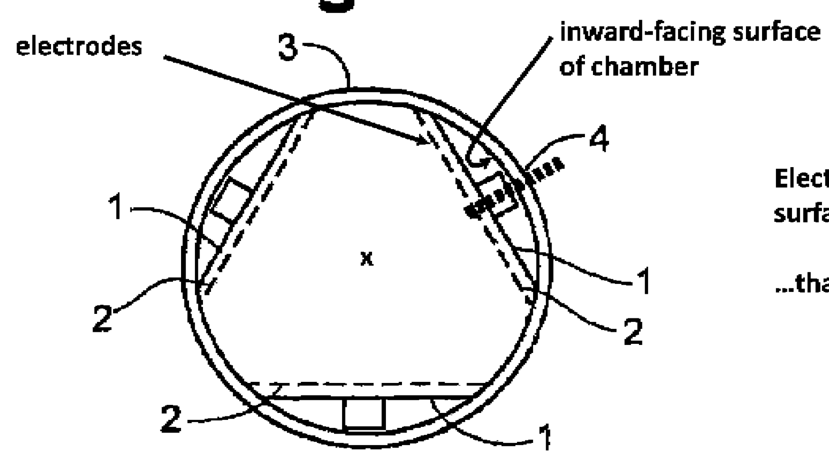
112, ¶1 Support in Specification

"each electrode of the emitter is positioned **closer to the inward-facing surface** of the chamber than to a longitudinal center axis of the oxygenation chamber" (see, e.g., claim 28; see also claims 15, 40, 50)

"the electrodes are positioned **away from** a longitudinal center axis of the tubular housing" (see, e.g., claim 17, see also claims 20, 29, 42, 62)

"each electrode of the emitter is positioned so that all points midway between all opposing electrodes **are closer to a surface of the tubular housing** than to a center point within the tubular housing" (see, e.g., claim 13, see also 38)

Fig. 7A



Electrodes are closer to inward-facing surface of the chamber…

…than to the center axis.

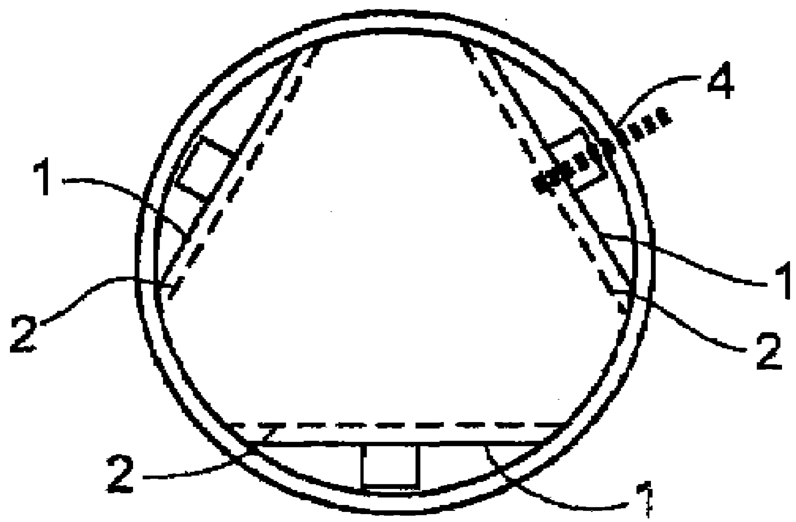
C. 112 Rejections

112, ¶1, Support in Specification

"each electrode of the emitter is positioned **closer to the inward-facing surface** of the chamber than to a longitudinal center axis of the oxygenation chamber" (see, e.g., claim 28; see also claims 15, 40, 50)

Does not rely on scale of drawing. (See Decl. of Dr. Strykowski, ¶4-8)

The sides of all equilateral triangles on a concentric circle will necessarily be closer to the circle than to the center when the triangle's corners lie outside the circle, i.e. the full triangle does not fit within the circle as shown in FIG. 7A.



Interview in Reissue Application No. 14/601,340 -- Reissue of 7,670,495 **Slide 15**

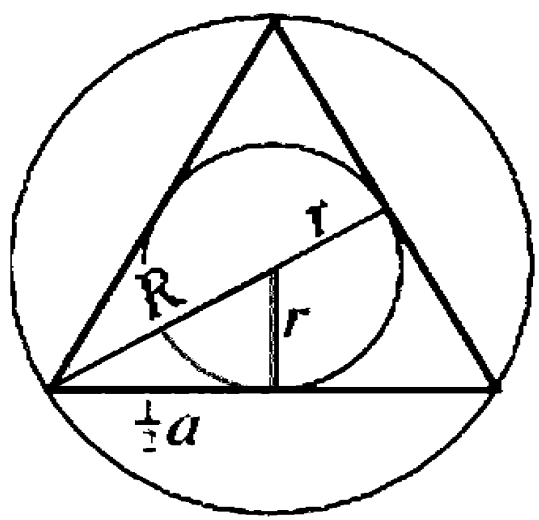
C. 112 Rejections

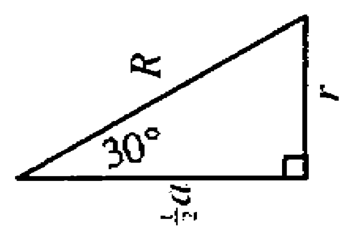
§112, ¶1, Support in Specification

"each electrode of the emitter is positioned <u>**closer to the inward-facing surface**</u> of the chamber than to a longitudinal center axis of the oxygenation chamber" (see, e.g., claim 28; see also claims 15, 40, 50)

Does not rely on <u>scale</u> of drawing. (See Decl. of Dr. Strykowski, ¶4-8)

The sides of <u>all</u> equilateral triangles on a concentric circle will <u>necessarily</u> be closer to the circle than to the center when the triangle's corners lie <u>outside</u> the circle, i.e. the full triangle does not fit within the circle as shown in FIG. 7A.





$$\sin 30° = ½ = r/R.$$

The distance each side of the triangle is away from the center point of the circle shrinks to ½ R (half the radius of the outer circle) only when the triangle fits inside the circle.

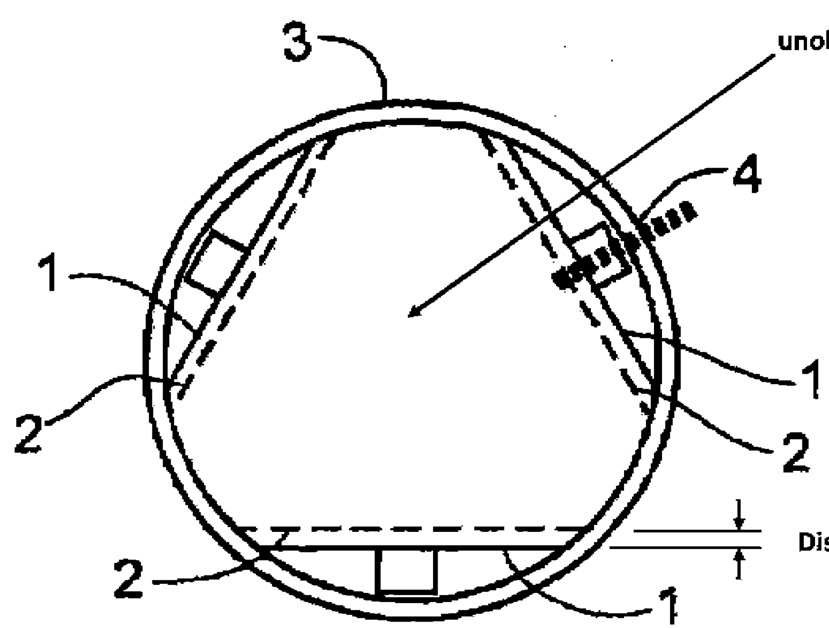
C. 112 Rejections

112, ¶1: Support in Specification

"the unobstructed passageway **includes the center axis and is multiple times wider** than the distance separating the opposing first and second electrodes within the tubular housing" (see claim 18, see also claims 30, 43, 54, 65)

Fig. 7A

See Decl. of Dr. Strykowski, ¶4, 11-12



unobstructed passageway

The passaeway in Fig. 7A is dramatically wider than the distance separating the electrodes. It is multiple times wider.

Distance separating the electrodes.

Slide 18

END

Interview in Reissue Application No. 14/601,340 – Reissue of 7,670,495

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
JOHNSON, JERRY D	

ART UNIT	PAPER NUMBER
3991	

MAIL DATE	DELIVERY MODE
06/05/2017	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 14/601,340	Applicant(s) SENKIW, JAMES ANDREW	
	Examiner JERRY D. JOHNSON	Art Unit 3991	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *February 6, 2017*.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *13-69* is/are pending in the application.
5a) Of the above claim(s) _____ is/are withdrawn from consideration.
6)☐ Claim(s) _____ is/are allowed.
7)☒ Claim(s) *13-69* is/are rejected.
8)☐ Claim(s) _____ is/are objected to.
9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.
11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a)☐ All b)☐ Some** c)☐ None of the:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.
3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
4) ☐ Other: _____.

Reissue Applications

For reissue applications filed on or after September 16, 2012, all references to 35 U.S.C. 251 and 37 CFR 1.172, 1.175, and 3.73 are to the current provisions.

On January 26, 2016, applicant filed a Request for Continued Examination (RCE) of continuation reissue application 14/601,340 of U.S. Patent No. 7,670,495 (the ‘495 patent) which issued from U.S. Patent Application No. 12/023,431 (the ‘431 application) with claims 1-12 on March 2, 2010. The ‘495 patent was previously reissued as U.S. RE45,415 on March 17, 2015, based on U.S. Application No. 13/247,241 (the ‘241 reissue application) filed September 28, 2011. The ‘495 patent is a division of U.S. Patent No. 7,396,441, (the ‘441 patent) which issued from U.S. Application No. 10/732,326 (the '326 application) which is a continuation-in-part of U.S. Patent No. 6,689,262 (the ‘262 patent).

Notice

If the patent reissue application issues without any cross reference to the continuation reissue application, amendment to the parent reissue application to include a cross-reference to the continuation reissue application must be done at the time of allowance of the continuation reissue application by Certificate of Correction. See MPEP 1451(II)(March 2014).

Scope of Claims

The present reissue application seeks to broaden the apparatus claims of the '495 patent (patented claim 2-7, 11 and 12 directed to an emitter for electrolytic generation of microbubbles of oxygen in an aqueous medium) through newly added claims 13-69. Claim 13 is representative:

> 13. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:
>
> a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;
>
> at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches up to 0.140 inches within the tubular housing;
>
> each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing and so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;
>
> a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;
>
> the power source being operable to delivery electric current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

The '495 patent specification contains the following definitions:

"O_2 emitter" means a cell comprised of at least one anode and at least one cathode separated by the critical distance. (Column 4, lines 7-8)

"Critical distance" means the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles. (Column 4, lines 1-3)

Column 3, lines 11-13 of the '495 patent teach "[i]n order to form microbubbles and nanobubbles, the anode and cathode are separated by a critical distance. The critical distance ranges from 0.005 inches to 0.140 inches."

An "O_2 emitter" is "[a]n emitter for electrolytic generation of bubbles of oxygen" as recited in claims 13-69. Accordingly, the emitter of claims 13-69 comprises at least one anode and at least one cathode separated by the critical distance of from 0.005 to 0.140 inches.

Newly presented claims 13-69 recite "**a tubular housing** having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet" (claim 13); "**a tubular housing** defining an oxygenation chamber and having a water inlet, a water outlet, a longitudinal water flow axis from the inlet to the outlet" (claim 27); "**a tubular housing** defining an oxygenation chamber and having a water inlet, and a water outlet" (claim 37); "**a tubular housing** defining an oxygenation chamber, and having an inward-facing surface that defines at least in part the oxygenation chamber, a water inlet, and a water outlet" (claim 50) and; "**a tubular housing** defining an oxygenation chamber, said housing having an outer wall that runs parallel to a longitudinal center axis of the housing, said housing having a water inlet and water outlet" (claim 62). (Emphasis added)

The term "tubular housing" does not appear in the '495 patent specification. Nor does the term "fluid conduit", which is recited in claim 1 of the '441 patent, appear in the '441 patent specification. Rather, the '441 and '495 specifications (which are essentially the same) teach that the emitter may be made to fit inside "a tube or hose" (column 9, lines 5-11 of each specification). Accordingly, the terms “tubular housing" and “fluid conduit” are considered to be descriptive of, and supported by, the terms “tube or hose”.

Consequently, the “tubular housing” having an inlet and an outlet as recited in claims 13-69 is also a “fluid conduit” as recited in claims 1-15 of the 441 patent, i.e., “a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen” (‘441 patent, claim 1). Newly presented claims 13-69, like claims 1-15 of the ‘441 patent, are therefore directed to an emitter for electrolytic generation of microbubbles of oxygen wherein the emitter is positioned within a conduit having an inlet and an outlet.

Reissue Declaration

The reissue oath/declaration filed with this application is defective (see 37 CFR 1.175 and MPEP § 1414) because of the following:

The claims of the present reissue application are directed to an invention that is patentably distinct from the claims of the '495 patent. More specifically, the reissue declaration states “[t]he ‘495 emitter claim 2, for example, is too broad in that it does not recite certain features of the disclosed emitter embodiment corresponding to FIGS. 7A and 7B which I was entitled to claim but did not claim. These features are shown in the embodiment of FIGS 7A and 7B and include, for example: the electrodes are positioned in the outer perimeter of the oxygenation chamber; this positioning of the electrodes provides an unobstructed passageway for water to flow; in that unobstructed passageway, water may flow from the water inlet to the water outlet without passing through a space between the electrodes of opposite polarity; and a portion of at least one of the first and second electrodes is in contact with a wall of the tubular housing." (Paragraph 7).

Claim 2 of the '495 patent recites:

2. An emitter for electrolytic generation of microbubbles of oxygen in an aqueous medium comprising:
an anode separated at a critical distance from a cathode,
a nonconductive spacer maintaining the separation of the anode and cathode,
the nonconductive spacer having a spacer thickness between 0.005 to 0.050 inches such that the critical distance is less than 0.060 inches and a power source all in electrical communication with each other,
wherein the critical distance results in the formation of oxygen bubbles having a bubble diameter less than 0.0006 inches, said oxygen bubble being incapable of breaking the surface tension of the aqueous medium such that said aqueous medium is supersaturated with oxygen.

The '431 divisional application, which became the '495 patent, was originally filed with a single claim to a method for treating waste water. Claims directed to an emitter (claims 2-7, 11 and 12), a method for oxygenating a non-native habitat (claim 8), a method for lowering the biologic oxygen demand of polluted water (claim 9), and a supersaturated aqueous product (claim 10) were added by preliminary amendment. The '495 patent issued from the '431 divisional application without any further amendments. As a result, the '495 patent **does not** contain claims to an emitter positioned within a "tubular housing" or "conduit" (as shown in Fig. 7) and recited in instant claims 13-69.

In contrast, during prosecution of the '441 patent, applicant specifically cited to Fig. 7 as support for the '441 patent claims. Moreover, as discussed below, applicant argued during prosecution of the '441 patent that claims to an emitter positioned within a conduit were patentably distinct from claims to the emitter alone. Consequently, the present continuation reissue application cannot be used to broaden the claims of the '495 patent to include the patentably distinct invention of the ‘441 divisional patent (which issued July 8, 2008). Nor can the present continuation reissue application recapture subject matter that was surrendered during the prosecution of the '441 divisional patent.

Claims 13-69 are rejected as being based upon a defective reissue declaration under 35 U.S.C. 251 as set forth above. See 37 CFR 1.175.

The nature of the defect(s) in the declaration is set forth in the discussion above in this Office action.

The ‘441 Patent

The ‘326 application, which became the ‘441 patent, was filed on December 10, 2003 with claims 1-8. In an Office Action dated November 29, 2005, the examiner restricted the claims as follows:

I. Claims 1-4, drawn to a flow-through oxygenator.

II. Claim 5, drawn to an oxygen supersaturated water product.

III. Claims 6-7, drawn to a method for enhancing the growth of plants.

IV. Claim 8, drawn to a method for treating waste water.

Applicant elected claims 1-4 to a flow-through oxygenator. Claim 1 recited:

1. A flow-through oxygenator comprising an emitter for electrolytic generation of microbubbles of oxygen comprising an anode separated at a critical distance from a cathode and a power source all in electrical communication with each other, **wherein the emitter is placed within or adjacent to a conduit for flow water**. (Emphasis added)

In a non-final Office Action dated May 24, 2007, claims 1-3 were rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,328,875 to Zappi. The examiner stated "the electrolytic apparatus as taught by Zappi is place [sic] adjacent to a conduit for flowing water" (page 4 of the Office Action mailed May 24, 2007). Claim 1-4 were also rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,225,401 to Divisek et al. (page 6 of the Office Action mailed May 24, 2007). The examiner stated "[e]ven though Divisek does not explicitly teach that its electrolyzer is place [sic] within or adjacent to a conduit for flowing water, one of ordinary skill in the art would have found the position of Divisek's electrolyzer at least adjacent to a water conduit obvious since water is added/fed to Devisek's [sic] electrolyzer for electrolysis to take place" (page 7 of the Office Action mailed May 24, 2007).

The examiner further rejected claim 1-4 and 9 of the '326 application on the grounds of non-statutory obviousness-type double patenting:

> [c]laims 1-4 and 9 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 6,689,262 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because the emitter of U.S. Patent No. 6,689,262 B2 is structurally the same as the emitter of the claimed flow-through oxygenator. Even though U.S. Patent No. 6,689,262 B2 does not explicitly teach the claimed flow through oxygenator, one of ordinary skill in the art would have found it obvious to use the instant emitter in an oxygenator as claimed since the emitter produces oxygen. (page 9 of the Office Action mailed May 24, 2007).

Claim 1 of U.S. Patent No. 6,689,262 reads as follows:

> 1. An emitter for electrolytic generation of microbubbles of oxygen comprising an anode separated at a critical distance from a cathode and a power source all in electrical communication with each other.

In a response filed August 17, 2007, applicant amended the claims to recite (bold emphasis added):

1. (Currently Amended) A flow through oxygenator ~~consisting of~~ comprising:

a fluid conduit having a fluid inlet and a fluid outlet with a conduit lumen;

an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that **the oxygen emitter is positioned within the conduit lumen** ~~comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other,~~; and

a power source ~~all~~ in electrical communication with ~~each other, wherein~~ the oxygen emitter ~~is placed within or adjacent to a conduit for flowing water~~.

Applicant also added new claims 25 and 26 (emphasis added):

25. (New) A flow through oxygenator comprising:

a watering hose having a hose lumen; and

an oxygen emitter operably mounted within the hose lumen.

26. (New) A flow through oxygenator comprising:

a hydroponic circulating system having a circulating lumen; and

an oxygen emitter operably mounted within the circulating lumen.

As to the amendment, applicant argued “Applicant has amended independent claim 1 to clarify the presently claimed flow through oxygenator as comprising an oxygen emitter positioned within a conduit lumen of a fluid conduit”. “Zappi et al. is absent any disclosure relative to the positioning of an oxygen emitter directly within the conduit lumen of a fluid conduit as presently claimed” and; “Divisek does not teach an electrolyzer placed directly within a conduit as presently claimed in amended independent claim 1” (Remarks, pages 7 and 8).

As to new claims 25 and 26, applicant argued “[a]s discussed previously with respect to the present rejections to independent claim 1, none of the presently cited art considered individually or in combination teaches the positioning of an oxygen emitter directly within a conduit lumen of a fluid conduit'" (Remarks, page 9)

Applicant further argued

> [c]laims 1-4 and 9 were previously rejected on the ground of nonstatutory obviousness type double patenting. Applicant respectfully asserts that the need for a Terminal Disclaimed to overcome a nonstatutory obviousness-type double patenting rejection has been overcome through the present amendment to independent claim 1 and the addition of new independent claims 25 and 26. As claims 1, 25 and 26 are patentably distinct from claims 1-6 of U.S. Patent No. 6,689,262, Applicant respectfully requests said rejections be withdrawn. (Remarks, page 6)

The examiner responded to applicant's arguments and amendment in an Office Action mailed November 1, 2007, the examiner stating "[t]he rejection of claims 1-3 under 35 U.S.C. 102(e) as being anticipated by Zappi et al. US 6,328,875 B1 (Zappi) is withdrawn in view of applicant's claim amendment filed 17 August 2007." The examiner also withdrew the rejection of claims 1-4 over Divisek et al. stating "[t]he rejection of claims 1-4 under 35 U.S.C. 103(a) as being unpatentable over Divisek et al. US 4,225,401 (Divisek) is withdrawn in view of applicant's claim amendment filed 17 August 2007." The examiner additionally withdrew the rejection of claims 1-4 and 9 on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 6,689,262 B2.

Thus, applicant not only distinguished the claims of the '441 patent application from the cited prior art based on the amendment requiring the emitter be directly within a conduit, but also argued that such an amendment made the claims patentably distinct from claims to an emitter not within a conduit. Accordingly, new claims 13-69 are directed to a patentably distinct invention from the issued '495 patent claims.

Inasmuch as claims to an emitter within a tubular housing (as recited in claims 13-69) are patentably distinct from claims to an emitter alone (as issued in the apparatus claims of the '495 patent), it would be appropriate to restrict claims 13-69 from the instant reissue application as being directed to an invention non-elected by original presentation. However, in view of compact prosecution and the fact that applicant cannot pursue claims 13-69, which are directed to, and broader than the patentably distinct '441 patent claims (which issued more than 2 years ago), in a divisional reissue application, the specialist has not done so. Such a restriction requirement would force applicant to file a divisional application to claims which are barred by 35 U.S.C. 251. *In re Graff*, 111 F.3d 874, 877, 42 USPQ2d 1471, 1473-74 (Fed. Cir. 1997) (Broadened claims in a continuing reissue application were properly rejected under 35 U.S.C. 251 because the proposal for broadened claims was not made (in the parent reissue application) within two years from the grant of the original patent and the public was not notified that broadened claims were being sought until after the two-year period elapsed.)

35 U.S.C. § 112, 1st paragraph

The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 13-69 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

There is no support for claiming "each electrode of the emitter is positioned so that substantially all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing"; "at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes"; "each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing"; "the electrodes are positioned away from a longitudinal center axis of the tubular housing"; "the passageway running longitudinally for at least the length of that portion of one of the electrodes positioned within the tubular housing"; "the unobstructed passageway includes the center axis

and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing"; "the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is substantially less than a cross-sectional area of the unobstructed passageway"; "the passageway running for at least the length of that portion of one of the electrodes positioned within the housing"; "the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is substantially less than a cross-sectional area of the unobstructed passageway"; "a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing"; "the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing" and; "the unobstructed passageway having a substantially uniform cross-sectional area along that length."

To the extent that applicant's Reissue Declaration references Figures 7A and 7B as support for the above claim limitations, e.g., "it was an error not to include emitter claims that include varying combinations of the features disclosed in the emitter embodiment corresponding to FIGS. 7A and 7B of the '495 patent" (Page 1 of the Declaration filed January 26, 2016), Figures 7A and 7B are **not** taught as being to scale. Accordingly, Figures 7A and 7B do not provide support for limitations which are not otherwise disclosed in the '495 patent specification. Nor do Figures 7A and 7B disclose features that are now being claimed. For example, Figures 7A and 7B do not disclose wherein "the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing"; "first and second conductors coupled to the first and second electrodes"; or "first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing".

35 U.S.C. § 112, 4th paragraph

The following is a quotation of 35 U.S.C. 112(d):

(d) REFERENCE IN DEPENDENT FORMS.—Subject to subsection (e), a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

The following is a quotation of pre-AIA 35 U.S.C. 112, fourth paragraph:

Subject to the following paragraph [i.e., the fifth paragraph of pre-AIA 35 U.S.C. 112], a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

Claims 23, 26, 36, 46, 49, 58, 61 and 69 are rejected under 35 U.S.C. 112(d) or pre-AIA 35 U.S.C. 112, 4th paragraph, as being of improper dependent form for failing to further limit the subject matter of the claim upon which it depends, or for failing to include all the limitations of the claim upon which it depends.

The '495 patent teaches that a "critical distance" separating the anode and cathode ranging from 0.005 inches to 0.140 inches is the distance at which evolved oxygen forms microbubbles and nanobubbles. As each of the claims from which claims 23, 26, 36, 46 and 49 depend are already limited to the critical distance, the recitation in claims 23, 26, 36, 46 and 49 to forming microbubbles or nanobubbles is not a further limitation to these claims. In like manner, the recitation in dependent claims 58, 61 and 69 that the emitter is "operable" to create microbubbles or nanobubbles is not a further limitation to the claims.

Applicant may cancel the claim(s), amend the claim(s) to place the claim(s) in proper dependent form, rewrite the claim(s) in independent form, or present a sufficient showing that the dependent claim(s) complies with the statutory requirements.

Recapture

Claims 13-69 are rejected under 35 U.S.C. 251 as being an improper recapture of broadened claimed subject matter surrendered in the application for the patent upon which the present reissue is based. See *Greenliant Systems, Inc. et al v. Xicor LLC*, 692 F.3d 1261, 103 USPQ2d 1951 (Fed. Cir. 2012); *In re Shahram Mostafazadeh and Joseph O. Smith*, 643 F.3d 1353, 98 USPQ2d 1639 (Fed. Cir. 2011); *North American Container, Inc. v. Plastipak Packaging, Inc.*, 415 F.3d 1335, 75 USPQ2d 1545 (Fed. Cir. 2005); *Pannu v. Storz Instruments Inc.*, 258 F.3d 1366, 59 USPQ2d 1597 (Fed. Cir. 2001); *Hester Industries, Inc. v. Stein, Inc.*, 142 F.3d 1472, 46 USPQ2d 1641 (Fed. Cir. 1998); *In re Clement*, 131 F.3d 1464, 45 USPQ2d 1161 (Fed. Cir. 1997); *Ball Corp. v. United States*, 729 F.2d 1429, 1436, 221 USPQ 289, 295 (Fed. Cir. 1984). A broadening aspect is present in the reissue which was not present in the application for patent. The record of the application for the patent shows that the broadening aspect (in the reissue) relates to claimed subject matter that applicant previously surrendered during the prosecution of the application. Accordingly, the narrow scope of the claims in the patent was not an error within the meaning of 35 U.S.C. 251, and the broader scope of claim subject matter surrendered in the application for the patent cannot be recaptured by the filing of the present reissue application.

During prosecution of the ‘326 application, which became the ‘441 patent, claims 1-3 were rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,328,875 to Zappi. The examiner stated “the electrolytic apparatus as taught by Zappi is place [sic] adjacent to a conduit for flowing water” (page 4 of the Office Action mailed May 24, 2007). Claim 1-4 were also rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,225,401 to Divisek et al. (page 6 of the Office Action mailed May 24, 2007). The examiner stated “[e]ven though Divisek does not explicitly teach that its electrolyzer is place [sic] within or adjacent to a conduit for flowing water, one of ordinary skill in the art would have found the position of Divisek's electrolyzer at least adjacent to a water conduit obvious since water is added/fed to Devisek’s [sic] electrolyzer for electrolysis to take place" (page 7 of the Office Action mailed May 24, 2007).

In a response filed August 17, 2007, applicant amended the claims to recite:

1. (Currently Amended) A flow through oxygenator ~~consisting of~~ comprising:
a fluid conduit having a fluid inlet and a fluid outlet with a conduit lumen;

an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen ~~comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other,~~; and

a power source ~~all~~ in electrical communication with ~~each other, wherein~~ the oxygen emitter ~~is placed within or adjacent to a conduit for flowing water~~.

As to the amendment, applicant argued “Applicant has amended independent claim 1 to clarify the presently claimed flow through oxygenator as comprising an oxygen emitter positioned within a conduit lumen of a fluid conduit”. “Zappi et al. is absent any disclosure relative to the positioning of an oxygen emitter directly within the conduit lumen of a fluid conduit as presently claimed" and; "Divisek does not teach an electrolyzer placed directly within a conduit as presently claimed in amended independent claim 1" (Remarks, pages 7 and 8). Applicant also added new claims 13-26. New claim 14 read:

> 14. (New) The flow through oxygenator of claim 1, wherein the plurality of matched sets comprises three matched sets of anodes and cathodes attached to the stabilizing hardware in adjacent relation such that each matched set resides at a 120° angle to the adjacent matched sets.

Applicant cited page 4, lines 18-28; page 13, line 22 to page 15, line 12 and Figure 7 as support for the amendment (Remarks, page 6). Page 13, lines 24-26 of the '326 application state:

> [i]n Figure 7 (A), the oxygenation chamber is comprised of three anodes 1 and cathodes 2, of appropriate size to fit inside a tube or hose and separated by the critical distance are placed within a tube or hose 3 at 102° angles to each other.

As to new independent claims 25 and 26, applicant argued "[a]s discussed previously with respect to the present rejections to independent claim 1, none of the presently cited art considered individually or in combination teaches the positioning of an oxygen emitter directly within a conduit lumen of a fluid conduit'" (Remarks, page 9)

The examiner responded to applicant's arguments and amendment in an Office Action mailed November 1, 2007, the examiner stating "[t]he rejection of claims 1-3 under 35 U.S.C. 102(e) as being anticipated by Zappi et al. US 6,328,875 B1 (Zappi) is withdrawn in view of applicant's claim amendment filed 17 August 2007." The examiner also withdrew the rejection of claims 1-4 over Divisek et al. stating "[t]he rejection of claims 1-4 under 35 U.S.C. 103(a) as being unpatentable over Divisek et al. US 4,225,401 (Divisek) is withdrawn in view of applicant's claim amendment filed 17 August 2007."

The examiner additionally entered new grounds of rejection over U.S. Patent Publication 2002/0074237 to Takesako et al (Takesako) and U.S. Patent 6,171,469 to Hough et al. (Hough). As to Takesako, the examiner rejected claims 1-3, 13, 15 and 17-22 under 35 U.S.C. 102(b) as being anticipated, stating:

> Takesako teaches a water electrolyzer comprising a fluid conduit having a fluid inlet and a fluid outlet connected with a conduit lumen (Fig. 1(a)-(b), #1, 21, 22). Takesako also teaches an electrolysis cell positioned within the conduit lumen and parallel to a flow axis of the conduit lumen (Fig. 1(b), paragraph [0021]). The electrolysis cell as taught by Takesako comprises a plurality of matched sets of anodes and cathodes and secured to electrode connecting rods by conductive bolts and spacers (Figs. 2-3, #2, 4, 25-27 and 31-33, paragraph [0056]). In addition, the electrodes are expanded metal mesh (paragraphs [0012, 0062] and the distance between the electrodes does not exceed 3.0 mm (paragraph [0017]. Takesako further teaches that the electrolysis cell in the conduit lumen is connected to a power source (Fig. 1(b)). (Office Action, page 4 and 5).

As to Hough, the examiner rejected claims 1-3, 13, 17 and 20-22 under 35 U.S.C. 102(b) as being anticipated, stating:

> Hough teaches a water electrolyzer for increasing oxygen content of water (abstract, title), wherein the water electrolyzer comprises a flow conduit having an inlet and an outlet connected to the conduit lumen (Fig. 1 #11-12). Hough also teaches a plurality of matched sets of anodes and cathodes mounted to stabilizing hardware and positioned within the conduit lumen (Fig. 2C). The electrodes are connected to a power source (Fig. 1 #14, col. 3 lines 6-11). The electrodes in the water electrolyzer of Hough are metal (col. 3 lines 1-5) and are positioned parallel to the flow axis of the conduit (Fig. 2C) (Office Action, pages 6 and 7).

The examiner also objected to claim 14 as being dependent up a rejected base claim but allowable if rewritten in independent form. The examiner stated "[t]he prior art of record does not teach or fairly suggest, either alone or in combination, the claimed flow through oxygenator comprising three matched sets of anodes and cathodes attached to stabilizing hardware in adjacent relation such that each matched set resides at a 120° angle to the adjacent matched sets." (Office Action, page 13)

In a response filed March 3, 2008, applicant amended the claims to recite:

1. (Currently Amended) A flow through oxygenator comprising:
a fluid conduit having a fluid inlet and a fluid outlet with a conduit lumen;

an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including ~~a plurality of~~ three matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen and each matched set resides at a 120° angle to the adjacent matched sets; and

a power source in electrical communication with the oxygen emitter.

25. (Currently Amended) A flow through oxygenator comprising:
a watering hose having a hose lumen; and
an oxygen emitter operably mounted with the hose lumen, the oxygen emitter including three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets.

26. (Currently Amended) A flow through oxygenator comprising:
a hydroponic circulating system having a circulating lumen; and
an oxygen emitter operably mounted within the circulating lumen, the oxygen emitter including three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets.

Applicant thus limited all the claims to include the limitation shown in Figure 7A, i.e., "three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets."

Applicant argued "[b]y way of the present amendment to independent claim 1, Applicant has incorporated the previously indicated allowable subject matter of former dependent claim 14. As such, Applicant requests said rejections be withdrawn." (Remarks, page 11)

The narrow scope of the claims in the '411 patent which recite "the oxygen emitter is positioned within the conduit lumen" (claims 1-15); "an oxygen emitter operably mounted within the hose lumen" (claim 16); and "an oxygen emitter operably mounted within the circulating lumen"(claim 17), along with "three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets" was done to overcome prior art rejections and was not an error within the meaning of 35 U.S.C. 251. The broader scope of claim subject matter surrendered in the application for the '411 patent cannot be recaptured by the filing of the present reissue application.

Response to Arguments

Applicant's arguments filed February 6, 2017 have been fully considered but they are not persuasive.

As to the §112, 1st paragraph rejections, applicant argues "the description of an article pictured can be relied on, in combination with the drawings, for what they would reasonably teach one of ordinary skill in the art (Remarks, pages 26-27) and point to the specific embodiment shown in Figure 7A as teaching the now claimed limitations (Remarks, pages 27-34). Applicant's arguments lack merit.

Figure 7A shows a single embodiment of the invention wherein "three anodes **1** and cathodes **2**, of appropriate size to fit inside a tube or hose and separated by the critical distance are placed within a tube or hose **3** at 120° angles to each other" (column 9, lines 7-11). Figure 7A, along with the description at column 9, lines 5-18 of the '495 patent, teach a single embodiment of the invention wherein three sets of anodes and cathodes (i.e., six electrodes) are arranged in an equilateral triangle (i.e., 120° angles to each other) within a tube or hose.

Applicant's claims do **not** require at least three sets of anodes and cathodes as disclosed and arranged in Figure 7A and described in column 9, lines 5-18, i.e., "at 120° angles to each other." For example, claim 13 recites "at least two electrodes". A single pair of electrodes cannot form an equilateral triangle as shown in Figure 7A and described in column 9 of the '495 patent. Nor do the additionally recited claim limitations inherently require three pairs of electrodes arranged in an equilateral triangle and it is disingenuous for applicant to point to the characteristics of an equilateral triangle as inherently supporting claims which do not require the electrodes to be arranged in an equilateral triangle.

Applicant argues

> [t]here is a difference between claiming the configuration of the electrodes and claiming a specific result from operating the electrodes in that configuration. The independent claims where they recite the separation distance are not claiming obtaining oxygen bubbles of a certain size. For example, claim 13 recites that "the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches" and the power source "is operable to produce oxygen in said water." By adding a requirement that the oxygen produced by the emitter includes bubbles of a certain size, the dependent claims are narrowing the claims. Infringement of the dependent claims may require different evidence (i.e. evidence indicative of the size of emitted bubbles), whereas there is no such requirement for determining infringement of the claims that recite the distance separating the electrodes. (Remarks, pages 34-35)

Applicant's argument lacks merit.

Applicant's claims are directed to an apparatus. The intended use of the apparatus, i.e., "obtaining oxygen bubbles of a certain size" is not a further limitation to the structure of the claimed apparatus. Accordingly, a dependent claim does not further limit the claim from which it depends by adding this "requirement."

Applicant's additional arguments filed February 6, 2017 have been fully considered but they are not persuasive for the reasons as stated in the above rejections.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Duty to Disclose

Applicant is reminded of the continuing obligation under 37 CFR 1.178(b), to timely apprise the Office of any prior or concurrent proceeding in which Patent No. 7,670,495 is or was involved. These proceedings would include interferences, reissues, reexaminations, and litigation.

Applicant is further reminded of the continuing obligation under 37 CFR 1.56, to timely apprise the Office of any information which is material to patentability of the claims under consideration in this reissue application.

These obligations rest with each individual associated with the filing and prosecution of this application for reissue. See also MPEP §§ 1404, 1442.01 and 1442.04.

Correspondence

Any inquiry concerning this communication or earlier communications from the specialist should be directed to Jerry D. Johnson whose telephone number is (571) 272-1448. The specialist can normally be reached on 5:30-3:00, M-F, alternate Fridays off.

If attempts to reach the specialist by telephone are unsuccessful, the specialist's supervisor, Stephen Stein can be reached on (571) 272-1544.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Telephone Numbers for reexamination inquiries:
Central Reexam Unit (CRU) (571) 272-7705

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Central Reexamination Unit
Commissioner for Patents
P. O. Box 1450
Alexandria VA 22313-1450

Please hand-deliver any communications to:
Customer Service Window
Attn: Central Reexamination Unit
Randolph Building, Lobby Level

401 Dulany Street
Alexandria, VA 22314

By EFS: Registered users may submit via the electronic filing system EFS-Web at https://efs.uspto.gov/efile/myportal/efs-registered

Signed:

/Jerry D. Johnson/
Patent Reexamination Specialist
Central Reexamination Unit 3991

/Alan Diamond/
Patent Reexamination Specialist
Central Reexamination Unit 3991

/Stephen Stein/
Supervisory Patent Reexamination Specialist
Central Reexamination Unit 3991

Index of Claims	Application/Control No. 14601340	Applicant(s)/Patent Under Reexamination SENKIW, JAMES ANDREW
	Examiner JERRY D JOHNSON	Art Unit 3991

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	05/06/2015	10/21/2015	09/19/2016	05/30/2017					
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	10	-	-	-	-					
	11	-	-	-	-					
	12	-	-	-	-					
	13	✓	✓	✓	✓					
	14	✓	✓	✓	✓					
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	35	✓	✓	✓	✓					
	36	✓	✓	✓	✓					

U.S. Patent and Trademark Office Part of Paper No. : 20170530

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14601340	SENKIW, JAMES ANDREW
	Examiner	Art Unit
	JERRY D JOHNSON	3991

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	05/06/2015	10/21/2015	09/19/2016	05/30/2017					
	37	✓	✓	✓	✓					
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	69	✓	✓	✓	✓					

PTO/AIA/31 (03-14)
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NOTICE OF APPEAL FROM THE EXAMINER TO THE PATENT TRIAL AND APPEAL BOARD	Docket Number (Optional) 3406.005US02

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	Application Number 14/601,340	Filed January 21, 2015
	For FLOW-THROUGH OXYGENATOR	
	Art Unit 3991	Examiner Jerry D. Johnson

Applicant hereby **appeals** to the Patent Trial and Appeal Board from the last decision of the examiner.

The fee for this Notice of Appeal is (37 CFR 41.20(b)(1)) $ 800

☑ Applicant asserts small entity status. See 37 CFR 1.27. Therefore, the fee shown above is reduced by 50%, and the resulting fee is: $ 400

☐ Applicant certifies micro entity status. See 37 CFR 1.29. Therefore, the fee shown above is reduced by 75%, and the resulting fee is: $ ______
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 502880.

☑ Payment made via EFS-Web.

☐ A petition for an extension of time under 37 CFR 1.136(a) (PTO/AIA/22 or equivalent) is enclosed.
For extensions of time in reexamination proceedings, see 37 CFR 1.550.

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I am the

☐ applicant ☑ attorney or agent of record Registration number 33,227 ☐ attorney or agent acting under 37 CFR 1.34 Registration number ______

Signature /Philip Caspers/
Typed or printed name Philip P. Caspers
Telephone Number 612-436-9600
Date July 21, 2017

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of ______ forms are submitted.

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The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	14601340
Filing Date:	21-Jan-2015
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Filer:	Aaron Wesley Pederson
Attorney Docket Number:	3406.005US2

Filed as Small Entity

Filing Fees for **Utility under 35 USC 111(a)**

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
NOTICE OF APPEAL	2401	1	400	400
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**400**

Electronic Acknowledgement Receipt	
EFS ID:	29860530
Application Number:	14601340
International Application Number:	
Confirmation Number:	1069
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Customer Number:	38846
Filer:	Aaron Wesley Pederson
Filer Authorized By:	
Attorney Docket Number:	3406.005US2
Receipt Date:	21-JUL-2017
Filing Date:	21-JAN-2015
Time Stamp:	17:52:29
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$400
RAM confirmation Number	072417INTEFSW00004249502880
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Notice of Appeal Filed	Notice_of_Appeal.pdf	236654 6da4f96099c1f4157ac2c35b766348872831eeb4	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	29873 d06cdddb7e9d99a277c97bd6c464d3175507b9ed	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	266527		

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
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New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/31 (03-14)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

NOTICE OF APPEAL FROM THE EXAMINER TO THE PATENT TRIAL AND APPEAL BOARD	Docket Number (Optional) 3406.005US02	
I hereby certify that this correspondence is being facsimile transmitted to the USPTO, EFS-Web transmitted to the USPTO, or deposited with the United States Postal Service with sufficient postage in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, on Alexandria, VA 22313-1450" [37 CFR 1.8(a)]	In re Application of Oxygenator Water Technologies, Inc.	
on ______________.	Application Number 14/601,340	Filed January 21, 2015
Signature ______________	For FLOW-THROUGH OXYGENATOR	
Typed or printed name ______________	Art Unit 3991	Examiner Jerry D. Johnson

Applicant hereby **appeals** to the Patent Trial and Appeal Board from the last decision of the examiner.

The fee for this Notice of Appeal is (37 CFR 41.20(b)(1)) $ 800

☑ Applicant asserts small entity status. See 37 CFR 1.27. Therefore, the fee shown above is reduced by 50%, and the resulting fee is: $ 400

☐ Applicant certifies micro entity status. See 37 CFR 1.29. Therefore, the fee shown above is reduced by 75%, and the resulting fee is: $ ______
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 502880.

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☐ A petition for an extension of time under 37 CFR 1.136(a) (PTO/AIA/22 or equivalent) is enclosed.
For extensions of time in reexamination proceedings, see 37 CFR 1.550.

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I am the

☐ applicant ☑ attorney or agent of record Registration number 33,227 ☐ attorney or agent acting under 37 CFR 1.34 Registration number ______

Signature /Philip Caspers/
Typed or printed name Philip P. Caspers
Telephone Number 612-436-9600
Date July 21, 2017

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of ______ forms are submitted.

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Electronic Patent Application Fee Transmittal	
Application Number:	14601340
Filing Date:	21-Jan-2015
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Filer:	Aaron Wesley Pederson
Attorney Docket Number:	3406.005US2
Filed as Small Entity	
Filing Fees for **Utility under 35 USC 111(a)**	

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
NOTICE OF APPEAL	2401	1	400	400
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		400

Electronic Acknowledgement Receipt

EFS ID:	29858078
Application Number:	14601340
International Application Number:	
Confirmation Number:	1069
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Customer Number:	38846
Filer:	Aaron Wesley Pederson
Filer Authorized By:	
Attorney Docket Number:	3406.005US2
Receipt Date:	21-JUL-2017
Filing Date:	21-JAN-2015
Time Stamp:	15:50:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Notice of Appeal Filed	Notice_of_Appeal.pdf	236654 6da4f96099c1f4157ac2c35b766348872831eeb4	no	2

Warnings:

JA2189

OWT Ex. 2119
Tennant Company v. OWT
IPR2021-00625

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	29873 d45d7e3bf793e3da99d33e344a3ac65b1447bc2d	no	2

Warnings:

Information:

Total Files Size (in bytes):	266527

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<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
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<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

Appellant	Oxygenator Water Technologies, Inc.	**Appeal Brief**
Serial No.	14/601,340	
Filing Date	01/21/2015	
Group Art Unit	3991	
Examiner	Johnson, Jerry D.	
Attorney Docket No.	3406.005US2	
Title: FLOW-THROUGH OXYGENATOR		

On July 21, 2017, Appellant filed a notice of appeal from the final decision of the Examiner set forth in the Final Office Action dated June 5, 2017.

I. Real party in interest

The real party in interest in the above-captioned application is the assignee Oxygenator Water Technologies, Inc.

II. Related appeals, interferences, and trials

There are no other appeals, interferences, or trials known to the Appellant that will have a bearing on the Board's decision in the present appeal.

III. List of Evidence

The following is a list of evidence of which copies are submitted herewith.

Exhibit A: U.S. Patent No. 7,670,495 (the '495 patent) – patent being reissued

Exhibit B: U.S. Patent No. 7,396,441 (the '441 patent) – parent of the '495 patent

Exhibit C: U.S. Patent No. 6,689,262 (the '262 patent) – parent of the '495 patent

Exhibit D: U.S. Patent App. Serial No. 14/601,340, Final Office Action dated June 5, 2017 (the '340 FOA dtd 6/5/2017) – office action from which this appeal was taken

Exhibit E:	U.S. Patent App. Serial No. 14/601,340, Applicant's Response filed Feb. 6, 2017 (the '340 Response dtd 2/6/2017)
Exhibit F:	U.S. Patent App. Serial No. 14/601,340 – Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 filed on February 6, 2017
Exhibit G:	U.S. Patent App. Serial No. 14/601,340 – Reissue Declaration of Inventorship filed on January 26, 2016 (the Senkiw Decl.)
Exhibit H:	U.S. Patent No. 7,670,495, Office Action dated March 27, 2009 (the '495 OA dtd 3/27/2009)
Exhibit I:	U.S. Patent No. 7,396,441, Final Office Action dated Nov. 1, 2007 (the '441 FOA dtd 11/1/2007)
Exhibit J:	U.S. Patent No. 7,396,441, Applicant's Response dated Aug. 17, 2007 (the '441 OA dtd 8/17/2007)
Exhibit K:	U.S. Patent No. 7,396,441, Office Action dated May 24, 2007 (the '441 OA dtd 5/24/2007")
Exhibit L:	U.S. Patent No. 7,396,441, Office Action dated Nov. 29, 2005 (the '441 OA dtd 11/29/2005)

IV. Summary of claimed subject matter

Pursuant to 37 C.F.R. §41.37(c)(1)(v), Appellant provides the following concise explanation of the subject matter defined in each claim with reference to the specification and to the drawings. Appellant submits that the citations to the specification and drawings are not intended to be exhaustive and that other support for the various claims may also be found throughout the specification and drawings. Citations in this section are to the specification of the present reissue application, which is U.S. Patent No. 7,670,495 (the '495 patent – Ex. A). Citations in the form: X:Y-Z, refer to lines Y-Z of column X of the '495 patent. Citations in the form: FIG. X – No. Y, refer to reference numeral Y of figure X of the '495 patent.

Claim Limitations	Support Location
Claim 13	
an emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;	3:26-32 9:7-11 FIG. 7A – No. 3
at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches within the tubular housing;	FIG. 7A – No. 1, 2 3:11-14 4:54 5:4-11
each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing	FIG. 7A 9:5-33
and so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 9:5-33 3:23-30 3:11-14
a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;	9:35-45
the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.	3:27-35 2:63-67
Claim 14	
the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis	FIG. 7A – No. 3 9:7-12
the electrodes extend in a direction that is parallel to the longitudinal axis	FIG. 7A – No. 1, 2 FIG. 7B – No. 1, 2 9:7-12 3:25-30

at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes	FIG. 7A 9:7-12
Claim 15	
the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis	FIG. 7A – No. 3 9:7-12
electrodes extend in a direction parallel to the longitudinal axis	FIG. 7A – No. 1, 2 FIG. 7B – No. 1, 2 9:7-12 3:25-30
each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing	FIG. 7A 9:7-12
Claim 16	
at least one of the electrodes is a stainless steel mesh or screen	3:6-8 4:63-64 FIG. 7B – No. 2
Claim 17	
the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing	FIG. 7A FIG. 7B 9:7-18
Claim 18	
the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing	FIG. 7A
Claim 19	
the first and second electrodes comprise an outside electrode and an inside electrode, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is	3:25-28 FIG. 7A – No. 1, 2 9:7-18
the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis	FIG. 7A – No. 1, 2 FIG. 7B – No. 1, 2 9:7-12 3:25-30
the first and second electrodes extend in a longitudinal direction parallel to an inward-facing surface of the tubular housing	FIG. 7A – No. 1, 2, 3 9:7-12

the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway	FIG. 7A 9:7-18
Claim 20	
the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to and including the center axis, the passageway running for at least the length of one of the electrodes positioned within the housing	FIG. 7A FIG. 7B 9:7-18
the first and second electrodes comprise an outside electrode and an inside electrode, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is	3:25-28 FIG. 7A – No. 1, 2 9:7-18
the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing	FIG. 7A – No. 1, 2 FIG. 7B – No. 1, 2 9:7-12 3:25-30
the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway	FIG. 7A 9:7-18
the tubular housing of the emitter is round	FIG. 7A – No. 3
Claim 21	
said inward-facing surface is a concave surface	FIG. 7A
Claim 22	
first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing	FIG. 7A – No. 4 FIG. 7B – No. 5, 6 9:11-17
Claim 23	
the oxygen produced comprises microbubbles	2:63-67 3:11-14 4:10-11 4:27-28
Claim 24	
the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode	9:35-45 (Table III)
Claim 25	

a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions	FIG. 7A – No. 1, 2 9:7-11 3:25-28
Claim 26	
the oxygen produced comprises nanobubbles	2:63-67 3:11-14 4:12-15 4:27-28
Claim 27	
An emitter for electrolytic generation of bubbles of oxygen in water	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing defining an oxygenation chamber and having a water inlet, a water outlet, a longitudinal water flow axis from the inlet to the outlet, and an inward-facing surface that runs parallel to the water flow axis and defines at least in part the oxygenation chamber	3:26-32 9:7-12 FIG. 7A – No. 3
at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that is parallel to the longitudinal axis	3:25-30 FIG. 7A – No. 1, 2 FIG. 7B – No. 1, 2 9:7-18
the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber	FIG. 7A 3:11-14 4:54 5:4-11
the position and size of each electrode within the chamber defines a cross-section of the chamber that has a water flow area within the oxygenation chamber through which water may flow without passing between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches, wherein the water flow area is greater than an area at the cross-section equal to the total area between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 9:5-33 3:23-30 3:11-14
a portion of the outside electrode positioned in the chamber is closer to the inward-facing surface of the oxygenation chamber than said distance separating the inside electrode from the outside electrode	FIG. 7A 3:25-28

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps	9:35-45
the power source being operable to deliver electrical current to the electrodes while water flows through the chamber of the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis	3:27-35 2:63-67
Claim 28	
each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a longitudinal center axis of the oxygenation chamber	FIG. 7A 9:7-12
Claim 29	
electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber	FIG. 7A FIG. 7B 9:7-18
Claim 30	
the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber	FIG. 7A
Claim 31	
the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway	FIG. 7A 9:7-18
Claim 32	
first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing	FIG. 7A – No. 4 FIG. 7B – No. 5, 6 9:11-17
Claim 33	
the oxygen produced comprises nanobubbles	2:63-67 3:11-14 4:12-15 4:27-28
Claim 34	
the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode	9:35-45 (Table III)
Claim 35	

the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions	FIG. 7A – No. 1, 2 9:7-11 3:25-28
Claim 36	
the oxygen produced comprises nanobubbles	2:63-67 3:11-14 4:12-15 4:27-28
Claim 37	
an emitter for electrolytic generation of bubbles of oxygen in water	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing defining an oxygenation chamber and having a water inlet, and a water outlet	3:26-32 9:7-12 FIG. 7A – No. 3
at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the oxygenation chamber, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches	FIG. 7A – No. 1, 2 3:11-14 4:54 5:4-11
a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber, said portion being a portion that opposes the other of the first and second electrodes	FIG. 7A
each electrode is positioned within the oxygenation chamber so that a cross section of the oxygenation chamber includes a water flow area that allows water to avoid passing between electrodes separated by 0.005 inches to 0.140 inches	FIG. 7A 9:5-33 3:11-14
a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps	9:35-45
the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis	3:27-35 2:63-67

Claim 38	
the tubular housing has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal center axis	FIG. 7A – No. 3 3:26-32 9:7-12
each electrode of the emitter is positioned so that all points midway between all opposing electrodes inside the chamber are closer to said inwardly-facing surface than to the longitudinal center axis	FIG. 7A
Claim 39	
the chamber has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal axis, wherein the electrodes extend in a direction that is parallel to the longitudinal axis	3:26-32 9:7-12 FIG. 7A
at least one of the first and second electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes	FIG. 7A 9:7-12
Claim 40	
each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to the longitudinal center axis of the oxygenation chamber	FIG. 7A 9:7-12
Claim 41	
the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing	FIG. 7A
Claim 42	
the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber	FIG. 7A FIG. 7B 9:7-18
Claim 43	
the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the chamber	FIG. 7A
Claim 44	
the chamber has an inward-facing surface that runs parallel to the longitudinal axis	FIG. 7A 3:26-32 9:7-12
the first and second electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is	3:25-28 FIG. 7A – No. 1, 2 9:7-18

the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway	FIG. 7A 9:7-18
Claim 45	
first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing	FIG. 7A – No. 4 FIG. 7B – No. 5, 6 9:11-17
Claim 46	
the oxygen comprises microbubbles	2:63-67 3:11-14 4:10-11 4:27-28
Claim 47	
the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode	9:35-45 (Table III)
Claim 48	
the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions	FIG. 7A – No. 1, 2 9:7-11 3:25-28
Claim 49	
the oxygen produced comprises nanobubbles	2:63-67 3:11-14 4:12-15 4:27-28
Claim 50	
an emitter for electrolytic generation of bubbles of oxygen in an aqueous medium	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing defining an oxygenation chamber, and having an inward-facing surface that defines at least in part the oxygenation chamber, a water inlet, and a water outlet	3:26-32 9:7-12 FIG. 7A – No. 3

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that runs parallel to the inward-facing surface, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the inward-facing surface of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is	3:25-28 FIG. 7A – No. 1, 2 FIG. 7B – No. 1, 2 9:7-18
the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber	3:11-14 4:54 5:4-11
each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a midpoint of the tubular housing and so that at least some water may flow through an unobstructed passageway from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches	FIGS. 7A-7B 9:7-11 3:23-30 3:11-14
Claim 51	
at least one of the inside and outside electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes	FIG. 7A 9:7-11
the tubular housing defines a longitudinal center axis that lies in the oxygenation chamber and wherein the unobstructed passageway includes the longitudinal center axis	FIG. 7A 9:7-11
Claim 52	
at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber	FIG. 7A
Claim 53	
the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing	FIG. 7A
Claim 54	
the unobstructed passageway is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber	FIG. 7A
Claim 55	
the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway	FIG. 7A 9:7-18
Claim 56	
the inward-facing surface is a concave surface	FIG. 7A

Claim 57	
first and second conductors coupled to the outside and inside electrodes, respectively, and exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing	FIG. 7A – No. 4 FIG. 7B – No. 5, 6 9:11-17
Claim 58	
the emitter is operable when connected to a power source to create microbubbles of oxygen in water flowing through the oxygenation chamber	2:63-67 3:11-14 4:10-11 4:27-28
Claim 59	
a power source wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode	9:35-45 (Table III)
Claim 60	
a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions	FIG. 7A – No. 1, 2 9:7-11 3:25-28
Claim 61	
the emitter is operable when connected to a power source to create nanobubbles of oxygen in water flowing through the oxygenation chamber.	2:63-67 3:11-14 4:10-11 4:27-28
Claim 62	
an emitter for electrolytic generation of bubbles of oxygen in an aqueous medium	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing defining an oxygenation chamber, said housing having an outer wall that runs parallel to a longitudinal center axis of the housing, said housing having a water inlet and a water outlet	3:26-32 9:7-12 FIG. 7A – No. 3
at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is	3:25-28 FIG. 7A – No. 1, 2 9:7-18

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the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 3:11-14 4:54 5:4-11
the electrodes being positioned away from the center axis and maintaining a longitudinal, unobstructed passageway parallel to and including the center axis that runs for at least the length of one of the electrodes positioned within the chamber, the unobstructed passageway having a uniform cross-sectional area along that length	FIG. 7A FIG. 7B 9:7-18
the electrodes being positioned so that water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 9:7-12 3:23-30 3:11-14
the outside electrode defines a cross-sectional area between the outside electrode and the outer wall of the chamber that is less than said cross-sectional area of the unobstructed passageway	FIG. 7A 9:7-18
Claim 63	
at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber	FIG. 7A
Claim 64	
the electrode in contact with a wall of the tubular housing is in contact with the outer wall which is a curved wall of the tubular housing	FIG. 7A
Claim 65	
the unobstructed passageway is multiple times wider than the distance separating the opposing outside and inside electrodes within the chamber	FIG. 7A
Claim 66	
said outer wall includes an inwardly-facing concave surface	FIG. 7A
Claim 67	
first and second conductors coupled to the outside and inside electrodes, respectively, and exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing	FIG. 7A – No. 4 FIG. 7B – No. 5, 6 9:11-17
Claim 68	
at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions	FIG. 7A – No. 1, 2 9:7-11 3:25-28
Claim 69	
the emitter is operable when connected to a power source to create nanobubbles of oxygen in water flowing through the oxygenation chamber	2:63-67 3:11-14 4:10-11 4:27-28

V. Argument

A. The Reissue Oath Rejection

1. Summary of Argument

The rejection based on the reissue declaration or oath ("reissue oath rejection") has been asserted since the first office action of the present application, but the legal theory for that rejection has evolved. In the current final office action from which this appeal was taken ("the '340 FOA dtd 6/5/2017" or "the current final office action" – Ex. D), the examiner relies on the oath rejection to bar any oxygen emitter claims wherein the emitter is positioned "within a conduit" or "within tubular housing".

The issue framed by the examiner's rejection of the declaration, then, is whether the examiner has identified any proper legal basis that would bar Applicant from obtaining reissue claims directed to an oxygen emitter positioned "within a conduit" or "tubular housing" (collectively, the "within a conduit" limitation). The legal bars suggested by the examiner during prosecution include: (1) the two year rule for broadening reissue, (2) the *Orita* doctrine (as discussed in MPEP 1412.01), and (3) the recapture doctrine (as discussed in MPEP 1412.02).

Firstly, this reissue application was filed on September 28, 2011, less than two years after the issue date of **the original patent (the '495 patent)**. [1] The two year rule has not been violated by Applicant's present reissue claims.

Secondly, the examiner has withdrawn the *Orita* rejection, but the current rejection is still in conflict with the *Orita* rule. The *Orita* inquiry is triggered by restriction requirements and addresses the question whether during prosecution applicant failed to file a timely divisional application to pursue claims that were previously presented but cancelled or not elected in response to a restriction requirement. *Orita* does not apply here because no restriction was made, repeated, or referred to in the '495 patent prosecution. The opposite happened -- the '495 patent claims were issued a double patenting rejection based on the claims in '441 parent patent (Ex. B) (**which included oxygen emitter claims wherein the emitter is positioned "within a**

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[1] The present reissue is a continuation reissue of broadening reissue application no. 13/247,241, filed September 28, 2011.

conduit") as well as claims in '262 parent patent (Ex. C). Notably, even the examiner in the '441 patent prosecution issued a double patenting rejection for the '441 patent claims (having the "within a conduit" limitation) based on the parent '262 patent claims (**not** having the "within the conduit" limitation). See n. 2. To overcome these double patenting rejections, Applicant filed terminal disclaimers in both prosecutions.

The examiner's oath rejection attempts to create a new restriction in the '441 patent prosecution (one that draws a distinction between claims that include the "within a conduit" limitation and claims without that limitation), and then imports that restriction into the '495 patent prosecution. That position has no basis in the prosecution facts. First, there was no such restriction in the '441 prosecution. The '441 patent examiner found the opposite. Second, even if such a restriction could be created, under the *Orita* rule restriction requirements from related applications do not carry over into subsequent continuing applications unless the examiner specifically refers to or repeats the restriction in the new application prosecution. That never happened. Again, the opposite happened in that the '495 patent claims were issued a double patenting rejection based on the claims in '441 parent patent that included the "within the conduit" limitation.

The effect of the '495 examiner's broad double patent rejection is important to understand. By this double patenting rejection based on the '441 and '262 patent claims, the '495 patent examiner had ruled that Applicant could have prosecuted any of the '441 or '262 patent claims along with the claims of the '495 patent, including the '441 patent claims that have a "within a conduit" limitation.

Thirdly, in current final office action, the examiner also strays from established legal principles and implies that the reissue oath is defective by virtue of "[t]he claims of the present reissue application are directed to an invention that is patentably distinct from the claims of the '495 patent." The examiner goes on to conclude that because the current reissue claims include a limitation that the emitter is positioned within a tubular housing (which the examiner equates to "within a conduit"), it would be legally appropriate to issue a restriction during this reissue prosecution. This suggested legal theory is flawed in several respects.

For example, the broad double patenting rejection made in the '495 patent prosecution conclusively resolved that Applicant could have prosecuted claims that include "within a

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conduit" or "within a tubular housing" in the '495 patent. That Applicant argued "within a conduit" in the prior '441 patent prosecution to distinguish prior art or, as asserted by the examiner, to distinguish the '262 patent claims (an assertion Applicant disputes, see footnote 5 herein discussing the same), is irrelevant. The Examiner's assertion that it would be appropriate to construct a new restriction from the '441 patent prosecution, and then import that restriction into the '495 patent prosecution is in conflict with the facts and is legally wrong under the *Orita* rule.

In addition, the claims of the '495 patent demonstrate that claims with this limitation could have been included in the '495 patent, because such claims <u>were</u> included. In the '495 patent prosecution, Applicant, in fact, filed and obtained a claim that expressly required the emitter to be positioned "within a conduit." Here is that claim.

> 1. A method for treating waste water comprising;
> providing **a flow-through** oxygenator comprising **an emitter** for electrolytic generation of microbubbles of oxygen comprising an anode separated at a critical distance from a cathode and a power source all in electrical communication with each other,
> **placing the emitter <u>within a conduit</u>**; and
> **passing waste water through the conduit**.

See the '495 patent, claim 1 (emphasis added).

There is no bar to seeking reissue claims that are patentably distinct from the original patent. It is not uncommon to seek reissue claims that are patentably distinct from the original patent. For example, one of the express purposes of reissue cases is to permit a narrowing correction where the inventor claimed more than he was entitled to. Unless such a narrowing correction defined a patentably distinct invention, reissues would be pointless in such cases. If there is no violation of the two year rule, the *Orita* doctrine, or the recapture doctrine, it is irrelevant whether the claims of the present reissue application are directed to an invention that is patentably distinct from the claims of the '495 patent.

Finally, the Examiner makes a recapture rejection that is not well explained, but it is tied to the examiner's newly created restriction and boils down to the following sequence of flawed reasoning. (1) The examiner starts with the premise that it is appropriate to construct a new restriction from the '441 patent prosecution (i.e., between claims that include the "within a conduit" limitation and those that do not) and import that restriction into the '495 patent. (2) Due to that newly created and imported restriction, the examiner contends that Applicant could only pursue claims that include the "within the conduit" limitation in a reissue filed on the '441 patent. (3) The examiner thus **takes the liberty treating the present reissue as being filed on the '441 patent, and not the '495 patent.** (4) After effectively declaring the '441 patent the original patent, the examiner then turns to the '441 patent prosecution and notes that certain limitations not present in the current reissue claims (e.g., the "triangle" limitation relating to the 120° angle positioning of the electrodes) were added by amendment and argued to overcome prior art. For a reissue filed on the '441 patent, claim scope without the "triangle" limitation was surrendered during the '441 patent prosecution. (5) Again, in a reissue deemed to be filed on the '441 patent, the examiner rejects the claims based on recapture because in a reissue filed on the '441 patent, Applicant cannot now seek claims without certain limitations which include the "triangle" limitation. The recapture rejection is bizarre in that it relies on facts that don't exist. This is not a reissue filed on the '441 patent. This is a reissue filed on the '495 patent, which is the original patent for this reissue. The rejection should be reversed.

To be clear, as to a reissue on the '495 patent, there is no recapture. Recapture is discussed in detail under Section V.D. herein. In summary, recapture does not bar reissue claims that include the "within a conduit" or that exclude the triangle limitation. Recapture **applies to broadening changes**, and involves attempts to remove limitations during reissue. Here, it's important to keep in mind that Applicant filed for reissue on the '495 patent, and not on the '441 patent. The triangle limitation was not included in any of the '495 patent claims. Therefore, the absence of the "triangle" limitation in the present reissue claims is not a broadening aspect of the present claims. Regarding the "within a conduit" limitation, Applicant also pursued and obtained claims in the '495 patent <u>with and without</u> that limitation. Applicant thereby communicated its intent **not to surrender** the right to pursue claims with or without the "positioned within a conduit" limitation. When claims are filed and issued in a continuing application without the limitations argued in a parent application, the Federal Circuit has stated that such facts show that Applicant has not surrendered the subject matter. *In re Clement*, 131 F.3d 1464, 1469 (Fed. Cir. 1997); *see also MBO Labs.*, F.3d 1306, 1318 (Fed. Cir. 2010). Moreover, including "within a conduit" or "within a tubular housing" limitation is not a broadening limitation. It is instead a narrowing limitation. Recapture does not apply.

None of the legal bars to broadening reissue apply. The reissue oath rejection should be reversed.

2. Overview of the ‘262, ‘441, and ‘495 patent prosecutions

The reissue oath rejection relates to the prosecution histories of: U.S. Patent No. 7,670,495 (the ‘495 patent – Ex. A) and its parent patents, U.S. Patent Nos. 6,689,262 (the ‘262 patent – Ex. C) and 7,396,441 (the ‘441 patent – Ex. B). The table below lists the continuing applications and patents in the chain leading up the ‘495 patent, the patent for which reissue is sought (referred to as the “original patent” under 35 U.S.C. §251). Under Section 251, broadening reissues must be filed within two years of the issue date of the “original patent.” This is known as the two year rule, which Applicant has satisfied.

Applications and Patents in Chain up to ‘495 Patent

Application No. (filed as)	Filing Date	Issued As	Issued Date	Reissue of '495 Filing Date
60/358,534 (provisional)	02/22/2002			
10/372,017 (utility)	02/21/2003	6,689,262	02/10/2004	
10/732,326 (CIP)	12/10/2003	7,396,441	07/08/2008	
12/023,431 (continuing div)	01/31/2008	**7,670,495 (original patent, i.e., patent being reissued)**	**03/10/2010**	**09/28/2011**

In all three prosecutions for the ‘262, ‘441, and ‘495 patents, Applicant consistently pursued method and apparatus claims relating to an emitter for electrolytic generation of bubbles of oxygen (“oxygen emitter claims”).

In the ‘262 patent prosecution, the oxygen emitter claims were allowed in a first office action without receiving an art rejection or a restriction requirement.

In the ‘441 patent prosecution, a restriction requirement was made and Applicant elected to prosecute the oxygen emitter claims of “Group I” (then pending claims 1-4) identified by the examiner as “the flow through oxygenator” claims. Notably, that group of claims was rejected by the examiner for obviousness type double patenting over the oxygen emitter claims of in the parent '262 patent, stating:

> 13. Claims 1-4 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 6,689,262 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because the emitter of U.S. Patent No. 6,689,262 82 is structurally the same as the emitter of the claimed flow-through oxygenator. Even though U.S. Patent No. 6,689,262 B2 does not explicitly teach the claimed flow through oxygenator, one of ordinary skill in the art would have found it obvious to use the instant emitter in an oxygenator as claimed since the emitter produces oxygen.

'441 OA dtd 11/29/2005 (Ex. L) at p. 6.[2] To overcome the obviousness double patenting rejection over the claims in the parent '262 patent, Applicant filed a terminal disclaimer.

To overcome other rejections, including prior art rejections, the Applicant amended the claims in the '441 patent prosecution. The chart below shows independent claim 1 both before and after the amendments that led to allowance. During the course of the prosecution of the present reissue, two of the limitations became the subject of reissue oath (or recapture) rejections. The first, which will be referred to as the **"triangle"** limitation, concerns the 120° angle positioning of the electrodes ("the oxygen emitter including three matched sets of anodes and cathodes … mounted to stabilizing hardware such that … each matched set resides at a 120° angle to the adjacent matched sets"). The second concerns the emitter being positioned **"within the conduit"**.

Claim discussed in '441 patent prosecution <u>prior to</u> amendment	Claim discussed in '441 patent prosecution <u>after</u> amendment (with and without markings to show changes)
1. A flow through oxygenator consisting of an emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, comprising an anode separated at a critical	1. A flow through oxygenator ~~consisting of~~ comprising<u>:</u> <u>a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen;</u> an <u>oxygen</u> emitter for electrolytic

[2] This double patent rejection in the '441 patent prosecution was made when claim 1 required the emitter to be "placed within or adjacent to a conduit", and reasserted later in prosecution when claim 1 was amended to require the emitter to be "positioned within the conduit." See '441 OA dtd 11/01/2007 (Ex. I) at p. 12.

distance from a cathode both within an aqueous medium and in aqueous communication with each other, and a power source all in electrical communication with each other, wherein the emitter is placed within or adjacent to a conduit for flowing water.	generation of microbubbles of oxygen from an aqueous medium, <u>the oxygen emitter including three matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen and each matched set resides at a 120° angle to the adjacent matched sets;</u> ~~comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other,~~ and a power source ~~all~~ in electrical communication with ~~each other wherein~~ the <u>oxygen</u> emitter ~~is placed within or adjacent to a conduit for flowing water~~. **Clean version (without markings)** 1. A flow through oxygenator comprising: a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen; an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including three matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen and each matched set resides at a 120° angle to the adjacent matched sets; and a power source in electrical communication with the oxygen emitter.

In the '495 patent prosecution, Applicant continued to pursue method and apparatus claims relating to the disclosed oxygen emitter. Claims were filed and issued in the '495 patent <u>**without**</u> the "triangle" limitation. Applicant thereby communicated its intent **not to surrender** the right to pursue claims **without** the triangle limitation. Regarding the "within a conduit" limitation, Applicant pursued and obtained claims in the '495 patent **with and without** that limitation. Again, Applicant thereby communicated its intent **not to surrender** the right to pursue claims with or without the "within a conduit" limitation.

In the '495 patent prosecution, no restriction was made, repeated, or referred to.[3] The opposite happened -- the '495 patent claims were issued a double patenting rejection based on the prior parent patents including the '441 patent (which included oxygen emitter claims wherein the emitter is positioned "within a conduit") and the '262 patent. *See '495OA dtd 3/27/2009 (Ex. H) at pp. 2-3.* To overcome an obviousness double patenting rejection over the claims in the '262 and '441 patents, Applicant filed a terminal disclaimer.

3. The *Orita* rule requires reversal of the reissue oath rejection

While the Examiner has withdrawn the rejection based on *Orita,* the current oath rejection is in conflict the *Orita.* Thus, it's important to understand the *Orita* rule.

a. The *Orita* Rule

The rule referred to as the *Orita* doctrine was enunciated in the case of *In re Orita*, 550 F.2d 1277, 1280, 193 USPQ 145, 148 (CCPA 1977); see also MPEP 1412.01 (citing *In re Orita*). The *Orita* rule states that if a restriction was made in the application that became the patent and the non-elected claims in the application were not re-filed in a divisional, those same claims cannot be recovered via reissue.

i. Restriction requirements from related applications do not carry forward unless the examiner repeats or refers to the restriction.

The Federal Circuit has clarified two important points relevant to this analysis. The first is that restriction requirements from related applications do not carry over into subsequent continuing applications unless the examiner specifically refers to or repeats the restriction in the

[3] See MPEP § 819 ("A restriction requirement (and election thereto) made in a parent application does not carry over to a continuation, CIP, or divisional application," citing *Bristol-Myers Squibb Co. v. Pharmachemie BV,* 361 F.3d 1343, 1348, 70 USPQ2d 1097, 1100 (Fed. Cir. 2004).

new application prosecution. *Bristol-Myers Squibb Co. v. Pharmachemie B.V.*, 361F.3d1343, 1348-49 (Fed. Cir. 2004). See also MPEP 819:

> A restriction requirement (and election thereto) made in a parent application does not carry over to a continuation, CIP, or divisional application. *See Bristol-Myers Squibb Co. v. Pharmachemie BV*, 361 F.3d 1343, 1348, 70 USPQ2d 1097, 1100 (Fed. Cir. 2004) (An original restriction requirement in an earlier filed application does not carry over to claims of a continuation application in which the examiner does not reinstate or refer to the restriction requirement in the parent application.).

See also G.D. Searle LLC v. Lupin Pharmaceuticals, Inc., 790 F.3d 1349, 1356 (Fed. Cir. 2015):

> When separate restriction requirements are imposed on separate applications and the record does not show that any of the various restriction requirements carried forward from one application to the next, the earlier restriction requirement cannot be viewed as having continued in effect with respect to the later-filed application.

ii. Assuming there is a restriction or non-election of claims in the original patent, *Orita* also requires the claims sought in reissue are <u>identical to or substantially identical</u> to the claims identified in restriction requirement

Secondly, the Federal Circuit has made clear that the *Orita* rule applies only where the claims sought in reissue are **identical to or substantially identical** to the claims identified in an Examiner's restriction requirement and only when such claims could not have been prosecuted in the application being reissued. *In re Doyle*, 293 F.3d 1355, 1359-60 (Fed. Cir. 2002).

The relevant analysis, therefore, is whether or not there was a restriction or non-election of claims during prosecution of the application that matured into the '495 patent (not the '441 patent) and whether the non-elected claim are substantially identical to the present reissue claims, such that the Applicant would have been precluded from prosecuting the present reissue claims in the application that issued as the '495 patent.

b. The reissue oath rejection is in conflict prosecution facts and the *Orita* rule

The examiner’s analysis relies on creating a new restriction in the ‘441 patent prosecution

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and importing that restriction into ‘495 patent prosecution that bars Applicant from pursuing any oxygen emitter claims in which the emitter is recited to be positioned “within a conduit” or “within a tubular housing.” That can be the only explanation for the examiner’s statement that it would be proper to restrict out such claims in the present reissue.

> Inasmuch as claims to an emitter within a tubular housing (as recited in claims 13-69) are patentably distinct from claims to an emitter alone (as issued in the apparatus claims of the '495 patent), it would be appropriate to restrict claims 13-69 from the instant reissue application as being directed to an invention non-elected by original presentation.

‘340 FOA dtd 6/5/2017 (Ex. D) at p. 11. Under the *Orita* rule, however, it is improper to either import or otherwise create in hindsight (as is the case here) a restriction that was not asserted in the ‘495 patent prosecution. Here, no restriction was made, repeated, or referred to in the ‘495 patent prosecution. The opposite happened -- the ‘495 patent claims were issued a double patenting rejection based on the claims in ‘441 parent patent (**which included oxygen emitter claims wherein the emitter is positioned “within a conduit”**) as well as claims in the ‘262 parent patent.

Notably, even the examiner in the ‘441 patent prosecution issued a double patenting rejection for ‘441 patent claims (having the “within a conduit” limitation) based on the parent ‘262 patent claims (**not** having the “within the conduit” limitation). What that means is that the restriction the examiner seeks to import (i.e., that draws a distinction between emitter claims including the “within the conduit” limitation and emitter claims without that limitation) cannot even be found in the parent ‘441 patent prosecution.

Thus, there are two major flaws in the examiner’s logic. First, by creating a new restriction that draws the line between emitter claims including the “within the conduit” limitation and emitter claims without that limitation, the examiner has taken a position that is opposite to the findings of the ‘441 patent examiner and the ‘495 patent examiner. In other words, it’s not just that such facts (the newly created restriction) do not exist in the prosecution record, but they are contradicted by the findings of two other examiners. Second, by importing the newly created restriction requirement into the ‘495 patent prosecution, the examiner has violated the *Orita* rule barring the importation of restrictions unless the examiner specifically refers to or repeats the restriction in the new application prosecution. *Bristol-Myers Squibb Co. v. Pharmachemie B.V.*, 361F.3d1343, 1348-49 (Fed. Cir. 2004).

c. Even assuming it is proper to create a new restriction and import it into the '495 patent prosecution, the present claims are not identical or substantially identical any previously considered claims

Reissue claims can only be rejected based on the *Orita* rule where the reissue claims are identical or substantially identical to claims that were subject to a prior restriction. See *Ex parte Belliveau*, decision of the Board of Patent Appeals and Interferences, Appeal No. 2010-007121, Application No. 10/801,177, Patent No. RE43,017 (Aug. 30, 2010) (reversing examiner's *Orita* rejection for failure to make any finding that the claims were identical or substantially identical to claims subject to the restriction requirement).[4]

The present claims are not substantially identical to the claims that were filed or considered in the '441 patent prosecution. The inventor in his reissue oath provides a detailed discussion of the reissue claims, and explains that the presently pending reissue claims result in a claim scope that is not the same as any previously presented. See Senkiw Decl. (Ex. G) at ¶¶24-25. The current final office action makes no finding or explanation that the presently rejected claims are identical or substantially identical to the claims that were subject to the restriction requirement made during the '441 patent prosecution. For this reason alone, a rejection of the reissue oath under *Orita* would be improper.

4. The assertion that Applicant cannot seek claims that are patentably distinct is legally wrong

In the current final office action, the examiner also the strays from the established legal principles and implies that the reissue oath is defective by virtue of "[t]he claims of the present reissue application are directed to an invention that is patentably distinct from the claims of the '495 patent." The examiner goes on to conclude that because the current reissue claims include a

[4] In addition to being accessible via PAIR, this case is also published on LEXIS at *Ex parte Belliveau*, 2010 Pat. App. LEXIS 17175 (B.P.A.I. Aug. 30, 2010).

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limitation that the emitter is positioned within a tubular housing, it would be legally appropriate to issue a restriction during this reissue prosecution:

> Inasmuch as claims to an emitter within a tubular housing (as recited in claims 13-69) are patentably distinct from claims to an emitter alone (as issued in the apparatus claims of the '495 patent), it would be appropriate to restrict claims 13-69 from the instant reissue application as being directed to an invention non-elected by original presentation.

'340 FOA dtd 6/5/2017 (Ex. D) at p. 11. This suggested legal theory is flawed in several respects.

First, the broad double patenting rejection made in the '495 patent prosecution conclusively resolved that Applicant could have prosecuted claims that include "within a conduit" or "within a tubular housing" in the '495 patent. That Applicant argued "within a conduit" in the prior '441 patent prosecution to distinguish prior art or, as asserted by the examiner, to distinguish the '262 patent claims (an assertion Applicant disputes)[5], misses the

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[5] The present rejection suggests that an argument had been made during prosecution of the '441 patent that placing the electrodes "within a conduit" made the claims patentably distinct from the claims in the prior '262 patent prosecution. No such argument was made. See Senkiw Decl. (Ex. G) ¶¶ 18-21. In an office action dated May 24, 2007 (Ex. K), claim 1 of Application No. 10/732,326 was rejected for double patenting based on claims in the '262 patent. In response, in an amendment dated August 17, 2007 (Ex. J), multiple changes were made to the claim, and the applicant stated that the double patenting rejection no longer applied. The claim chart above under section "Overview of the '262, '441, and '495 patent prosecutions" shows the claim both before and after the amendment. The remarks section filed with the amendment included the generic statement:

> "Applicant respectfully asserts that the need for a Terminal Disclaimer to overcome a non-statutory obviousness-type double patenting rejection has been overcome through the present amendment to independent claim 1… As claims 1 [and others] are patentably distinct from claims 1-6 of U.S. Patent No. 6,689,262, Applicant respectfully requests said rejection be withdrawn."

First, this statement does not state that it is the "within a conduit" language that made the claims patentably distinct from the '262 patent claims. Second, the phrase "placed within or adjacent to a conduit" was already included in claim 1 prior to the amendment. Third, there were other significant amendments to the claim made by that amendment that the current office action ignores. From the marked changes shown above it is clear that the amendments to the claim included: changing the preamble from "consisting of" to "comprising"; removing any reference to a critical distance between electrodes; adding a limitation that there be a plurality of anodes and a plurality of cathodes; adding a limitation that the electrodes now be arranged in a plurality of "matched sets"; adding features of a fluid conduit; and adding relevant inquiry. This is not a reissue of the ’441 patent. This is a reissue of the ’495 patent, and the relevant issue is whether the present claims could have been prosecuted in the ’495 patent. There was no restriction requirement in the ’495 prosecution, and based on the diversity of the claims actually presented, prosecuted, and allowed in the ’495 patent and the double patenting rejection made in the ’495 patent prosecution, there was never any restriction or election made in the prosecution of the ’495 patent that would provide any basis for excluding the present reissue claims from that case. The Examiner’s assertion that it would appropriate to issue a restriction in the current reissue is in conflict with *Orita* and thus legally wrong.

Second, the claims of the ‘495 patent themselves demonstrate that claims with this limitation could have been included in the ‘495 patent, because such claims <u>were</u> included. In the ‘495 patent prosecution, Applicant, in fact, filed and obtained a claim that expressly required the emitter to be positioned “within a conduit.” Here is that claim.

> 1. A method for treating waste water comprising;
> providing **a flow-through** oxygenator comprising **an emitter** for electrolytic generation of microbubbles of oxygen comprising an anode separated at a critical distance from a cathode and a power source all in electrical communication with each other,
> **placing the emitter within a conduit**; and
> passing waste water through the conduit.

‘495 patent, claim 1 (emphasis added).

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completely new structure, “stabilizing hardware”, that was not previously recited. The limitation that the electrodes be “positioned within the conduit lumen” was never called out as being the basis for making the claims patentably distinct from the ‘262 patent claims. In fact, no one limitation was specifically identified as the basis for making the claim patentably distinct from the ‘262 patent claims, and there is no more reason in the prosecution history to pin the distinction on the “within a conduit” limitation than there is to pin the distinction on the new “stabilizing hardware” limitation, for example, or the “plurality of matched sets” limitation.

In fact, the language that the electrodes be “placed within or adjacent to a conduit” had already been in the claim <u>prior to</u> the amendment which suggests that the “positioned within the conduit” limitation was not the basis for arguing the claim was now patentably distinct from the ‘262 patent claims. Therefore, the record does not support that the examiner or the Applicant made any statements or arguments that the use of the phrase “within a conduit” causes claims to be patentably distinct from the ’262 patent claims. More importantly, however, as discussed above, it does not matter whether the present claims are patentably distinct from any prior claims, because there was no restriction requirement issued in the ’495 patent prosecution or any narrow constructive election which would have prevented the present reissue claims from being prosecuted in the ’495 patent.

Third, there is no bar to seeking reissue claims that are patentably distinct from the original patent. For example, one of the express purposes of reissue cases is to permit a narrowing correction where the inventor claimed more than he was entitled to. Unless such a narrowing correction defined a patentably distinct invention, reissues would be pointless in such cases.

MPEP §1412.01 makes clear that the test for satisfying the requirement in 35 U.S.C. §251 that a reissue patent be "for the invention disclosed in the original patent" is that the new claims need only be for the same general invention as measured against <u>the specification's disclosure</u>, not the prior claims. If there is support under §112 for the newly added claims and there is no other indication in the specification of an intent not to claim the invention, then the newly added claims satisfy the requirement of 35 U.S.C. §251 that the reissue patent be issued for the "same invention." Therefore, any suggestion that the newly added claims are directed to a "different" invention *as compared to the claims* of the '495 patent is improper and provides no basis for rejecting these claims.

As explained by the inventor in his reissue oath, the claimed combination of limitations in the presently pending reissue claims result in a claim scope that is not the same as any previously presented.

> I discuss in paragraphs 7 and 8 how the emitter claims presented in this reissue application are narrower in significant respects than emitter claim 2 of the '495 patent, and the combination of narrowing limitations to each of the presently pending independent claims result in a claim scope that is not the same as any claim previously presented, amended, or issued during the prosecutions of the '262, '441, and '495 patents. Stated simply, at no time were the presently pending claims or any claims with the limitations discussed above in paragraphs 7 and 8 presented to the Patent Office or surrendered during any of the earlier prosecutions.

Senkiw Decl. (Ex. G) at ¶24.

It is not uncommon to seek reissue claims that are patentably distinct from the original patent. If there is no violation of the two year rule, the *Orita* doctrine, or the recapture doctrine, it is irrelevant whether the claims of the present reissue application are directed to an invention that is patentably distinct from the claims of the '495 patent.

B. Rejection of claims under 35 U.S.C. § 112, 1st paragraph

1. The Applicable Law

35 U.S.C. § 112, 1st paragraph provides in relevant part "The specification shall contain a written description of the invention".

The written description requirement is satisfied if one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention based on the specification. MPEP 2163 states:

> To satisfy the written description requirement, a patent specification must describe the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention. See, e.g., Moba, B.V. v. Diamond Automation, Inc., 325 F.3d 1306 (Fed. Cir. 2003).

Possession of the invention can be shown by inclusion of an embodiment in the specification that includes the claimed subject matter. MPEP 2163 states:

> The complete structure of a species or embodiment typically satisfies the requirement that the description be set for "in such full, clear, concise, and exact terms" to show possession of the claimed invention. … If a complete structure is disclosed, the written description is satisfied for that species or embodiment, and a rejection under 35 U.S.C. 112(a) or pre-AIA 35 U.S.C. 112, para. 1, for lack of a written description must not be made.

Both the words and figures of the specification can be used to show possession of the claimed invention. MPEP 2163 continues:

> An applicant may show possession of an invention by disclosure or drawings or structural chemical formulas that are sufficiently detailed to show that applicant was in possession of the claimed invention as a whole. See, e.g., Vas-Cath, 935 F.2d at 1565.

Moreover, the Federal Circuit has stated that drawings alone may show possession of an invention to meet the requirements of § 112, 1st paragraph. See, Vas-Cath, Inc. v. Mahurkar, 935 F.2d at 1565 (Fed. Cir. 1991) (finding that utility application claim limitations relating to the relative size and shape of a catheter lumen were adequately disclosed by the drawings of a design patent). In other words, the description of an article pictured can be relied on, in combination with the drawings, for what they would reasonably teach one of ordinary skill in the art. See also, In re Wolfensperger, 302 F.2d 950 (CCPA 1962) (the drawings of applicant's specification provided sufficient written descriptive support for the claim limitation at issue); Autogiro Co. of

Am v. United States, 384 F.2d 391, 398 (Ct. C. 1967) ("In those instances where a visual representation can flesh out words, drawings may be used in the same manner and with the same limitations as the specification.")

Finally, written description support for claims excluding features disclosed in a specific embodiment is found, if the specification does not indicate that the specific feature was essential or critical to the invention. See, MPEP 2163.05 I. Only under "certain circumstances" is the omission of a limitation an issue regarding whether the inventor had possession of a broader, more generic invention. MPEP 2163.05 I. citing (Gentry Galley, Inc. v. Berkline Corp., 134 F.3d 1473 (Fed. Cir. 1998). The courts have stated that these "certain circumstances" are limited to situations in which the feature was described or implied as being essential or critical to the invention. MPEP 2163.05 I states:

> In *Gentry Galley*, the "court's determination that the patent disclosure did not support a broad meaning for the disputed claim terms was premised on clear statements in the written description that described the location of a claim element — the 'control means' — as 'the only possible location' and that variations were 'outside the stated purpose of the invention.' … *Gentry Galley* then, considers the situation where the patent's disclosure makes crystal clear that a particular (i.e., narrow) understanding of a claim term is an 'essential element of [the inventor's] invention.'"

MPEP 2163.05 continues:

> Claims to generic shape were not entitled to filing date of parent application which disclosed "conical cup" in view of the disclosure of the parent application stating the advantages and importance of the conical shape.

MPEP 2163.05 continues:

> In a reissue application, a claim to a display device was broadened by removing the limitations directed to the specific tapered shape of the tips without violating the written description requirement. The shape limitation was considered to be unnecessary since the specification, as filed, did not describe the tapered shape as essential or critical to the operation or patentability of the claim.

Accordingly, unless there is reason to believe that a particular feature of a specific embodiment is essential or critical to the invention, a claim omitting that feature does not violate the written description requirement.

2. Rejection of claims 13-69

Claims 13-69 were rejected under pre-AIA 35 U.S.C. 112, first paragraph as failing to comply with the written description requirement. The '340 FOA dtd 6/5/2017 lists thirteen phrases as containing subject matter that was not described in the specification. *See '340 FOA dtd 6/5/2017 (Ex. D) at pp. 12-13.* Appellant respectfully traverses the rejection of each of these phrases. Each of these phrases is numbered 1-13 and addressed below.

Initially, it is noted that Appellants discussed these written description rejections with Dr. Paul Strykowski, a Professor at the University of Minnesota, to obtain an opinion from one skilled in the art on the rejections. Dr. Strykowski holds Ph.D. and M.S degrees in Mechanical Engineering, and teaches undergraduate and graduate fluid mechanics courses.

Dr. Strykowski read the disclosure of U.S. Patent No. 7,670,495 (the patent off of which this reissue application is filed) and reviewed the claims of the present application. Based on his review, he believed that each of the phrases rejected in the '340 FOA dtd 6/5/2017 under pre-AIA 35 U.S.C. 112, first paragraph, were supported by the present application. Dr. Strykowski agreed to prepare a declaration expressing his opinion and the reasoning behind it. In his declaration, he states that he believes that the inventor, Mr. Senkiw, possessed the invention in the present claims at the time he filed his application for the '495 patent. He also states that he believes the features rejected under section 112, first paragraph, are in large part disclosed and supported merely by understanding the cross sectional drawings of the electrolysis chamber in FIGs. 7A and 7B. He provides further detail on his opinion in the declaration. Dr. Strykowski's declaration was submitted in the present application on February 6, 2017 and is referenced in remarks below. A copy of Dr. Strykowski's declaration is submitted herewith as Exhibit F.

a. <u>Phrases 1-3 – claims 13, 15, 17, 20, 29, 42</u>

Phrase 1. "each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing"

Phrase 2. "the electrodes are positioned away from a longitudinal center axis of the tubular housing"

Phrase 3. "each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing"

At the outset, Appellant notes that phrase 3 as quoted in the '340 FOA dtd 6/5/2017 includes the word "substantially". Appellant amended each instance of this language to remove the word "substantially" in the Amendment and Response submitted on February 6, 2017 (Exhibit E).

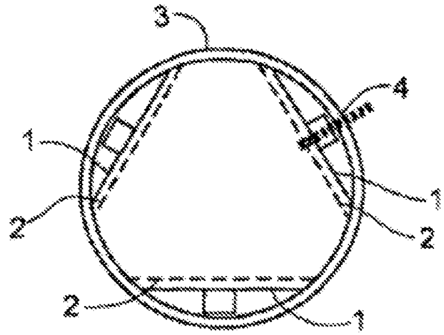
Each of these three phrases relates to positioning the electrodes inside the housing so that the electrodes are arranged toward the outside, away from the centerpoint of the housing. This arrangement is clearly shown in FIG. 7A of the present application.

The '340 FOA dtd 6/5/2017 asserted:

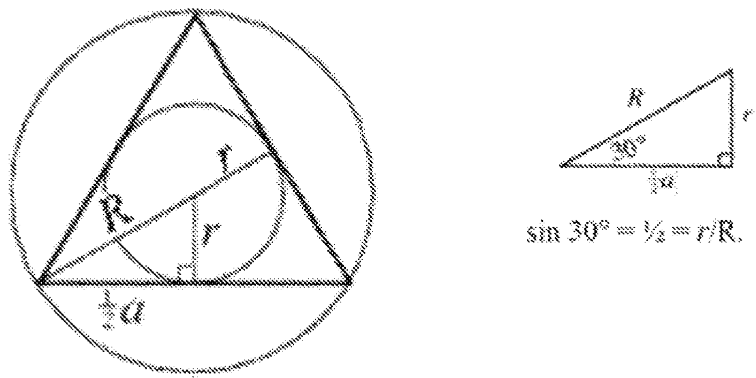
> Figures 7A and 7B are **not** taught as being to scale. Accordingly, Figures 7A and 7B do not provide support for limitations which are not otherwise disclosed in the '495 patent specification. Nor do Figures 7A and 7B disclose features that are now being claimed.

The phrases 1-3 listed above, however, do not rely on the scale of the drawing. The combination of the drawings and their descriptions provides the support for the three phrases, without relying on scale. As shown in FIG. 7A, three sets of electrodes (1, 2) are arranged along the lines of a triangle. The written description confirms that the three sets of anode and cathode pairs are each at the same 120 degree angle with respect to each other (i.e. the triangle is an equilateral triangle). See col. 9, lines 10-11. FIG. 7A also shows that the electrodes terminate at the inside surface of the tube wall, and the electrodes do not complete the corners of the triangle. In other words, the points of the triangle would fall outside the tube 3. None of these facts rely on the scale of the drawing. They are merely features disclosed by the drawing along with description in the specification.

Fig. 7A



The electrodes shown in FIG. 7A do not pass through the center axis of the tube but instead are positioned away from the center axis and closer to the wall of the tube than they are to the center axis of the tube. Geometry mathematically dictates this. Geometry dictates that electrodes positioned along the lines of an equilateral triangle centered on a round tube with its corners located outside the tube, will necessarily be located closer to the outer wall than to the center point of the tube. It is mathematically impossible for electrodes in this configuration to be closer to the center of the tube than the wall of the tube. It doesn't matter how large or small you make the housing or the electrodes: if the electrodes are arranged as chords of a circle along the sides of an equilateral triangle having its points outside the circle as is clearly shown in FIG. 7A and also described at 9:7-11, the electrodes can never be closer to the center point of the tube than to the circular wall of the tube. This is pure math and does not rely on any drawing being to scale. It is dictated by the shapes described and shown in FIG. 7A (concentric circle and equilateral triangle). Consider the following:



See http://mathworld.wolfram.com/EquilateralTriangle.html. This simple calculation shows that *r* (the distance each side of the triangle is away from the center point of the circle) shrinks to ½ R (half the radius of the outer circle) only when the triangle fits inside the circle. If the corners of the triangle fall outside the circle (as shown in FIG. 7A), then *r* will necessarily be greater than ½ R. In other words, when the corners of the triangle fall outside the circle, the sides of the triangle will always be closer to the outer circle than to the center point or axis of that circle. Therefore, not only does FIG. 7A disclose the relationships recited in these phrases between the electrodes, tube wall and tube center, but even if the scale of the drawing were altered or changed, the relationship would still necessarily be satisfied. The Declaration of Dr. Strykowski filed on February 6, 2017 supports these findings. See Declaration of Dr. Paul Strykowski under 37 C.F.R. § 1.132 (Ex. F) at ¶¶ 4-8.

In the "Response to Arguments" section, the '340 FOA dtd 6/5/2017 asserted that the applicant's written description arguments with respect to FIG. 7A lacked merit because the claims do not require all the features shown in FIG. 7A. In particular, the "Response to Arguments" section focused on the description of FIG. 7A that indicates that the emitter includes *three* anodes and cathodes that are placed "at 120° angles to each other".

However, there is no requirement that every feature shown in a drawing or described in the description be included in the claims. In fact, the exact opposite is explicitly allowed. If a given feature is not considered essential or critical to the invention, the Applicant is allowed to claim the structure without that feature included. See, The Applicable Law section 5B(i) above.

In this case, the specification discloses more than just what is shown in FIG. 7A, and clearly shows that neither the specific number of anodes and cathodes (i.e., three) nor the 120° angle relationship shown in FIG. 7A were considered essential.

First of all, the specification does not indicate that the number of electrode pairs or the 120° angle relationship of FIG. 7A is essential. In fact, the specification does not assign *any* benefit to the number of electrode pairs or the 120° angle relationship. In contrast, the specification baldly states that the embodiment shown in the FIG. 7A is "comprised of" three anodes and cathodes at 120° angles to each other. '495 at col. 9, lines 7-11. No further discussion of the number of electrode pairs or the 120° angle relationship is included. Thus, the current specification provides no indication that either the number of anodes and cathodes or the 120° angle relationship is essential.

Second, the embodiment shown in FIG. 7A is described as *one embodiment* of a flow-through emitter. The specification indicates that other embodiments do *not* need three anodes and cathodes or a 120° angle relationship. The other embodiments of flow-through emitters are introduced at col. 9, lines 19-23:

> This invention is not limited to the design selected for this embodiment. Those skilled in the art can readily fabricate any of the emitters shown in FIG. 4 or 5, or can design *other embodiments that will oxygenate flowing water*. One useful embodiment is the "T" model …

The specification then goes on to describe the "T" model emitter embodiment. Notably, this "T" model emitter embodiment is described as achieving the same function as the embodiment of FIG. 7A with a completely different configuration of electrodes. In particular, the "T" model does *not* specify that there are three anodes and cathodes or that the anodes and cathodes are at a 120° angle relationship. Other disclosed flow-through emitter embodiments also do not include the three anodes and cathodes or the 120° angle relationship. In TABLE III, the specification includes a "2-plate Tube" example in addition to the "3-Plate tube" example. Not only does a "2-plate Tube" have only 2-plates instead of three, there is no way a "2-plate Tube" can be arranged into a triangle with each side at a 120° angle relationship, because there are only 2 plates. The specification also discusses the alternative embodiments at col. 3, lines 28-30: "Alternatively, the anodes and cathodes may be in plates parallel to the long axis of the tube, or may be plates in a wafer stack." Thus, the specification indicates that the inventor did not consider the number of anodes and cathodes or the particular relationship between sets of anodes and cathodes to be essential or critical to the invention. Accordingly, the specification indicates that the inventor had possession of a flow-through emitter that was not limited to three anodes and cathodes or to the sets of anodes and cathodes being at a 120° angle relationship.

For at least these reasons, FIG. 7A and its description provide support for each of phrases 1-3 listed above. Accordingly, Appellant respectfully requests reconsideration and withdrawal of the rejection to claims 13, 15, 17, 20, 29, and 42 under pre-AIA 35 U.S.C. 112, first paragraph, written description.

Nothing in this section is intended to import a limitation that the electrodes be configured in a triangular configuration. This section is merely meant to point out that the phrases noted above are supported by the disclosure and are not dependent on the scale of the figures.

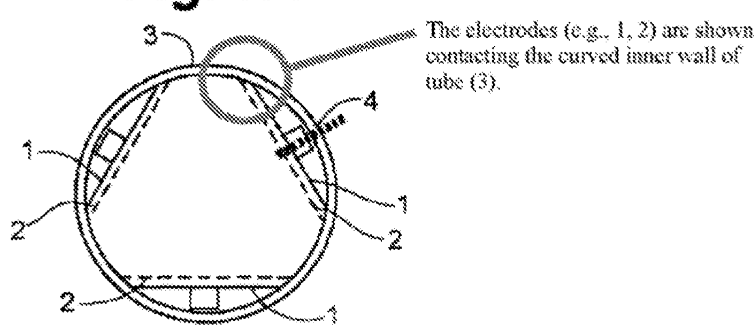
b. <u>Phrases 4, 5 – claims 37, 41, 53</u>

Phrase 4. "a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing"

Phrase 5. "the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing"

These two phrases capture simple aspects relating to an electrode or a portion thereof being in contact with a wall of the tubular housing. The specification clearly provides evidence that the inventor had possession of such simple aspects. For example, FIG. 7A illustrates electrodes contacting a wall of a tubular housing.

Fig. 7A



Moreover, this contact is not dependent on the scale of the drawing. The electrodes either contact the tubular housing or they don't, and FIG. 7A clearly shows that they do. See also, Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 (Ex. F) at ¶¶ 4, 9-10. Finally, the description of FIG. 7A also indicates that the electrodes contact the tubular housing. The description discloses that the stabilizing hardware 4 positions the anodes and cathodes within the tubular housing. The description also indicates that the positioning hardware can be a screw. The action of a screw is to pull two components together. Thus, using a screw to fasten the anodes and cathodes to the tubular housing necessarily requires the anodes and cathodes to be pulled against (i.e., to contact) the tubular housing.

Therefore, FIG. 7A provides sufficient written description support for the phrases 4 and 5 listed above. As a result, Appellant respectfully requests reconsideration and withdrawal of the rejection to claims 37, 41, and 53 under pre-AIA 35 U.S.C. 112, first paragraph, written description.

c. <u>Phrase 6 – claim 14</u>

Phrase 6. "at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes"

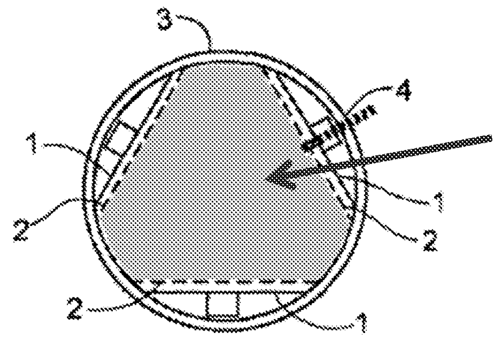
These two phrases are also supported via the contact illustrated between the electrodes and the tubular housing. Because the electrodes contact the wall in FIG. 7A above, each electrode is closer to the wall than the distance separating the electrodes. Components that are touching or contacting each other are necessarily closer together than components that are separated. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 (Ex. F) at ¶¶ 4, 9-10.

Therefore, FIG. 7A also provides sufficient written description support for phrase 6 listed above. As a result, Appellant respectfully requests reconsideration and withdrawal of the rejection to claim 14 under pre-AIA 35 U.S.C. 112, first paragraph, written description.

d. <u>Phrase 7 – claim 18</u>

Phrase 7. "the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing"

This phrase relates to the concept that there is an unobstructed passageway in the center of the tubular housing, enabling water to flow freely through the apparatus. FIG. 7A shows the electrodes supported by stabilizing hardware 4 that does not cross into the center of the tube. Instead, the stabilizing hardware extends generally radially outward to support the electrodes against the wall of the tube. As shown in the figure, this creates an unobstructed passageway through the tube that includes the center axis of the tube. The passageway is dramatically wider than the narrow distance separating the first and second electrodes. One of skill in the art would recognize from FIG. 7A that the electrode pairs are spaced apart to form a water flow passage at the center of the tube that is multiple times wider than the distance between the electrodes of a pair. See Declaration of Dr. Paul Strykowski under 37C.F.R. §1.132 (Ex. F) at ¶¶ 4, 11-12.



The unobstructed water flow passageway (shaded here on FIG. 7A) includes the longitudinal center axis of the tubular housing 3 and is dramatically wider than the spacing between electrodes 1 and 2.

Moreover, the specification indicates that the inventor had possession of the concept of such an unobstructed passageway, providing a space for fluid to flow freely through the apparatus, enabling running water to be efficiently oxygenated. As indicated above, the example shown in FIG. 7A is an embodiment specifically designed to accommodate running water flowing therethrough. Additionally, the specification describes another flow-through embodiment, the "T" model, wherein the electrodes are placed out of the direct flow of water entirely. See, col. 3, lines 31-32 and col. 9, lines 21-24. Therefore, the specification provides written description support for phrase 7 listed above. As a result, Appellant respectfully requests reconsideration and withdrawal of the rejection to claim 18 under pre-AIA 35 U.S.C. 112, first paragraph, written description.

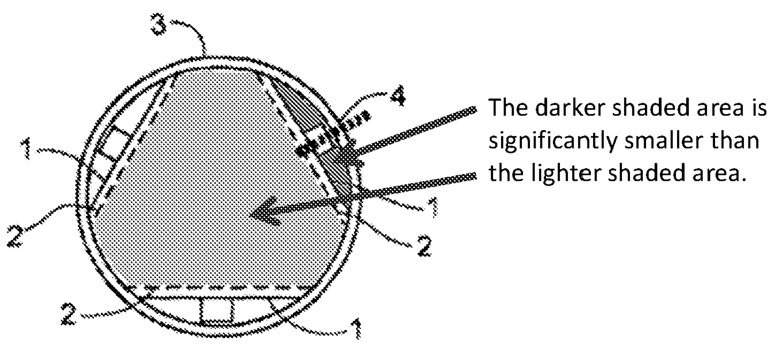
e. <u>Phrase 8 – claims 19, 20, 44</u>

Phrase 8. "the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway"

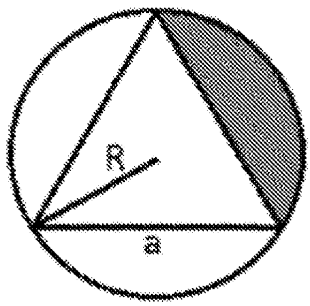
At the outset, Appellant notes that this phrase as quoted in the '340 FOA dtd 6/5/2017 includes the word "substantially". Appellant amended each instance of this language to remove the word "substantially" in the Amendment and Response submitted on February 6, 2017 (Exhibit E).

Regarding written description support of the remaining language, it again is present in the drawings and description of the present application. Similar to phrases 1-3 and 8, the language of phrase 8 relates to the concept of positioning the electrode pairs closer to the outer wall of the tube to provide a larger area for water to flow at the center of the tube.

FIG. 7A shows the area between the electrodes and the housing (the darker shaded area in the figure below) is less than (and is even dramatically less than) the cross-sectional area of the unobstructed passageway (the lighter shaded area in the figure below). One of skill in the art would recognize from FIG. 7A that by positioning the electrode pairs closer to the outer wall of the tube, a larger area for water to flow is created at the center of the tube and there is less area between the electrode and the wall of the tube for water to pass. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 (Ex. F) at ¶¶ 4, 13-14.



This relationship is not dependent on the scale of the drawing. As noted above, where an equilateral triangle is positioned over a circle with its corners falling outside the circle, the area shown in the above figure will necessarily be less than the lighter shaded area shown above.



1. The area of the equilateral triangle is $\frac{a^2\sqrt{3}}{4}$ = 0.43 a^2 (rounding)

2. The area of the circle is πR^2.

3. cos 30° = $\frac{\sqrt{3}}{2} = \frac{a}{2R}$, therefore R = $\frac{a}{\sqrt{3}}$

4. The area of the shaded portion = $3\,\frac{1}{3}\left(\pi R^2 - \frac{a^2\sqrt{3}}{4}\right) = \left(\frac{\pi}{9} - \frac{\sqrt{3}}{12}\right)a^2 = 0.20\,a^2$ (rounding)

5. 0.20 a^2 < 0.43 a^2

As shown in the equations to the right of the figure, where the triangle is shown to fit precisely within the circle, the area between one of the triangle sides and the circle (shaded above) will necessarily be less than half the area of the triangle. Where the corners of the triangle fall outside the circle, as shown in FIG. 7A of the '495 patent, the shaded area above will be an even smaller fraction of the area of the triangle inside the circle. Therefore, not only does FIG. 7A show the relationship recited in the phrase above, but this relationship will necessarily be maintained for any arrangement where there the electrodes are positioned along the sides of any equilateral triangle with its corners located outside the tubular housing, as shown in FIG. 7A. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 (Ex. F) at ¶¶ 4, 13-14.

Similar to phrase 8, the specification indicates that the inventor had possession of the concept of such an electrode positioning, providing a space for fluid to flow freely through the apparatus, enabling running water to be efficiently oxygenated. As indicated above, the example shown in FIG. 7A is an embodiment specifically designed to accommodate running water flowing therethrough. Additionally, the specification indicates that the inventor was aware that electrode configurations other than the 120 degree electrode angles relative to each other could be used. See, col. 9, lines 19-24. Therefore, the specification provides written description support for phrase 8 listed above. As a result, Appellant respectfully requests reconsideration and withdrawal of the rejection to claims 19, 20, and 44 under pre-AIA 35 U.S.C. 112, first paragraph, written description.

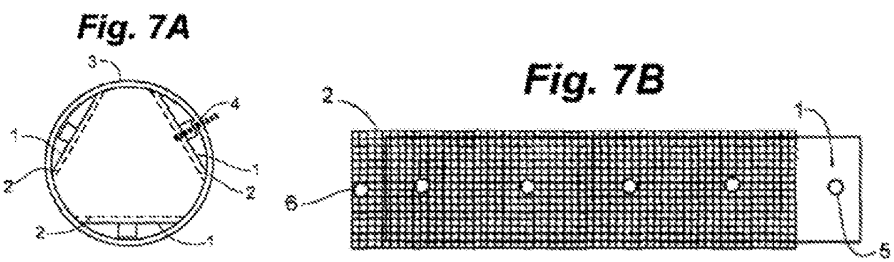
f. Phrases 9, 10 – claims 17, 20

Phrase 9. "the passageway running for at least the length of one of the electrodes positioned within the housing"

Phrase 10. "the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing"

At the outset, Appellant notes that these phrases as quoted in the '340 FOA dtd 6/5/2017 include the words "that portion of". Appellant amended each instance of this language to remove those words in the Amendment and Response submitted on February 6, 2017 (Exhibit E).

Regarding written description support of the remaining language, it again is present in the drawings and description of the present application. These phrases relate to the concept that the passageway provided by the position of the electrodes runs at least the length of the electrodes. Similar to phrases 1-3, 8, and 9, such a passageway provides a space for water to flow freely through the apparatus, enabling running water to be efficiently oxygenated.



FIGS. 7A and 7B are described as showing the oxygenation chamber of an emitter. Col. 3, lines 55-59 ("FIG. 7 shows an oxygenation chamber suitable for flow-through applications. FIG. 7A is a cross section showing arrangement of three plate electrodes. FIG. 7B is a longitudinal section showing the points of connection to the power source."); col. 9:7-17 ("In FIG. 7(A), the oxygenation chamber is comprised of three anodes 1 and cathodes 2, of appropriate size to fit inside a tube or hose and separated by the critical distance are placed within a tube or hose 3 at 120° angles to each other. The anodes and cathodes are positioned with stabilizing hardware 4. ("FIG. 7(B) shows a plan view of the oxygenation chamber … with stabilizing hardware 5 serving as a connector to the power source.").

As shown in these figures, there is an unobstructed passageway at the center of the tube that runs the length of the electrodes 1, 2. The length of the electrodes is shown in FIG. 7B. FIG. 7A, which shows a cross-sectional view of the oxygenation chamber, shows how hardware is positioned toward the outside of the electrodes so that there are no obstructions in the passageway for the length of the electrodes. There is no reliance on the scale of the drawings to satisfy these claim phrases. Therefore, the disclosures of FIGS. 7A and 7B and their description in the specification reasonably convey to the artisan that the inventor had possession of the invention at least as of the time the '495 patent was filed. See Declaration of Dr. Paul Strykowski under 37 C.F.R. § 1.132 (Ex. F) at ¶¶ 4, 15-17. By disclosing an example emitter oxygenation chamber with a passageway satisfying these phrases, the inventor met the written description requirement of 35 U.S.C. §112.

Similar to phrases 8 and 9 above, the specification indicates that the inventor had possession of the concept of such an electrode positioning, providing a space for fluid to flow freely through the apparatus, enabling running water to be efficiently oxygenated. As indicated above, the example shown in FIG. 7A is an embodiment specifically designed to accommodate running water flowing therethrough. Additionally, the specification indicates that the inventor was aware that electrode configurations other than the 120 degree electrode angles relative to each other could be used. See, col. 9, lines 19-24. Therefore, the specification provides written description support for phrases 9 and 10 listed above. As a result, Appellant respectfully requests reconsideration and withdrawal of the rejection to claims 17 and 20 under pre-AIA 35 U.S.C. 112, first paragraph, written description.

g. <u>Phrase 11 – claim 62</u>

Phrase 11. "the unobstructed passageway having a uniform cross-sectional area along that length"

At the outset, Appellant notes that these phrases as quoted in the ‘340 FOA dtd 6/5/2017 include the word “substantially” modifying the word “uniform”. Appellant amended each instance of this phrase to remove the word “substantially” in the Amendment and Response submitted on February 6, 2017 (Exhibit E).

Regarding written description support of the remaining language, it again is present in the drawings and description of the present application. This phrase relates to the concept that the passageway has a uniform cross-sectional area. This is a simple concept and one of ordinary skill in the art would certainly conclude that the inventor had possession of this concept based on FIGs. 7A and 7B and their related description as discussed with respect to phrases 9 and 10 above. Therefore, the specification provides written description support for phrase 11 listed above. As a result, Appellant respectfully requests reconsideration and withdrawal of the rejection to claim 62 under pre-AIA 35 U.S.C. 112, first paragraph, written description.

h. <u>Phrases 12, 13 – claims 22, 45</u>

Phrase 12. "first and second conductors coupled to the first and second electrodes"

Phrase 13. "first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing"

The '340 FOA dtd 6/5/2017 asserted that Figures 7A and 7B do not disclose the above phrases recited in the claims. Figures 7A and 7B along with their description, however, do provide sufficient written description support for the above listed phrases. In particular, it is clear from Figures 7A and 7B along with their description that the inventor had possession of each of the above concepts.

For example, the description states that conductive hardware can be used to position the electrodes. '495 patent at col. 9, lines 11-14:

> The anodes and cathodes are positioned with stabilizing hardware 4. The stabilizing hardware, which can be any configuration such as a screw, rod or washer, is preferably formed form stainless steel.

Figure 7A shows the conductive hardware attached to an electrode, holding the electrode in place against the tubular housing 3. The description further describes that there are two distinct conductive hardware items for a set of electrodes, each conductive hardware item coupling its respective electrode to the power source. '495 patent at col. 9, lines 14-17:

> FIG. 7(B) shows a plan view of the oxygenation chamber with stabilizing hardware 4 serving as a connector to the power source and stabilizing hardware 5 serving as a connector to the power source.

Figure 7B shows the two conductive hardware items at 5 and 6 respectively, connected to their respective electrodes 1 and 2.

Fig. 7A

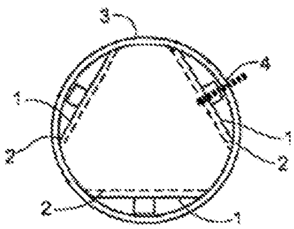
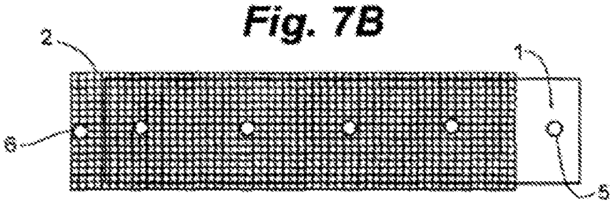


Fig. 7B



Although there is an obvious error in Figure 7B, where reference numeral 6 should be reference numeral 4, it is clear that the inventor had possession of the concept of "first and second conductors coupled to the first and second electrodes". Moreover, Figures 7A and 7B clearly illustrate that the conductive hardware exits a wall of the tubular housing 3 in a radial direction, satisfying the language of phrase 13. Therefore, the specification provides written description support for phrases 12 and 13 listed above. As a result, Appellant respectfully requests reconsideration and withdrawal of the rejection to claims 22 and 45 under pre-AIA 35 U.S.C. 112, first paragraph, written description.

j. <u>Claims 16, 21, 23-28, 30-36, 38-40, 43, 46-52, 54-61, and 63-69</u>

The heading for this rejection indicated that all of claims 13-69 were rejected. However, none of the language cited in the '340 FOA dtd 6/5/2017 is present in any of claims 16, 21, 23-28, 30-36, 38-40, 43, 46-52, 54-61, or 63-69. Accordingly, Applicant respectfully requests withdrawal of the rejection to these claims under pre-AIA 35 U.S.C. 112, first paragraph, written description.

C. Rejection of claims under 35 U.S.C. § 112, 4th paragraph

1. The Applicable Law

35 U.S.C. § 112, 4th paragraph provides in relevant part "a claim in dependent form shall … specify a further limitation of the subject matter claimed".

A question as to the significance of a further limitation in a dependent claim is not sufficient to support a rejection under section 112, fourth paragraph. MPEP 608.01(n). Rather, it must be shown that the dependent claim does not, in fact, further limit its referenced (e.g., independent) claim. See, *Id.* Typically, a dependent claim is found to not further limit its referenced claim if the dependent claim omits a limitation that is required by an independent claim. See, *Id.* MPEP 608.01(n) includes the following example "if claim 1 recites the combination of elements A, B, C, and D, a claim reciting the structure of claim 1 in which D was omitted or replaced by E would not be a proper dependent". If no such limitations are omitted by the dependent claim, all limitations from the referenced (e.g., independent) claim are incorporated into the dependent claim, and the additional language that the dependent claim adds to the referenced claim provides a further limitation, sufficient to satisfy the requirement of section 112, paragraph 4. See, *Id.* That is, if the dependent claim does not omit limitations from its referenced claim and includes different language than its referenced claim, the dependent claim is most likely proper under section 112, fourth paragraph.

Intended use language is language that limits only the use of a structure, and does not limit the structure itself. See, MPEP 2114(II). An example of language that does not limit the structure of an apparatus is language that specifies that a mixing means be "completely submerged …". *Id.* Such language does not limit the structure of the mixing means, because the structure is the same regardless of whether the mixing means is completely submerged. Conversely, if the structure recited without the questioned language cannot inherently perform the function recited in the questioned language, the language necessarily requires a further limitation on the structure, and the language is not intended use language. Instead, the language is merely functional language, which is allowed. See, MPEP 2114(I.) and MPEP 2173.05(g) ("A claim term is functional when it recites a feature 'by what it does rather than by what it is'") citing *In re Swinehart*, 439 F.2d 210 (CCPA 1971) ("There is nothing inherently wrong with defining some part of an invention in functional terms.") *Id.* ("[a] patent applicant is free to recite features of an apparatus either structurally or functionally.") citing *In re Schreiber*, 128 F.3d 1471 (Fed. Cir. 1997).

2. Rejection of claims 23, 26, 36, 46, 49, 58, 61, and 69

Claims 23, 26, 36, 46, 58, 61, and 69 are rejected under pre-AIA 35 U.S.C. 112, 4th paragraph, as being of improper dependent form for failing to further limit the subject matter of the claim upon which it depends, or for failing to include all the limitations of the claim upon which it depends. Appellant respectfully traverses these rejections.

The above referenced dependent claims specifically recite either the term "microbubbles" or the term "nanobubbles". Even though none of the claims from which these dependent claims depend contain the terms "microbubbles" or "nanobubbles", the '340 FOA dtd 6/5/2017 asserted that the dependent claims were not proper on the grounds that the claims from which they depend were "already limited to the critical distance", and that critical distance "is the distance at which evolved oxygen forms microbubbles and nanobubbles."

The specification states that "'Critical distance' means the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles." '495 col. 4, lines 1-3. The specification provides a range for the critical distance of 0.005 inches to 0.0140 inches, and a preferred range of 0.045 to 0.060 inches. '495 col. 3, lines 12-14. By providing ranges, the specification allows the critical distance to be a distance that is within those ranges, but does not state that *all* distances within those ranges are *always* a critical distance. The actual critical distance may be different for different applications. That is, just because a distance is within a stated range does not necessarily mean that the distance is a "critical distance". The distance is a critical distance if evolved oxygen forms microbubbles and nanobubbles. Accordingly, a distance within a stated range may not form microbubbles or nanobubbles in a given application.

Thus, the independent claims of the present application, which are limited only to the range of 0.005 inches to 0.0140 inches, are not limited to producing microbubbles or nanobubbles. Accordingly, depending claims reciting microbubbles and nanobubbles add a further limitation and are proper.

In the "Response to Arguments" section, the '340 FOA dtd 6/5/2017 asserted that these dependent claims do not further limit their independent claims, because the independent claims recite an apparatus and the dependent claims recite an intended use of the apparatus.

The rejected dependent claims, however, do not recite an intended use of an apparatus. As discussed above in the Applicable Law section 5C(i), intended use language is language that does not limit the structure of an apparatus, other than the use of the structure. If the structure recited without the questioned language cannot inherently perform the function recited in the questioned language, however, the language necessarily requires a further limitation on the structure, and the language is not intended use language.

The language of the rejected dependent claims is not intended use language, because it provides a further limitation on the structure of the apparatus. In particular, the language provides a limit on the distance between a pair of emitters. As explained above, the distance range recited in the independent claims between a pair of emitters does not necessarily produce microbubbles and nanobubbles. Thus, the language in claim 26, for example, that states "the oxygen produced comprises nanobubbles", is a further limitation on the structure of claim 13, because the structure of claim 13 cannot inherently produce nanobubbles or microbubbles. Thus, claim 13 adds a further structure limitation in that it requires that the emitters be positioned a distance away such that they produce nanobubbles. Similar arguments apply to the other dependent claims.

Based on the above, Appellant respectfully requests reconsideration and withdrawal of the rejections to claims 23, 26, 36, 46, 58, 61, and 69, under pre-AIA 35 U.S.C. 112, 4th paragraph.

D. Rejection of claims under 35 U.S.C. § 251 (Recapture Rejection)

The recapture rejection should be reversed because, as discussed in the Summary of Argument at pages 16-18 above, the examiner constructs the recapture rejection by treating the present reissue as being a reissue of the '441 patent, and not the '495 patent. Based on that flawed premise, the examiner concludes that Applicant cannot seek claims that recapture subject matter added during the '441 patent prosecution (e.g., the "triangle limitation relating to the 120° angle positioning of the electrodes). This is not a reissue of the '441 patent, and therefore, the recapture rejection should be reversed.

This is a reissue of the '495 patent, and recapture does not apply. Applicant provides a detailed analysis of recapture below. In summary, it's important to keep in mind that Applicant filed for reissue of the '495 patent, and not of the '441 patent.

As to **the '495 patent prosecution,** claims were filed and issued <u>without</u> the "triangle" limitation. Therefore, Applicant did not surrender the right to pursue claims in the '495 patent with or without the "triangle limitation" limitation. Because none of the '495 patent claims include the "triangle" limitation, it cannot be said that Applicant is trying to remove that limitation in a reissue of the '495 patent. Recapture does not apply to the "triangle" limitation.

Likewise, regarding the "within a conduit" limitation, it cannot be said that Applicant surrendered the right to pursue claims that include, or do not include, the "within the conduit" limitation because in **the '495 patent prosecution,** claims were filed and issued with and without that limitation. Moreover, for the "within the conduit" limitation, it's important to keep

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in mind that recapture **applies to broadening changes**, and involves attempts to remove limitations during reissue. Here, Applicant seeks claims that include a "within a tubular housing" limitation (which the examiner equates to the "within a conduit" limitation). That is a narrowing change, not a broadening change. Thus, recapture does not apply.

1. The Applicable Law

The Federal Circuit has stated that the "recapture" of subject matter which was surrendered in an application to obtain the original patent is not an error that can be corrected under 35 U.S.C. § 251. See, MPEP 1412.02 and MBO Laboratories, Inc. v. Becton, Dickinson & Co., 602 F.3d 1306 (Fed. Cir. 2010); citing In re Clement, 131 F.3d 1464, 1468 (Fed. Cir. 1997). The Court recited a three step test for recapture analysis. *Id.* The three step test is:

> (1) first, we determine whether, and in what respect, the reissue claims are broader in scope than the original patent claims;
>
> (2) next, we determine whether the broader aspects of the reissue claims relate to subject matter surrendered in the original prosecution; and
>
> (3) finally, we determine whether the reissue claims were materially narrowed in other respects, so that the claims may not have been enlarged, and hence avoid the recapture rule.

Step 1

Step 1 is to determine whether and in what aspects the reissue claims are broader than the original patent claims. The original patent is the patent actually being reissued. See, MBO Labs. ("The term 'original patent' [for step 1] refers to the patent corrected by reissue"). See also, MPEP 1412.02 (underlining added):

> *A. The First Step – Was there broadening?*
>
> In every reissue application, the examiner must first review each claim for the presence of broadening, as compared with the scope of the claims of the patent to be reissued.

That is, to determine in what respects a reissue claim has been broadened, the reissue claims are not compared to claims in related applications, only to the claims of the patent being reissued.

If no broadening is found in step 1, no improper recapture has occurred, and the analysis ends. Steps 2 and 3 are not needed. See, MPEP 1412.01 ("If the reissue claim is not broadened in any respect as compared to the patent claims, the analysis ends; there is no recapture.")

Step 2

In step 2, it must be determined whether the patentee surrendered subject matter, and whether any of the broader aspects of the reissue claim relate to that surrendered subject matter. MBO Labs. Note that step 2 does not itself identify any broader aspects. "The broader aspects" referenced in step 2 are the broader aspects identified in step 1. That is, step 2 is dependent upon the result of step 1. The broadened aspects of the reissue claims identified in step 1 are the aspects that are compared (in step 2) to subject matter surrendered during prosecution to determine if any of those broader aspects fall within any of the surrendered subject matter. See, MPEP 1412.02 and MBO Labs.

Step 2 has two subparts. MPEP 1412.02 states that the two subpart are:

> (A) One must first determine whether applicant surrendered any subject matter in the prosecution of the original application that became the patent to be reissued.
> …
> (B) If the applicant did surrender subject matter in the original application prosecution, the examiner must then determine whether any of the broadening of the reissue claims is in the area of the surrendered subject matter.

Again note, that neither of these subparts itself identifies any broader aspects. Subpart A determines whether applicant surrendered any subject matter, and subpart B compares that surrendered subject matter to the broadening of the reissue claims. As noted above, broadening of the reissue claims is determined in step 1, with respect to the claims of the patent being reissued. Thus, the "broadening of the reissue claims" in subpart B is the broadening identified in step 1. This broadening is compared in subpart B to the surrendered subject matter identified in subpart A.

In contrast to step 1, which only considers the patent being reissued, for step 2, determining what subject matter has been surrendered is based on a review of all related applications. See, MBO Labs. (emphasis added) ("The term 'original patent' [for step 1] refers to the patent corrected by reissue; it does not limit the universe of patents and their prosecution histories that can be the basis for surrendered subject matter [under step 2].") See, also MPEP 1412.02. Note that this provides authorization to look to related applications for surrendered subject matter only. When looking for broadening aspects in step 1, related applications are not relevant. Only the patent to be reissued is relevant as discussed above.

Even for step 2, however, the Court in MBO Labs. noted that the recapture doctrine, like the doctrine of prosecution history estoppel, looks to related applications for surrendered subject matter when the claims being reissued and the claims in a related application have a limitation in common. That is, an argument related to a limitation in a related application will be binding in subsequent related prosecutions where the claims include that same limitation. MBO Labs. at 1318. ("The prosecution history of a related patent can be relevant if, for example, it addresses a limitation in common with the patent in suit. … When multiple patents derive from the same initial application, the prosecution history regarding a claim limitation in any patent that has issued applies with equal force to subsequently issued patents that contain the same claim limitation.") (emphasis added).

Additionally, the addition or arguing of a limitation does not necessarily mean the applicant has surrendered that limitation. If a later continuing application is filed without the added or argued limitation, surrender of that limitation has not occurred. See, Clement (emphasis added):

> Although the recapture rule does not apply in the absence of evidence that the applicant's amendment was "an admission that the scope of that claim was not in fact patentable," "the court may draw inferences from changes in claim scope when other reliable evidence of the patentee's intent is not available." Deliberately canceling or amending a claim in an effort to overcome a reference strongly suggests that the applicant admits that the scope of the claim before the cancellation or amendment is unpatentable, but it is not dispositive because other evidence in the prosecution history may indicate the contrary. n.2
>
> For example, if an applicant amends a broad claim in an effort to distinguish a reference and obtain allowance, but promptly files a continuation application to continue to traverse the prior art rejections, circumstances would suggest that the applicant did not admit that broader claims were not patentable-assuming that the applicant does not ultimately abandon the continuation application because the examiner refuses to withdraw the rejections.

Finally, similar to step 1, if none of the broader aspects are determined to fall within surrendered subject in the step 2 analysis, no improper recapture has occurred, and the analysis ends. Step 3 is not needed. See, MPEP 1412.02.

Step 3

Step 3 of the recapture analysis determines whether the reissued claims were materially narrowed in other respects to avoid the recapture rule. Similar to step 2, step 3 is dependent on the result of step 2. In step 3, the claims are considered materially narrowed if the claims retain a significant portion of the surrendered subject matter. See, In re Youman, 679 F.3d 1335 (Fed. Cir. 2012) That is, if the surrendered subject matter identified in step 2, has not been entirely eliminated from the claim, but rather it has been made less restrictive, the following must be determined: 1) what portion of the surrendered subject matter has been retained, and 2) whether the retained subject matter materially narrows the original claims to avoid recapture. See, *Id.* at 1346 n.4 ("'original claims' are defined as 'the claims before surrender'"). For example, if the patentee modifies the added [or argued] limitation such that it is broader than the patented claim, yet still materially narrowed relative to the original claim, the recapture rule does not bar reissue." *Id.* at 1347. Likewise, even if the modified limitation does not materially narrow, a new limitation that relates to the surrendered subject matter can still materially narrow the claim to avoid violating the recapture rule. See, *Id.* at 1347. On the other hand, if the retained portion of the modified limitation is "well known in the art," impermissible recapture has not been avoided. See, In re Mostafazadeh, 643 F.3d at 1361 (Fed. Cir. 2011).

2. Rejection of claims 13-69

Claims 13-69 were rejected under 35 U.S.C. 251 as being an improper recapture of broadened claimed subject matter surrendered in the application for the patent upon which the present reissue is based. Appellant respectfully traverses these rejections.

The '340 FOA dtd 6/5/2017 asserted that the claims improperly recapture subject matter that was surrendered during prosecution of the '326 application, which became the '441 patent. The analysis of the '340 FOA dtd 6/5/2017 is flawed, however, because it skips step 1 of the recapture analysis test. As covered above in the Applicable Law section 5D(i), step 1 of the recapture analysis test is "to determine whether, and in what respect, the reissue claims are broader in scope than the original patent claims". The "original patent claims" in this step are the claims of the patent actually being reissued. Thus, step 1 of the recapture analysis requires that it be determined whether, and in what respect, the reissue claims are broader in scope than the claims of the patent being reissued. Steps 2 and 3 of the recapture analysis depend on the analysis of step 1, and are therefore irrelevant if step 1 has not been performed. In fact, if no broadening is found in step 1, the recapture analysis is over – no improper recapture is present. Steps 2 and 3 are not even needed.

The patent actually being reissued in the present application is U.S. Patent No. 7,670,495 (the '495 patent). The '340 FOA dtd 6/5/2017 does not address step 1, because it does not address whether, or in what respect, the claims of the present application are broader than the claims of the '495 patent. Instead, the recapture rejection jumps right to discussion of prosecution history of prior different, but related applications, which is relevant only for steps 2 and 3 of the recapture test. *See, '340 FOA dtd 6/5/2017 (Ex. D) at p. 16, line 1 ("During prosecution of the '326 application ...").* The patent being reissued (the '495 patent) is not even referenced in the "Recapture" rejection section of the '340 FOA dtd 6/5/2017. This failure to address step 1 is fatal to the Action's conclusion on recapture, as any further analysis of improper recapture is dependent upon step 1, and thus cannot be conducted without a proper analysis of step 1.

Accordingly, Appellant respectfully asserts that the '340 FOA dtd 6/5/2017 has not made a prima facie case for improper recapture of subject matter, because step 1 of the recapture analysis has not been addressed. As a result, Appellant respectfully requests withdrawal of the rejections to claims 13-69 under 35 U.S.C. 251.

Notwithstanding the fact that the '340 FOA dtd 6/5/2017 did not make a prima facie case for improper recapture of subject matter, the facts of the present situation show that no improper recapture is occurring. In particular, there is no broadening aspect identifiable under step 1 of the recapture test that was also surrendered subject matter under step 2 of the recapture test.

For example, the recapture rejection made in the '340 FOA dtd 6/5/2017 identified limitations relating to an oxygen emitter being within a lumen, as well as the limitation "three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120 degree angle to the adjacent matched sets." The '340 FOA dtd 6/5/2017 implied that since these limitations are not included in the present claims, improper recapture is occurring. *See, '340 FOA dtd 6/5/2017 (Ex. D) at pp. 19-20.* For ease of reference, the limitations relating to the oxygen emitter in a lumen are referred to herein as "the lumen limitations", and the "three matched sets …" limitation will be referred to herein as "the triangle limitation".

The implication in the ‘340 FOA dtd 6/5/2017 that the lack of inclusion of these limitations amounts to improper recapture is incorrect. These limitations do not meet step 1 *or* step 2 of the recapture analysis test.

These limitations do not meet step 1 of the recapture analysis test, because they are not a “broadening aspect”. When performing the step 1 analysis, it is clear that none of the claims of the patent to be reissued (the ‘495 patent) included the triangle limitation and that at least some of the claims (e.g., claim 2) did not include any of the lumen limitations. Thus, the lack of inclusion of the lumen limitations and the triangle limitation in the present claims is not a broadening aspect, because the claims of the patent to be reissued did not include those limitations to start with. Since these limitations are not broadening aspects, neither the lumen limitations nor the triangle limitation can be the basis for improper recapture. The recapture analysis for these limitations ends at step 1, because none of the limitations meets the step 1 test. That is, neither the lumen limitations nor the triangle limitation are an aspect that can be compared to the surrendered subject matter in step 2 of the recapture analysis. To put it plainly, since neither of these limitations is being recaptured in the first place, there is no way for these limitations to be the basis of an improper recapture rejection.

Moreover, neither of these limitations meets step 2 of the recapture test either. Even if the limitations were broadening aspects under step 1 (which they are not), none of the limitations were surrendered under the step 2 analysis. As discussed above in the Applicable Law section 5D(i), if a continuing application is filed with claims that do not claim a limitation added or argued in an earlier application, surrender of that limitation has not occurred. In the present case, although during prosecution of the ‘441 patent, the Applicant added or argued the lumen limitation or the triangle limitation in the claims, by contrast, the ‘495 patent (the patent being reissued) was filed as a continuing application off of the ‘441 patent with claims that did *not* include these limitations. Thus, in accordance with In re Clement discussed above, this indicates Applicant’s desire *not* to surrender the subject matter. Moreover, the examiner of the ‘495 patent agreed that these limitations were not necessary, as claims without the limitations were ultimately granted. Accordingly, neither the lumen limitations nor the triangle limitation was surrendered when considering the prosecution history of the present application’s entire family.

Finally, in addition to not addressing step 1, the '340 FOA dtd 6/5/2017 also did not address step 3 of the recapture analysis test. As discussed above in Applicable Law section 5D(i), even if a broadening aspect of a claim does relate to surrendered subject matter, narrowing limitations added to the claim that counteract that broadening can be sufficient to pull the claim from improper recapture. In the present claims, numerous narrowing limitations have been added regarding the positioning of the electrodes. If it is believed that a limitation meets both step 1 and step 2 of the recapture test, the narrowing limitations on the configuration of the electrodes would need to be analyzed under step 3 to determine whether material narrowing has taken place to avoid the recapture rule.

For at least these reasons, Appellant's respectfully request withdrawal of the rejection to claims 13-69 under 35 U.S.C. 251.

VI. Conclusion

Appellant respectfully requests reversal of the rejections of the claims under appeal.

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CLAIMS APPENDIX

1-12. (Canceled)

13. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;

at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches within the tubular housing;

each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing and so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

14. (New) The emitter of claim 13 wherein the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis;

wherein the electrodes extend in a direction that is parallel to the longitudinal axis; and

wherein at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes.

15. (New) The emitter of claim 13 wherein the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis;

wherein said electrodes extend in a direction parallel to the longitudinal axis; and

wherein each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing.

16. (New) The emitter of claim 13 wherein at least one of the electrodes is a stainless steel mesh or screen.

17. (New) The emitter of claim 13 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing.

18. (New) The emitter of claim 17 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing.

19. (New) The emitter of claim 17 wherein the first and second electrodes comprise an outside electrode and an inside electrode, wherein the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is, wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway.

20. (New) The emitter of claim 13 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to and including the center axis, the passageway running for at least the length of one of the electrodes positioned within the housing;

wherein the first and second electrodes comprise an outside electrode and an inside electrode;

wherein the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing;

the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is;

wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway; and

wherein the tubular housing of the emitter is round.

21. (New) The emitter of claim 19 wherein said inward-facing surface is a concave surface.

22. (New) The emitter of claim 13 further including first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing.

23. (New) The emitter of claim 13 wherein the oxygen produced comprises microbubbles.

24. (New) The emitter of claim 13 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

25. (New) The emitter of claim 13 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

26. (New) The emitter of claim 13 wherein the oxygen produced comprises nanobubbles.

27. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing defining an oxygenation chamber and having a water inlet, a water outlet, a longitudinal water flow axis from the inlet to the outlet, and an inward-facing surface that runs parallel to the water flow axis and defines at least in part the oxygenation chamber;

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that is parallel to the longitudinal axis, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber, wherein the position and size of each electrode within the chamber defines a cross-section of the chamber that has a water flow area within the oxygenation chamber through which water may flow without passing between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches, wherein the water flow area is greater than an area at the cross-section equal to the total area between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches, wherein at least a portion of the outside electrode positioned in the chamber is closer to the inward-facing surface of the oxygenation chamber than said distance separating the inside electrode from the outside electrode; and

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the chamber of the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

28. (New) The emitter of claim 27 wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a longitudinal center axis of the oxygenation chamber.

29. (New) The emitter of claim 27 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber.

30. (New) The emitter of claim 29 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber.

31. (New) The emitter of claim 30 wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway.

32. (New) The emitter of claim 27 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing.

33. (New) The emitter of claim 27 wherein the oxygen produced comprises nanobubbles.

34. (New) The emitter of claim 27 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

35. (New) The emitter of claim 27 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

36. (New) The emitter of claim 35 wherein the oxygen produced comprises nanobubbles.

37. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing defining an oxygenation chamber and having a water inlet, and a water outlet;

at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the oxygenation chamber, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches, a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber, said portion being a portion that opposes the other of the first and second electrodes, wherein each electrode is positioned within the oxygenation chamber so that a cross section of the oxygenation chamber includes a water flow area that allows water to avoid passing between electrodes separated by 0.005 inches to 0.140 inches;

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

38. (New) The emitter of claim 37 wherein the tubular housing has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal center axis; and

wherein each electrode of the emitter is positioned so that all points midway between all opposing electrodes inside the chamber are closer to said inwardly-facing surface than to the longitudinal center axis.

39. (New) The emitter of claim 37 wherein the chamber has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal axis, wherein the electrodes extend in a direction that is parallel to the longitudinal axis, and wherein at least one of the first and second electrodes is

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positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes.

40. (New) The emitter of claim 39 wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to the longitudinal center axis of the oxygenation chamber.

41. (New) The emitter of claim 37 wherein the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing.

42. (New) The emitter of claim 37 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber.

43. (New) The emitter of claim 42 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the chamber.

44. (New) The emitter of claim 42 wherein the chamber has an inward-facing surface that runs parallel to the longitudinal axis;

wherein the first and second electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is; and

wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway.

45. (New) The emitter of claim 37 further including first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing.

46. (New) The emitter of claim 37 wherein the oxygen comprises microbubbles.

47. (New) The emitter of claim 37 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

48. (New) The emitter of claim 37 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

49. (New) The emitter of claim 37 wherein the oxygen produced comprises nanobubbles.

50. (New) An emitter for electrolytic generation of bubbles of oxygen in an aqueous medium comprising:

a tubular housing defining an oxygenation chamber, and having an inward-facing surface that defines at least in part the oxygenation chamber, a water inlet, and a water outlet;

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that runs parallel to the inward-facing surface, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the inward-facing surface of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber;

wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a midpoint of the tubular housing and so that at least some water may flow through an unobstructed passageway from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches.

51. (New) The emitter of claim 50 wherein at least one of the inside and outside electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes, and wherein the tubular housing defines a longitudinal center axis that lies in the oxygenation chamber and wherein the unobstructed passageway includes the longitudinal center.

52. (New) The emitter of claim 50 wherein at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber.

53. (New) The emitter of claim 52 wherein the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing.

54. (New) The emitter of claim 50 wherein the unobstructed passageway is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber.

55. (New) The emitter of claim 54 wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway.

56. (New) The emitter of claim 55 wherein said inward-facing surface is a concave surface.

57. (New) The emitter of claim 50 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing.

58. (New) The emitter of claim 50 wherein the emitter is operable when connected to a power source to create microbubbles of oxygen in water flowing through the oxygenation chamber.

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59. (New) The emitter of claim 50 coupled to a power source wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

60. (New) The emitter of claim 50 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

61. (New) The emitter of claim 50 wherein the emitter is operable when connected to a power source to create nanobubbles of oxygen in water flowing through the oxygenation chamber.

62. (New) An emitter for electrolytic generation of bubbles of oxygen in an aqueous medium comprising:

a tubular housing defining an oxygenation chamber, said housing having an outer wall that runs parallel to a longitudinal center axis of the housing, said housing having a water inlet and a water outlet,

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches;

the electrodes being positioned away from the center axis and maintaining a longitudinal, unobstructed passageway parallel to and including the center axis that runs for at least the length of one of the electrodes positioned within the chamber, the unobstructed passageway having a uniform cross-sectional area along that length, the electrodes being positioned so that water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;

wherein the outside electrode defines a cross-sectional area between the outside electrode and the outer wall of the chamber that is less than said cross-sectional area of the unobstructed passageway.

63. (New) The emitter of claim 62 wherein at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber.

64. (New) The emitter of claim 63 wherein the electrode in contact with a wall of the tubular housing is in contact with the outer wall which is a curved wall of the tubular housing.

65. (New) The emitter of claim 62 wherein the unobstructed passageway is multiple times wider than the distance separating the opposing outside and inside electrodes within the chamber.

66. (New) The emitter of claim 62 wherein said outer wall includes an inwardly-facing concave surface.

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67. (New) The emitter of claim 62 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing.

68. (New) The emitter of claim 62 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

69. (New) The emitter of claim 68 wherein the emitter is operable when connected to a power source to create nanobubbles of oxygen in water flowing through the oxygenation chamber.

Electronic Patent Application Fee Transmittal	
Application Number:	14601340
Filing Date:	21-Jan-2015
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Filer:	Aaron Wesley Pederson
Attorney Docket Number:	3406.005US2
Filed as Small Entity	
Filing Fees for **Utility under 35 USC 111(a)**	

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 2 months with $0 paid	2252	1	300	300
Miscellaneous:				
		Total in USD ($)		**300**

Electronic Acknowledgement Receipt	
EFS ID:	31020475
Application Number:	14601340
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First Named Inventor/Applicant Name:	James Andrew Senkiw
Customer Number:	38846
Filer:	Aaron Wesley Pederson
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Attorney Docket Number:	3406.005US2
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Payment Type	DA
Payment was successfully received in RAM	$300
RAM confirmation Number	112217INTEFSW00006887502880
Deposit Account	502880
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The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Affidavit/Dec/Exhibit after Notice of Appeal	Exhibit_A.pdf	16028426 00f02469d44306d752cbfd41ae981920095d44ea	no	18
Warnings:					
Information:					
2	Affidavit/Dec/Exhibit after Notice of Appeal	Exhibit_B.pdf	15823416 5460a89f5418b33b5ae7bb4181da4ddfc0d35142	no	17
Warnings:					
Information:					
3	Affidavit/Dec/Exhibit after Notice of Appeal	Exhibit_C.pdf	9155155 2ab17d3dab5eece6431db98d19e52576c77a2dd2	no	10
Warnings:					
Information:					
4	Affidavit/Dec/Exhibit after Notice of Appeal	Exhibit_D.pdf	1074734 2e652eb167d9183b17e8fd600ba844f40f7c91a7	no	26
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5	Affidavit/Dec/Exhibit after Notice of Appeal	Exhibit_E.pdf	2782833 71078747fbef9ee1fcc1f7bb57c025459eed4aa2	no	50
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6	Affidavit/Dec/Exhibit after Notice of Appeal	Exhibit_F.pdf	2300996 b333b6f0e84d2810da69e9608ecc725fe2349a40	no	28
Warnings:					
Information:					

7	Affidavit/Dec/Exhibit after Notice of Appeal	Exhibit_G.pdf	2203016 69399ab68f62a1d74077b007d902e96a92fda9f1	no	20
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Information:					
9	Affidavit/Dec/Exhibit after Notice of Appeal	Exhibit_I.pdf	666241 f1c3827950cf26909256d36d28e74118ed7451cb	no	17
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Warnings:					
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14	Fee Worksheet (SB06)	fee-info.pdf	30127 78e3696b16a74e8a4b4cc0bfcd4471d252c6fd81	no	2
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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Exhibit A

US007670495B2

(12) **United States Patent**
Senkiw

(10) **Patent No.: US 7,670,495 B2**
(45) **Date of Patent: *Mar. 2, 2010**

(54) **FLOW-THROUGH OXYGENATOR**

(75) Inventor: **James Andrew Senkiw**, Minneapolis, MN (US)

(73) Assignee: **Oxygenator Water Technologies, Inc.**, Minnetonka, MN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/023,431**

(22) Filed: **Jan. 31, 2008**

(65) **Prior Publication Data**

US 2008/0179259 A1 Jul. 31, 2008

Related U.S. Application Data

(60) Division of application No. 10/732,326, filed on Dec. 10, 2003, now Pat. No. 7,396,441, which is a continuation-in-part of application No. 10/372,017, filed on Feb. 21, 2003, now Pat. No. 6,689,262.

(60) Provisional application No. 60/358,534, filed on Feb. 22, 2002.

(51) **Int. Cl.**

C02F 1/48	(2006.01)
C02F 1/00	(2006.01)
C25B 1/02	(2006.01)
C25B 1/04	(2006.01)

(52) **U.S. Cl.** **210/748**; 210/600; 210/243; 204/245; 204/232; 205/628

(58) **Field of Classification Search** 210/748, 210/600, 243; 204/278, 242, 243, 275.1, 204/232, 286.1, 554, 660; 205/633–638
See application file for complete search history.

(56) **References Cited**

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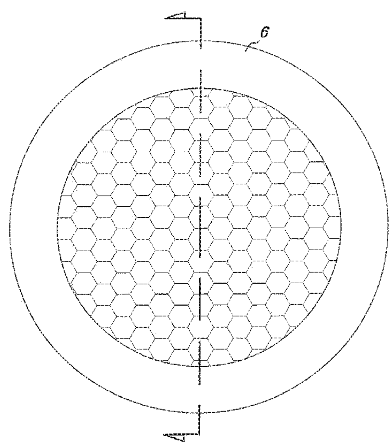
Primary Examiner—Walter D Griffin
Assistant Examiner—Cameron J Allen
(74) *Attorney, Agent, or Firm*—Patterson, Thuente, Skaar & Christensen, P.A.

(57) **ABSTRACT**

An oxygen emitter which is an electrolytic cell is disclosed. When the anode and cathode are separated by a critical distance, very small microbubbles and nanobubbles of oxygen are generated. The very small oxygen bubbles remain in suspension, forming a solution supersaturated in oxygen. A flow-through model for oxygenating flowing water is disclosed. The use of supersaturated water for enhancing the growth of plants is disclosed. Methods for applying supersaturated water to plants manually, by drip irrigation or in hydroponic culture are described. The treatment of waste water by raising the dissolved oxygen with the use of an oxygen emitter is disclosed.

12 Claims, 8 Drawing Sheets



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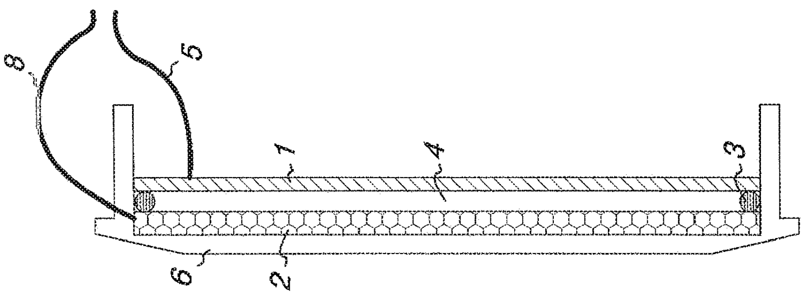


Fig. 1B

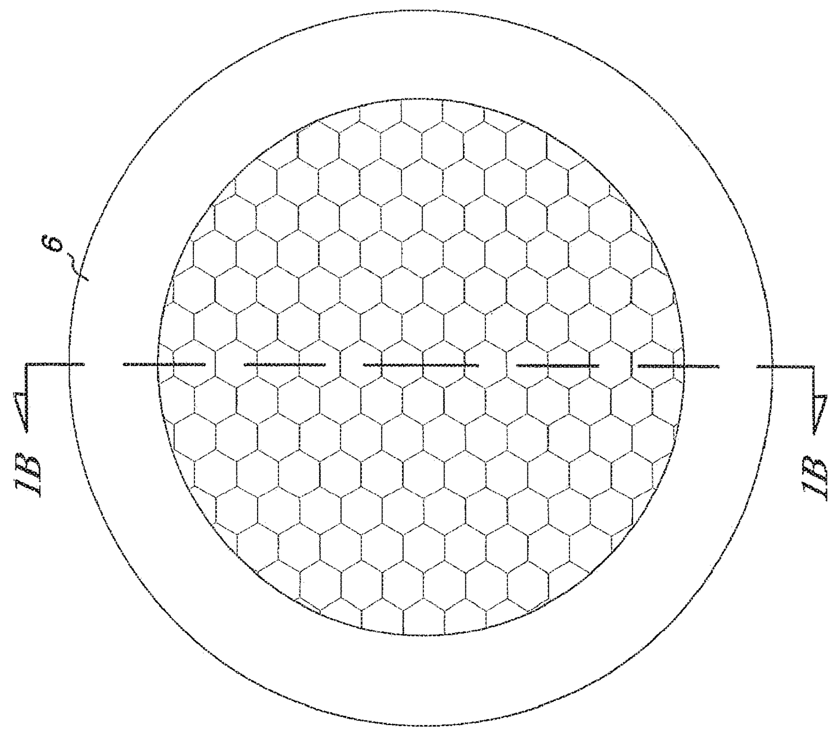


Fig. 1A

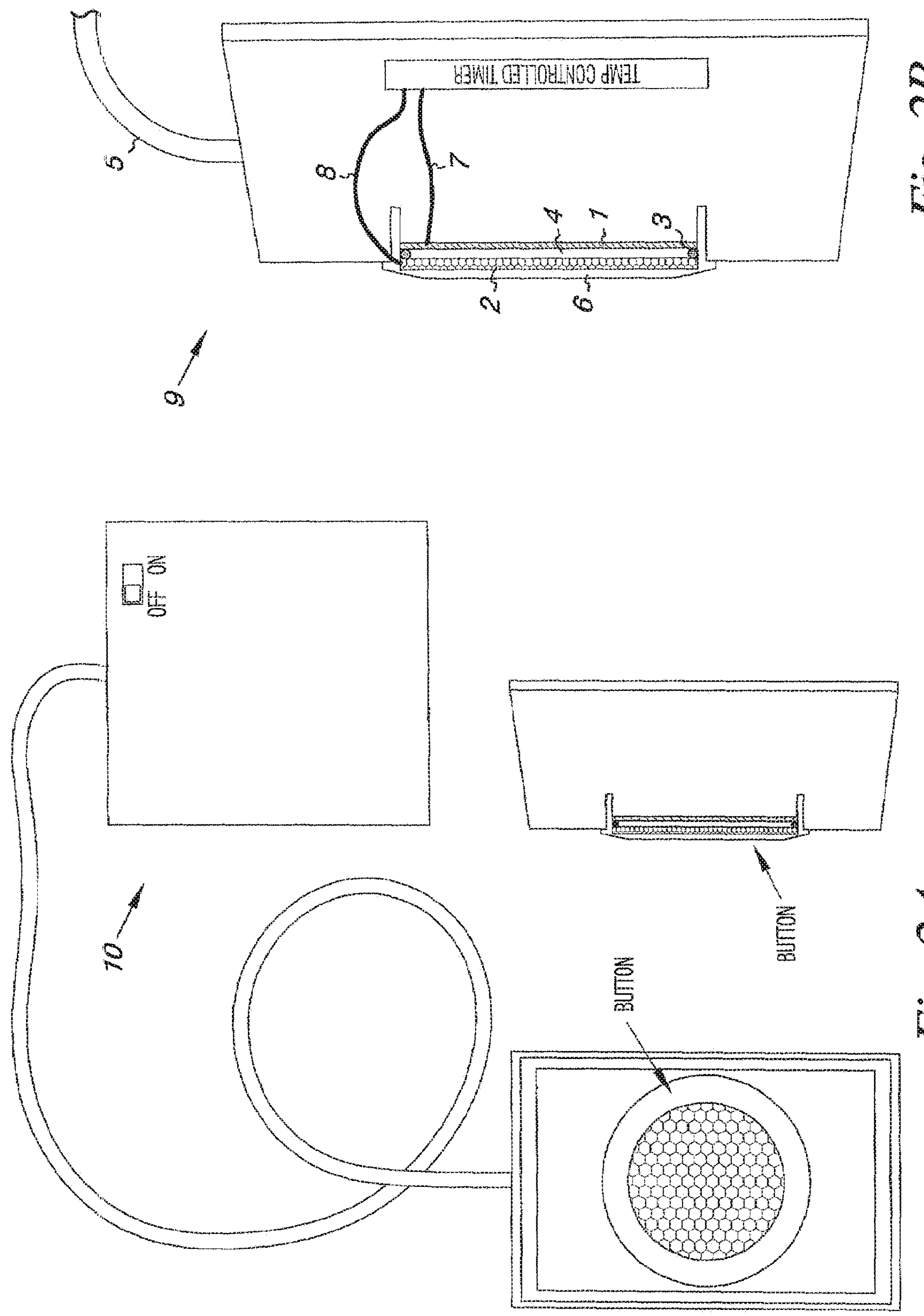
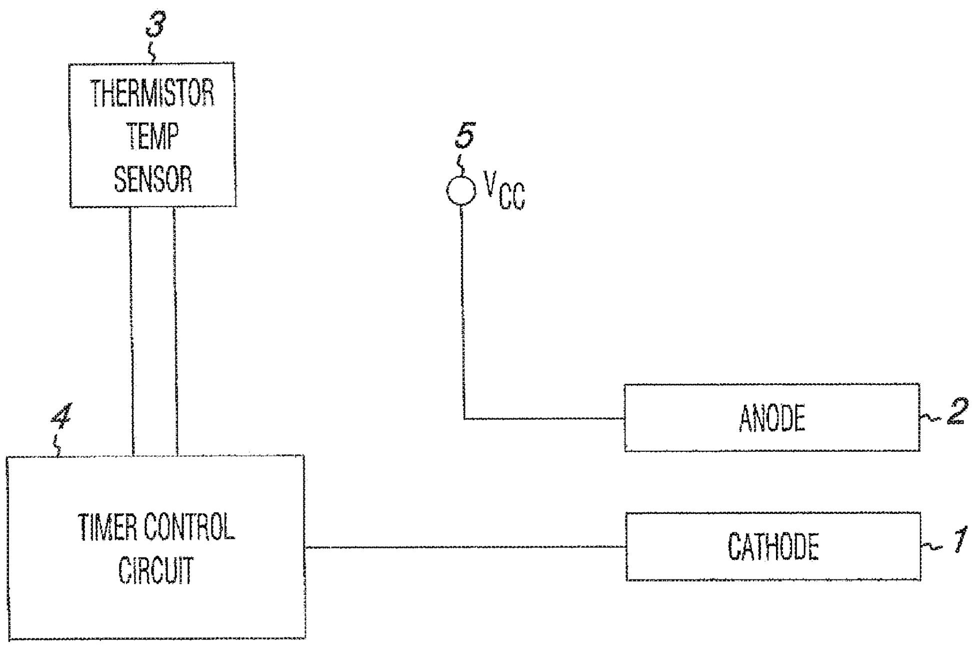


Fig. 2B

Fig. 2A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THERMISTOR
TEMP
SENSOR
5
V_{CC}
4
TIMER CONTROL
CIRCUIT
ANODE
2
CATHODE
1

Fig. 3

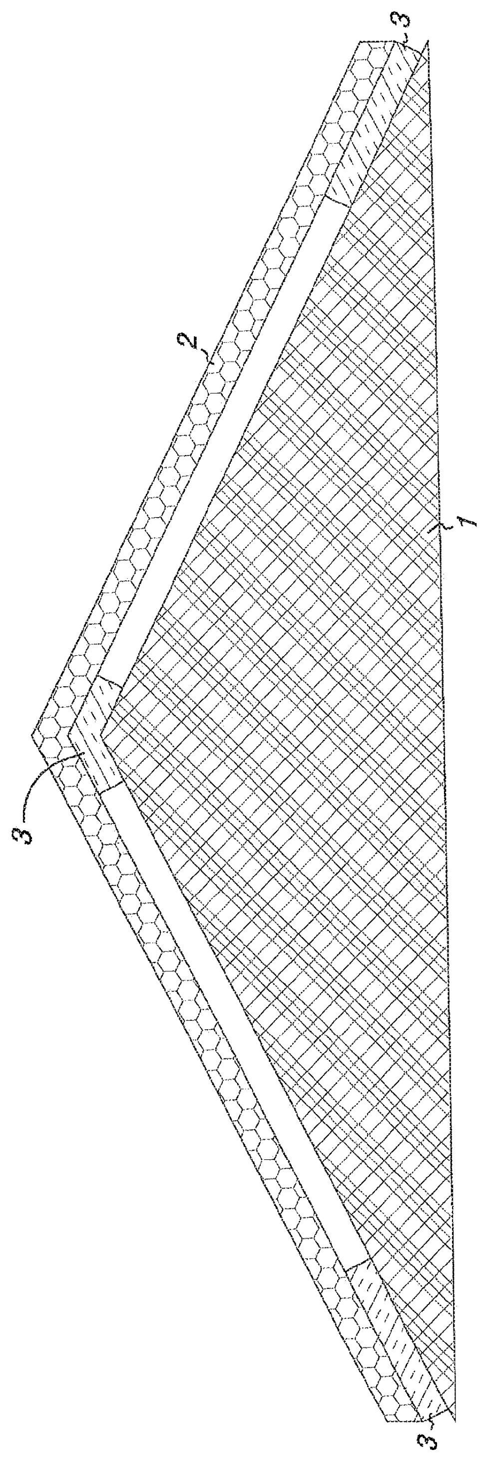


Fig. 4

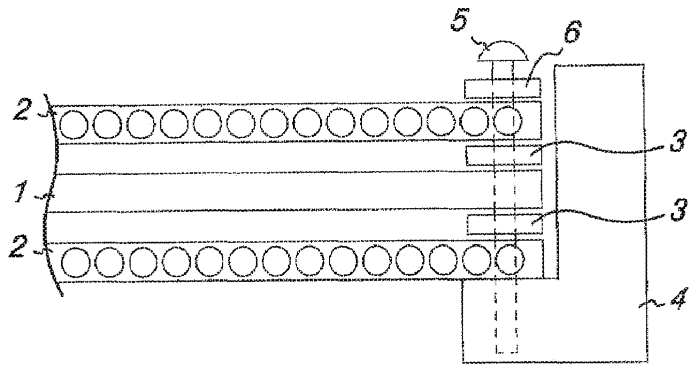


Fig. 5A

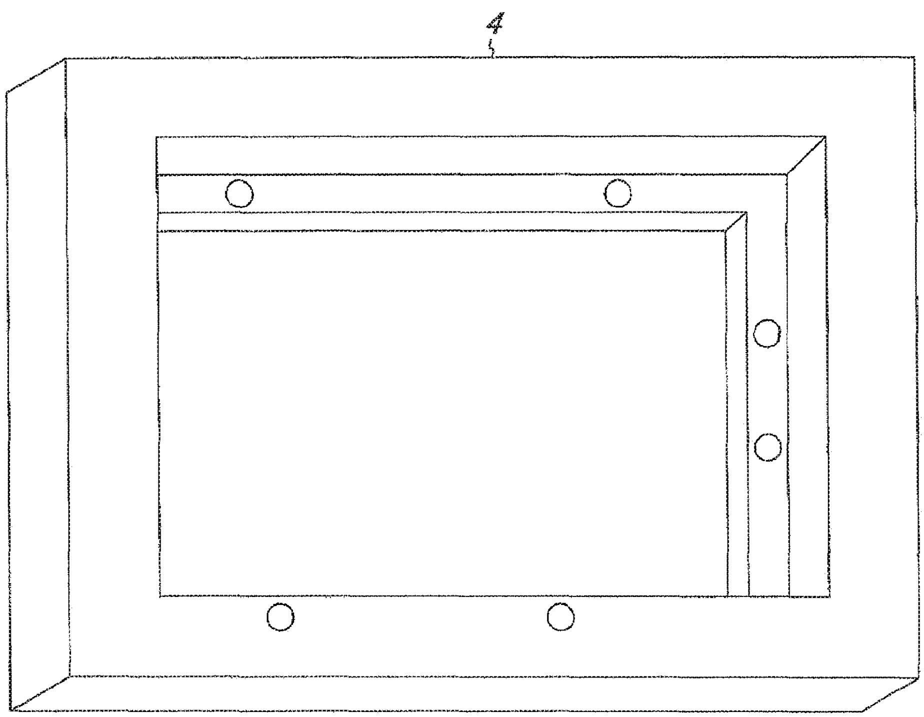


Fig. 5B

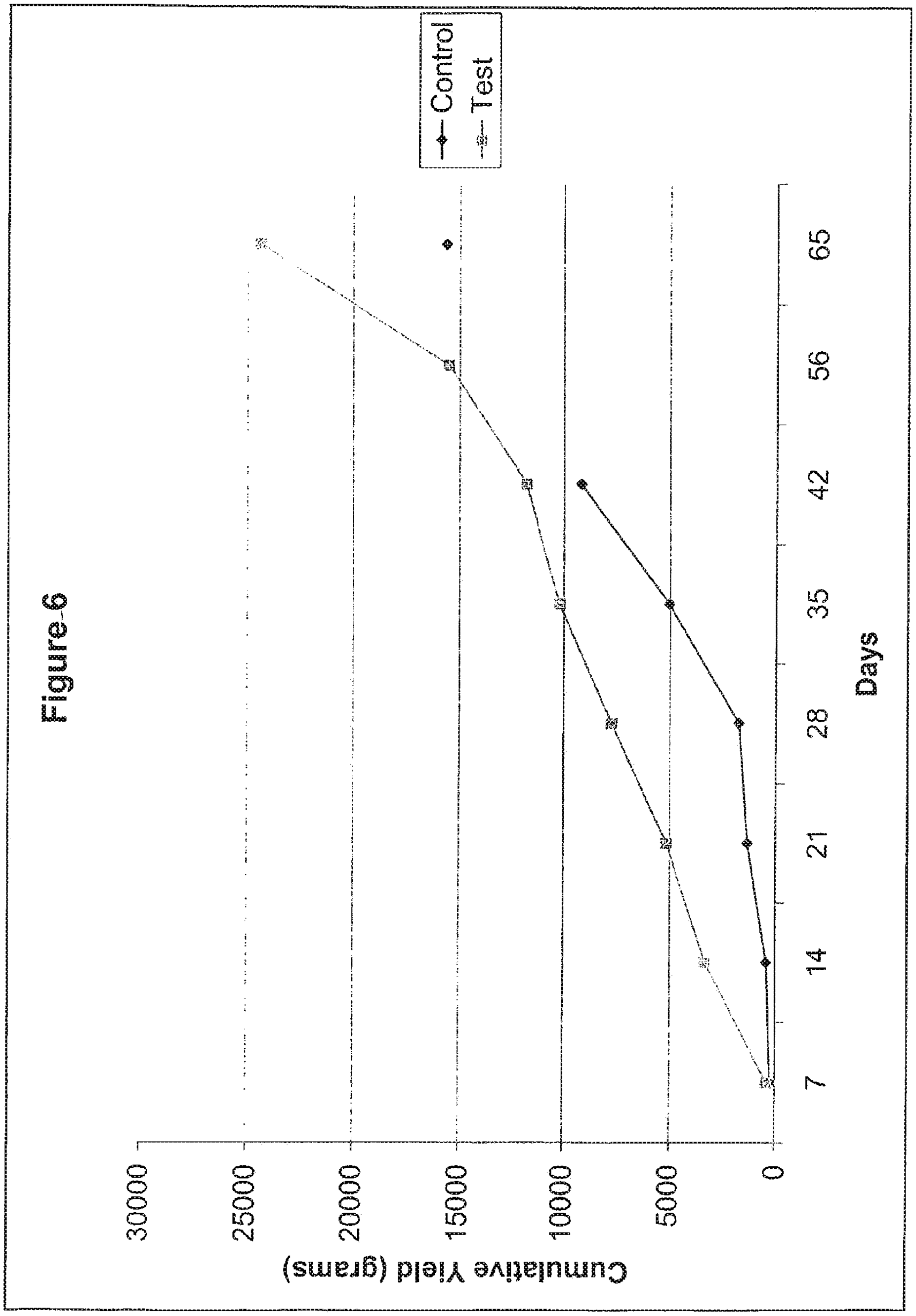


Figure 6
Control
Test
Cumulative Yield (grams)
30000
25000
20000
15000
10000
5000
0
7
14
21
28
35
42
56
65
Days

Fig. 7A

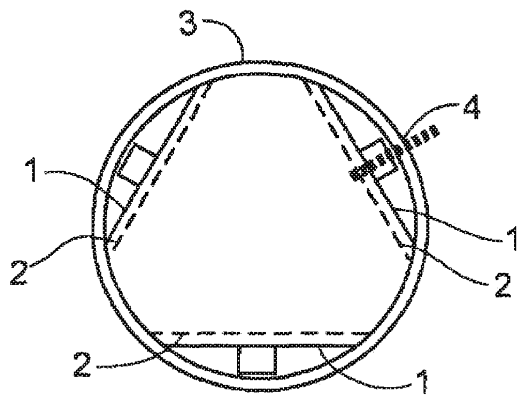


Fig. 7B

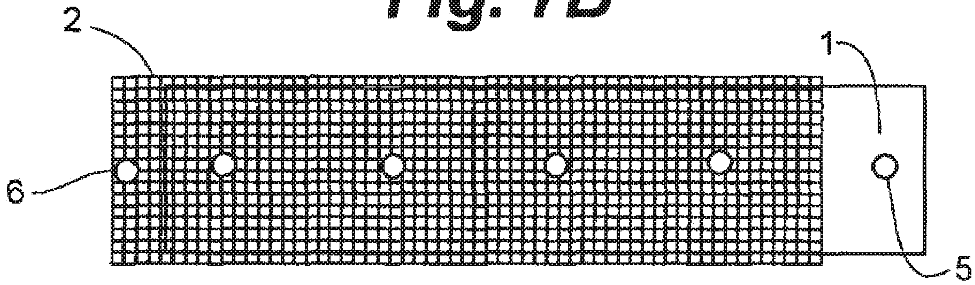
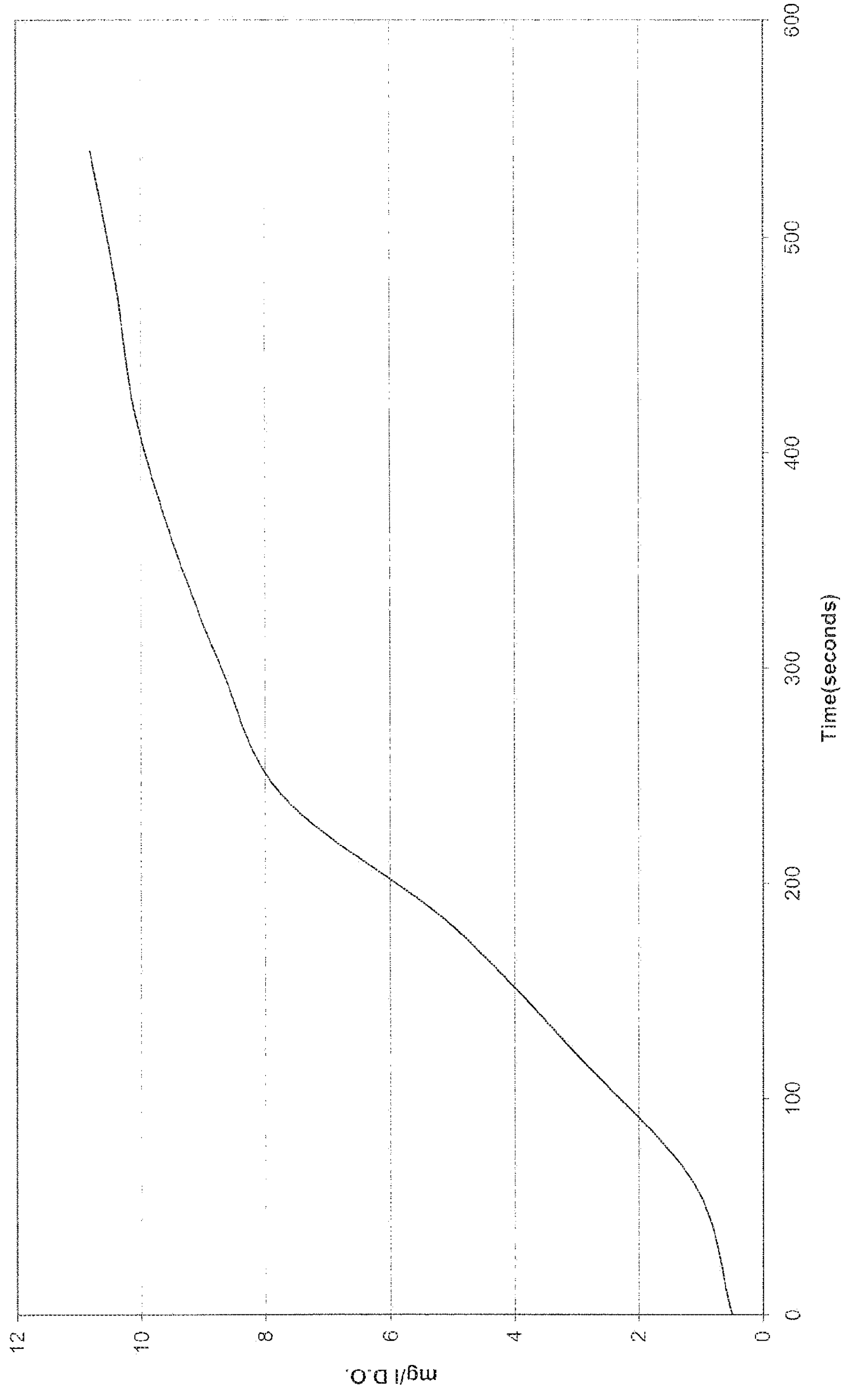


Fig. 8 Time vs D.O.



FLOW-THROUGH OXYGENATOR

RELATED APPLICATIONS

This application is a division of application Ser. No. 10/732,326 filed Dec. 10, 2003, which in turn is a continuation-in-part of application Ser. No. 10/372,017, filed Feb. 21, 2003, now U.S. Pat. No. 6,689,262, which claims the benefit of U.S. Provisional Application No. 60/358,534, filed Feb. 22, 2002, each of which is hereby fully incorporated herein by reference.

FIELD OF THE INVENTION

This invention relates to the electrolytic generation of microbubbles of oxygen for increasing the oxygen content of flowing water. This invention also relates to the use of super-oxygenated water to enhance the growth and yield of plants. The flow-through model is useful for oxygenating water for hydroponic plant culture, drip irrigation and waste water treatment.

BACKGROUND OF THE INVENTION

Many benefits may be obtained through raising the oxygen content of aqueous media. Efforts have been made to achieve higher saturated or supersaturated oxygen levels for applications such as the improvement of water quality in ponds, lakes, marshes and reservoirs, the detoxification of contaminated water, culture of fish, shrimp and other aquatic animals, biological culture and hydroponic culture. For example, fish held in a limited environment such as an aquarium, a bait bucket or a live hold tank may quickly use up the dissolved oxygen in the course of normal respiration and are then subject to hypoxic stress, which can lead to death. A similar effect is seen in cell cultures, where the respiring cells would benefit from higher oxygen content of the medium. Organic pollutants from agricultural, municipal and industrial facilities spread through the ground and surface water and adversely affect life forms. Many pollutants are toxic, carcinogenic or mutagenic. Decomposition of these pollutants is facilitated by oxygen, both by direct chemical detoxifying reactions or by stimulating the growth of detoxifying microflora. Contaminated water is described as having an increased biological oxygen demand (BOD) and water treatment is aimed at decreasing the BOD so as to make more oxygen available for fish and other life forms.

The most common method of increasing the oxygen content of a medium is by sparging with air or oxygen. While this is a simple method, the resulting large bubbles produced simply break the surface and are discharged into the atmosphere. Attempts have been made to reduce the size of the bubbles in order to facilitate oxygen transfer by increasing the total surface area of the oxygen bubbles. U.S. Pat. No. 5,534,143 discloses a microbubble generator that achieves a bubble size of about 0.10 millimeters to about 3 millimeters in diameter. U.S. Pat. No. 6,394,429 ("the '429 patent") discloses a device for producing microbubbles, ranging in size from 0.1 to 100 microns in diameter, by forcing air into the fluid at high pressure through a small orifice.

When the object of generating bubbles is to oxygenate the water, either air, with an oxygen content of about 21%, or pure oxygen may be used. The production of oxygen and hydrogen by the electrolysis of water is well known. A current is applied across an anode and a cathode which are immersed in an aqueous medium. The current may be a direct current from a battery or an AC/DC converter from a line. Hydrogen gas is produced at the cathode and oxygen gas is produced at the anode. The reactions are:

AT THE CATHODE:	$4H_2O + 4e^- \rightarrow 4OH^- + 2H_2$
AT THE ANODE:	$2H_2O \rightarrow O_2 + 4H^+ + 4e^-$
NET REACTION:	$6H_2O \rightarrow 4OH^- + 4H^+ ++ 2H_2 + O_2$

286 kilojoules of energy is required to generate one mole of oxygen.

The gasses form bubbles which rise to the surface of the fluid and may be collected. Either the oxygen or the hydrogen may be collected for various uses. The "electrolytic water" surrounding the anode becomes acidic while the electrolytic water surrounding the cathode becomes basic. Therefore, the electrodes tend to foul or pit and have a limited life in these corrosive environments.

Many cathodes and anodes are commercially available. U.S. Pat. No. 5,982,609 discloses cathodes comprising a metal or metallic oxide of at least one metal selected from the group consisting of ruthenium, iridium, nickel, iron, rhodium, rhenium, cobalt, tungsten, manganese, tantalum, molybdenum, lead, titanium, platinum, palladium and osmium. Anodes are formed from the same metallic oxides or metals as cathodes. Electrodes may also be formed from alloys of the above metals or metals and oxides co-deposited on a substrate. The cathode and anodes may be formed on any convenient support in any desired shape or size. It is possible to use the same materials or different materials for both electrodes. The choice is determined according to the uses. Platinum and iron alloys ("stainless steel") are often preferred materials due to their inherent resistance to the corrosive electrolytic water. An especially preferred anode disclosed in U.S. Pat. No. 4,252,856 comprises vacuum deposited iridium oxide.

Holding vessels for live animals generally have a high population of animals which use up the available oxygen rapidly. Pumps to supply oxygen have high power requirements and the noise and bubbling may further stress the animals. The available electrolytic generators likewise have high power requirements and additionally run at high voltages and produce acidic and basic water which are detrimental to live animals. Many of the uses of oxygenators, such as keeping bait or caught fish alive, would benefit from portable devices that did not require a source of high power. The need remains for quiet, portable, low voltage means to oxygenate water.

It has also been known that plant roots are healthier when oxygenated water is applied. It is thought that oxygen inhibits the growth of deleterious fungi. The water sparged with air as in the '429 patent was shown to increase the biomass of hydroponically grown cucumbers and tomatoes by about 15%.

The need remains for oxygenator models suitable to be placed in-line in water distribution devices so as to be applied to field as well as hydroponic culture.

SUMMARY OF THE INVENTION

This invention provides an oxygen emitter which is an electrolytic cell which generates very small microbubbles and nanobubbles of oxygen in an aqueous medium, which bubbles are too small to break the surface tension of the medium, resulting in a medium supersaturated with oxygen.

The electrodes may be a metal or oxide of at least one metal selected from the group consisting of ruthenium, iridium, nickel, iron, rhodium, rhenium, cobalt, tungsten, manganese, tantalum, molybdenum, lead, titanium, platinum, palladium and osmium or oxides thereof. The electrodes may be formed into open grids or may be closed surfaces. The most preferred cathode is a stainless steel mesh. The most preferred mesh is a {fraction (1/16)} inch grid. The most preferred anode is platinum and iridium oxide on a support. A preferred support is titanium.

In order to form microbubbles and nanobubbles, the anode and cathode are separated by a critical distance. The critical distance ranges from 0.005 inches to 0.140 inches. The preferred critical distance is from 0.045 to 0.060 inches.

Models of different size are provided to be applicable to various volumes of aqueous medium to be oxygenated. The public is directed to choose the applicable model based on volume and power requirements of projected use. Those models with low voltage requirements are especially suited to oxygenating water in which animals are to be held.

Controls are provided to regulate the current and timing of electrolysis.

A flow-through model is provided which may be connected in-line to a watering hose or to a hydroponic circulating system. The flow-through model can be formed into a tube with triangular cross-section. In this model, the anode is placed toward the outside of the tube and the cathode is placed on the inside, contacting the water flow. Alternatively, the anodes and cathodes may be in plates parallel to the long axis of the tube, or may be plates in a wafer stack. Alternately, the electrodes may be placed in a side tube ("T" model) out of the direct flow of water. Protocols are provided to produce superoxygenated water at the desired flow rate and at the desired power usage. Controls are inserted to activate electrolysis when water is flowing and deactivate electrolysis at rest.

This invention includes a method to promote growth and increase yield of plants by application of superoxygenated water. The water treated with the emitter of this invention is one example of superoxygenated water. Plants may be grown in hydroponic culture or in soil. The use of the flow-through model for drip irrigation of crops and waste water treatment is disclosed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is the O_2 emitter of the invention.

FIG. **2** is an assembled device.

FIG. **3** is a diagram of the electronic controls of the O_2 emitter.

FIG. **4** shows a funnel or pyramid variation of the O_2 emitter.

FIG. **5** shows a multilayer sandwich O_2 emitter.

FIG. **6** shows the yield of tomato plants watered with superoxygenated water.

FIG. **7** shows an oxygenation chamber suitable for flow-through applications. FIG. **7**A is a cross section showing arrangement of three plate electrodes. FIG. **7**B is a longitudinal section showing the points of connection to the power source.

FIG. **8** is a graph showing the oxygenation of waste water.

DETAILED DESCRIPTION OF THE INVENTION

Definitions

For the purpose of describing the present invention, the following terms have these meanings:

"Critical distance" means the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles.

"Critical distance" means the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles.

"O_2 emitter" means a cell comprised of at least one anode and at least one cathode separated by the critical distance.

"Metal" means a metal or an alloy of one or more metals.

"Microbubble" means a bubble with a diameter less than 50 microns.

"Nanobubble" means a bubble with a diameter less than that necessary to break the surface tension of water. Nanobubbles remain suspended in the water, giving the water an opalescent or milky appearance.

"Supersaturated" means oxygen at a higher concentration than normal calculated oxygen solubility at a particular temperature and pressure.

"Superoxygenated water" means water with an oxygen content at least 120% of that calculated to be saturated at a temperature.

"Water" means any aqueous medium with resistance less than one ohm per square centimeter; that is, a medium that can support the electrolysis of water. In general, the lower limit of resistance for a medium that can support electrolysis is water containing more than 2000 ppm total dissolved solids.

The present invention produces microbubbles and nanobubbles of oxygen via the electrolysis of water. As molecular oxygen radical (atomic weight 8) is produced, it reacts to form molecular oxygen, O_2. In the special dimensions of the invention, as explained in more detail in the following examples, O_2 forms bubbles which are too small to break the surface tension of the fluid. These bubbles remain suspended indefinitely in the fluid and, when allowed to build up, make the fluid opalescent or milky. Only after several hours do the bubbles begin to coalesce on the sides of the container and the water clears. During that time, the water is supersaturated with oxygen. In contrast, the H_2 formed readily coalesces into larger bubbles which are discharged into the atmosphere, as can be seen by bubble formation at the cathode.

The first objective of this invention was to make an oxygen emitter with low power demands, low voltage and low current for use with live animals. For that reason, a small button emitter was devised. The anode and cathode were set at varying distances. It was found that electrolysis took place at very short distances before arcing of the current occurred. Surprisingly, at slightly larger distances, the water became milky and no bubbles formed at the anode, while hydrogen continued to be bubbled off the cathode. At distance of 0.140 inches between the anode and cathode, it was observed that the oxygen formed bubbles at the anode. Therefore, the critical distance for microbubble and nanobubble formation was determined to be between 0.005 inches and 0.140 inches.

EXAMPLE 1

Oxygen Emitter

As shown in FIG. **1**, the oxygen evolving anode **1** selected as the most efficient is an iridium oxide coated single sided sheet of platinum on a support of titanium (Eltech, Fairport Harbor, Ohio). The cathode **2** is a {fraction (1/16)} inch mesh (size 8 mesh) marine stainless steel screen. The anode and cathode are separated by a non-conducting spacer **3** containing a gap **4** for the passage of gas and mixing of anodic and cathodic water and connected to a power source through a connection point **5**. FIG. **2** shows a plan view of the assembled device. The O_2 emitter **6** with the anode connecting wire **7** and the cathode connecting wire **8** is contained in an enclosure **9**, connected to the battery compartment **10**. The spacer thickness is critical as it sets the critical distance. It must be of sufficient thickness to prevent arcing of the current, but thin enough to separate the electrodes by no more than 0.140 inches. Above that thickness, the power needs are higher and the oxygen bubbles formed at higher voltage will coalesce and escape the fluid. Preferably, the spacer is from 0.005 to 0.075 inches thick. At the lower limits, the emitter tends to foul more quickly. Most preferably, the spacer is about 0.050 inches thick. The spacer may be any nonconductive material such as nylon, fiberglass, Teflon®, polymer or other plastic. Because of the criticality of the space distance, it is preferable to have a non-compressible spacer. It was found that Buna, with a durometer measure of 60 was not acceptable due to decomposition. Viton, a common fluoroelastomer, has a durometer measure of 90 and was found to hold its shape well.

In operation, a small device with an O_2 emitter 1.485 inches in diameter was driven by 4AA batteries. The critical distance was held at 0.050 inches with a Viton spacer. Five gallons of water became saturated in seven minutes. This size is suitable for raising oxygen levels in an aquarium or bait bucket.

It is convenient to attach a control circuit which comprises a timer that is thermostatically controlled by a temperature sensor which determines the off time for the cathode. When the temperature of the solution changes, the resistance of the thermistor changes, which causes an off time of a certain duration. In cool water, the duration is longer so in a given volume, the emitter generates less oxygen. When the water is warmer and therefore hold less oxygen, the duration of off time is shorter. Thus the device is self-controlled to use power most economically. FIG. **3** shows a block diagram of a timer control with anode **1**, cathode **2**, thermistor temperature sensor **3**, timer control circuit **4** and wire from a direct current power source **5**.

EXAMPLE 2

Measurement of O_2 Bubbles

Attempts were made to measure the diameter of the O_2 bubbles emitted by the device of Example 1. In the case of particles other than gasses, measurements can easily be made by scanning electron microscopy, but gasses do not survive electron microscopy. Large bubble may be measured by pore exclusion, for example, which is also not feasible when measuring a gas bubble. A black and white digital, high contrast, backlit photograph of treated water with a millimeter scale reference was shot of water produced by the emitter of Example 1. About 125 bubbles were seen in the area selected for measurement. Seven bubbles ranging from the smallest clearly seen to the largest were measured. The area was enlarged, giving a scale multiplier of 0.029412.

Recorded bubble diameters at scale were 0.16, 0.22, 0.35, 0.51, 0.76, 0.88 and 1.09 millimeters. The last three were considered outliers by reverse analysis of variance and were assumed to be hydrogen bubbles. When multiplied by the scale multiplier, the assumed O_2 bubbles were found to range from 4.7 to 15 microns in diameter. This test was limited by the resolution of the camera and smaller bubbles in the nanometer range could not be resolved. It is known that white light cannot resolve features in the nanometer size range, so monochromatic laser light may give resolution sensitive enough to measure smaller bubbles. Efforts continue to increase the sensitivity of measurement so that sub-micron diameter bubbles can be measured.

EXAMPLE 3

Other Models of Oxygen Emitter

Depending on the volume of fluid to be oxygenated, the oxygen emitter of this invention may be shaped as a circle, rectangle, cone or other model. One or more may be set in a substrate that may be metal, glass, plastic or other material. The substrate is not critical as long as the current is isolated to the electrodes by the nonconductor spacer material of a thickness from 0.005 to 0.075 inches, preferably 0.050 inches. It has been noticed that the flow of water seems to be at the periphery of the emitter, while the evolved visible bubbles (H_2) arise at the center of the emitter. Therefore, a funnel or pyramidal shaped emitter was constructed to treat larger volumes of fluid. FIG. **4** is a cross sectional diagram of such an emitter. The anode **1** is formed as an open grid separated from a marine grade stainless steel screen cathode **2** by the critical distance by spacer **3** around the periphery of the emitter and at the apex. This flow-through embodiment is suitable for treating large volumes of water rapidly.

The size may be varied as required. A round emitter for oxygenating a bait bucket may be about 2 inches in diameter, while a 3-inch diameter emitter is adequate for oxygenating a 10 to 40 gallon tank. The live well of a fishing boat will generally hold 40 to 80 gallons of water and require a 4-inch diameter emitter. It is within the scope of this invention to construct larger emitters or to use several in a series to oxygenate larger volumes. It is also within the scope of this invention to vary the model to provide for low voltage and amperage in cases where the need for oxygen is moderate and long lasting or conversely, to supersaturate water very quickly at higher voltage and amperage. In the special dimensions of the present invention, it has been found that a 6 volt battery supplying a current as low as 40 milliamperes is sufficient to generate oxygen. Such a model is especially useful with live plants or animals, while it is more convenient for industrial use to use a higher voltage and current. Table I shows a number of models suitable to various uses.

TABLE I

Emitter Model	Gallons	Volts	Amps Max.	Ave	Watts
Bait keeper	5	6	0.090	0.060	0.36
Livewell	32	12	0.180	0.120	1.44
OEM 2 inch	10	12	0.210	0.120	1.44
Bait store	70	12	0.180	0.180	2.16
Double cycle	2	12	0.180	0.180	2.16
OEM 3 inch	50	12	0.500	0.265	3.48
OEM 4 inch	80	12	0.980	0.410	4.92
Water pail	2	24	1.200	1.200	28.80
Plate	250	12	5.000	2.500	30.00

EXAMPLE 4

Multilayer Sandwich O_2 Emitter

An O_2 emitter was made in a multilayer sandwich embodiment. (FIG. **5**) An iridium oxide coated platinum anode **1** was formed into a grid to allow good water flow and sandwiched between two stainless steel screen cathodes **2**. Spacing was held at the critical distance by nylon spacers **3**. The embodiment illustrated is held in a cassette **4** which is secured by nylon bolt **5** with a nylon washer **6**. The dimensions selected were:

cathode screen	0.045 inches thick
nylon spacer	0.053 inches thick
anode grid	0.035 inches thick
nylon spacer	0.053 inches thick
cathode screen	0.045 inches thick,

for an overall emitter thickness of 0.231 inches thick inches.

If a more powerful emitter is desired, it is within the scope of this invention to repeat the sequence of stacking. For example, an embodiment may easily be constructed with this sequence: cathode, spacer, anode, spacer, cathode, spacer, anode, spacer, cathode, spacer, anode, spacer, cathode. The number of layers in the sandwich is limited only by the power requirements acceptable for an application.

EXAMPLE 5

Effect of Superoxygenated Water on the Growth of Plants

It is known that oxygen is important for the growth of plants. Although plants evolve oxygen during photosynthesis, they also have a requirement for oxygen for respiration. Oxygen is evolved in the leaves of the plants, while often the roots are in a hypoxic environment without enough oxygen to support optimum respiration, which can be reflected in less than optimum growth and nutrient utilization. Hydroponically grown plants are particularly susceptible to oxygen deficit in the root system. U.S. Pat. No. 5,887,383 describes a liquid supply pump unit for hydroponic cultures which attain oxygen enrichment by sparging with air. Such a method has high energy requirements and is noisy. Furthermore, while suitable for self-contained hydroponic culture, the apparatus is not usable for field irrigation. In a report available on the web, it was shown that hydroponically grown cucumbers and tomatoes supplied with water oxygenated with a device similar to that described in the '429 patent had increased biomass of about 12% and 17% respectively. It should be noted that when sparged with air, the water may become saturated with oxygen, but it is unlikely that the water is superoxygenated.

A. Superoxygenated Water in Hydroponic Culture.

Two small hydroponic systems were set up to grow two tomato plants. Circulation protocols were identical except that the 2 ½ gallon water reservoir for the Control plant was eroated with and aquarium bubbler and that for the Test plant was oxygenated with a five-inch strip emitter for two minutes prior to pumping. The cycle was set at four minutes of pumping, followed by four minutes of rest. The control water had an oxygen content of about 97% to 103% saturation, that is, it was saturated with oxygen. The test water had an oxygen content of about 153% to 165% saturation, that is, it was supersaturated. The test plant was at least four times the volume of the control plant and began to show what looked like fertilizer burn. At that point the fertilizer for the Test plant was reduced by half. Since the plants were not exposed to natural light but to continuous artificial light in an indoor environment without the natural means of fertilization (wind and/or insects), the experiment was discontinued after three months. At that time, the Test plant but not the Control plant had blossomed.

B. Superoxygenated Water in Field Culture.

A pilot study was designed to ascertain that plants outside the hydroponic culture facility would benefit from the application of oxygen. It was decided to use water treated with the emitter of Example 1 as the oxygen carrier. Since water so treated is supersaturated, it is an excellent carrier of oxygen.

Tomato seeds (Burpee "Big Boy") were planted in one-inch diameter peat and dirt plugs encased in cheese cloth and placed in a tray in a southwest window. Controls were watered once a day with tap water ("Control") or oxygenated water ("Test"). Both Controls and Test sprouted at one week. After five weeks, the Test plants were an average of 11 inches tall while the Controls were an average of nine inches tall. At this time, May 10, when the threat of frost in Minnesota was minimal, the plants were transplanted to 13 inch diameter pots with drainage holes. Four inches of top soil was added to each pot, topped off with four inches of Scott's Potting Soil. The pots were placed outside in a sunny area with at least eight hours a day of full sun. The plants were watered as needed with either plain tap water (Control) or oxygenated water (Test). The oxygenated water was produced by use of the emitter of Example 1 run for one-half hour in a five-gallon container of water. Previous experiments showed that water thus treated had an oxygen content from 160% to 260% saturation. The Test plants flowered on June 4, while the Controls did not flower until June 18. For both groups, every plant in the group first had flowers on the same day. All plants were fertilized on July 2 and a soaker hose provided because the plants were now so big that watering by hand was difficult. The soaker hose was run for one half to one hour each morning, depending on the weather, to a point at which the soil was saturated with water. One half hour after the soaker hose was turned off, about 750 ml of superoxygenated water was applied to each of the Test plants.

The Test plants were bushier than the Controls although the heights were similar. At this time, there were eight Control plants and seven Test plants because one of the Test plants broke in a storm. On July 2, the control plants averaged about 17 primary branches from the vine stem, while the control plants averaged about 13 primary branches from the vine stem. As the tomatoes matured, each was weighed on a kitchen scale at harvest. The yield history is shown in Table II.

TABLE II

Week of:	Control, grams tomatoes from eight plants/ cumulative total		Test, grams tomatoes from seven plants/ cumulative total	
July 27	240		400	
August 3	180	420	2910	3310
August 10	905	1325	1830	5140
August 17	410	1735	2590	7730
August 24	3300	5035	2470	10200
August 31	4150	9175	1580	11780
September 15	not weighed		3710	15490
Final Harvest September 24	6435	15620	8895	24385

The total yield for the eight Control plants was 15620 grams or 1952 grams of tomatoes per plant.

The total yield for the seven Test plants was 24385 grams or 3484 grams of tomatoes per plant, an increase in yield of about 79% over the Control plants.

FIG. **6** shows the cumulative total as plotted against time. Not only did the Test plants blossom and bear fruit earlier, but that the Control plants never caught up to the test plants in the short Minnesota growing season. It should be noted that the experiment was terminated because of predicted frost. All fruits, both green and red, were harvested and weighed at that point.

EXAMPLE 6

Flow-Through Emitter for Agricultural Use

In order to apply the findings of example 5 to agricultural uses, an emitter than can oxygenate running water efficiently was developed. In FIG. 7(A), the oxygenation chamber is comprised of three anodes **1** and cathodes **2**, of appropriate size to fit inside a tube or hose and separated by the critical distance are placed within a tube or hose **3** at 120° angles to each other. The anodes and cathodes are positioned with stabilizing hardware **4**. The stabilizing hardware, which can be any configuration such as a screw, rod or washer, is preferably formed from stainless steel. FIG. 7(B) shows a plan view of the oxygenation chamber with stabilizing hardware **4** serving as a connector to the power source and stabilizing hardware **5** serving as a connector to the power source. The active area is shown at **6**.

This invention is not limited to the design selected for this embodiment. Those skilled in the art can readily fabricate any of the emitters shown in FIG. **4** or **5**, or can design other embodiments that will oxygenate flowing water. One useful embodiment is the "T" model, wherein the emitter unit is set in a side arm. The emitted bubbles are swept into the water flow. The unit is detachable for easy servicing. Table III shows several models of flow through emitters. The voltage and flowrates were held constant and the current varied. The Dissolved oxygen (DO) from the source was 7.1 mg/liter. The starting temperature was 12.2° C. but the flowing water cooled slightly to 11 or 11.5° C. Without undue experimentation, anyone may easily select the embodiment that best suits desired characteristics from Table III or designed with the teachings of Table III.

continuous application of oxygen than did the tomato plants of Example 5, which were given superoxygenated water only once a day.

EXAMPLE 7

Treatment of Waste Water

Waste water, with a high organic content, has a high BOD, due to the bacterial flora. It is desirable to raise the oxygen content of the waste water in order to cause the flora to flocculate. However, it is very difficult to effectively oxygenate such water. Using a 4 inch OEM (see Table I) with a 12 volt battery, four liters of waste water in a five gallon pail were oxygenated. As shown in FIG. **8**, the dissolved oxygen went from 0.5 mg/l to 10.8 mg/l in nine minutes.

Those skilled in the art will readily comprehend that variations, modifications and additions may in the embodiments described herein may be made. Therefore, such variations, modifications and additions are within the scope of the appended claims.

The invention claimed is:

1. A method for treating waste water comprising;

providing a flow-through oxygenator comprising an emitter for electrolytic generation of microbubbles of oxygen comprising an anode separated at a critical distance from a cathode and a power source all in electrical communication with each other,

placing the emitter within a conduit; and

passing waste water through the conduit.

2. An emitter for electrolytic generation of microbubbles of oxygen in an aqueous medium comprising: an anode separated at a critical distance from a cathode, a nonconductive

TABLE III

MODEL	ACTIVE ELECTRODE AREA, SQ.IN.	VOLTAGE	CURRENT, AMPS.	FLOW RATE GAL/MINUTE	DO OF* SAMPLE AT ONE MINUTE
2-Inch "T"	2	28.3	0.72	12	N/A
3-inch "T"	3	28.3	1.75	12	N/A
2-plate Tube	20	28.3	9.1	12	8.4
3-Plate tube	30	28.3	12.8	12	9.6

*As the apparatus runs longer, the flowing water becomes milky, indicating supersaturation. The one-minute time point shows the rapid increase in oxygenation.

The following plants will be tested for response to superoxygenated water: grape vines, lettuce, and radishes in three different climate zones. The operators for these facilities will be supplied with units for drip irrigation. Drip irrigation is a technique wherein water is pumped through a pipe or hose with perforations at the site of each plant to be irrigated. The conduit may be underground or above ground. Since the water is applied directly to the plant rather than wetting the entire field, this technique is especially useful in arid climates or for plants requiring high fertilizer applications.

The superoxygenated water will be applied by drip irrigation per the usual protocol for the respective plants. Growth and yield will be compared to the same plants given only the usual irrigation water. Pest control and fertilization will be the same between test and control plants, except that the operators of the experiments will be cautioned to be aware of the possibility of fertilizer burn in the test plants and to adjust their protocols accordingly.

It is expected that the superoxygenated plants with drip irrigation will show more improved performance with more

spacer maintaining the separation of the anode and cathode, the nonconductive spacer having a spacer thickness between 0.005 to 0.050 inches such that the critical distance is less than 0.060 inches and a power source all in electrical communication with each other, wherein the critical distance results in the formation of oxygen bubbles having a bubble diameter less than 0.0006 inches, said oxygen bubbles being incapable of breading the surface tension of the aqueous medium such that said aqueous medium is supersaturated with oxygen.

3. The emitter of claim **2**, wherein the anode is a metal or a metallic oxide or a combination of a metal and a metallic oxide.

4. The emitter of claim **2**, wherein the anode is platinum and iridium oxide on a support.

5. The emitter of claim **2**, wherein the cathode is a metal or metallic oxide or a combination of a metal and a metallic oxide.

6. The emitter of claim **2**, wherein the critical distance is 0.005 to 0.060 inches.

7. The emitter of claim **2**, comprising a plurality of anodes separated at the critical distance from a plurality of cathodes.

8. A method for oxygenating a non-native habitat for temporarily keeping aquatic animals, comprising:

inserting the emitter of claim **2** into the aqueous medium, the non-native habitat comprising an aquarium, a bait bucket or a live well.

9. A method for lowering the biologic oxygen demand of polluted water comprising:

passing the polluted water through a vessel containing the emitter of claim **2**.

10. A supersaturated aqueous product formed with the emitter of claim **2**, the supersaturated aqueous product having an approximately neutral pH.

11. The emitter of claim **2**, further comprising a timer control.

12. The emitter of claim **2**, wherein the anode and cathode are arranged such that the emitter assumes a funnel or pyramidal shaped emitter.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,670,495 B2
APPLICATION NO. : 12/023431
DATED : March 2, 2010
INVENTOR(S) : Senkiw

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 10, Line 55:
Delete "breading" and insert --breaking--.

Signed and Sealed this

First Day of June, 2010

David J. Kappos

David J. Kappos
Director of the United States Patent and Trademark Office

Exhibit B

US007396441B2

(12) **United States Patent**
Senkiw

(10) **Patent No.: US 7,396,441 B2**
(45) **Date of Patent: *Jul. 8, 2008**

(54) **FLOW-THROUGH OXYGENATOR**

(75) Inventor: **James Andrew Senkiw**, Minneapolis, MN (US)

(73) Assignee: **Aqua Innovations, Inc.**, Minnetonka, MN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 7 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **10/732,326**

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(65) **Prior Publication Data**

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Related U.S. Application Data

(63) Continuation-in-part of application No. 10/372,017, filed on Feb. 21, 2003, now Pat. No. 6,689,262.

(60) Provisional application No. 60/358,534, filed on Feb. 22, 2002.

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C25B 1/02 (2006.01)
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C02F 1/00 (2006.01)

(52) **U.S. Cl.** **204/278**; 204/242; 204/275.1; 204/232; 204/286.1; 204/554; 204/660; 205/633; 205/742; 210/243; 210/748

(58) **Field of Classification Search** 205/628–639, 205/742; 204/242, 245, 275.1, 278.5, 290.1, 204/232, 278, 286.1, 554, 660; 210/243, 210/748
See application file for complete search history.

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(Continued)

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Effect of Oxygenated Water on the Growth and Biomass Development of Seedless Cucumbers and Tomato Seedlings under Greenhouse Conditions: Mohyuddin Mirza et al. www.seair.ca, 2003.

Primary Examiner—Roy King
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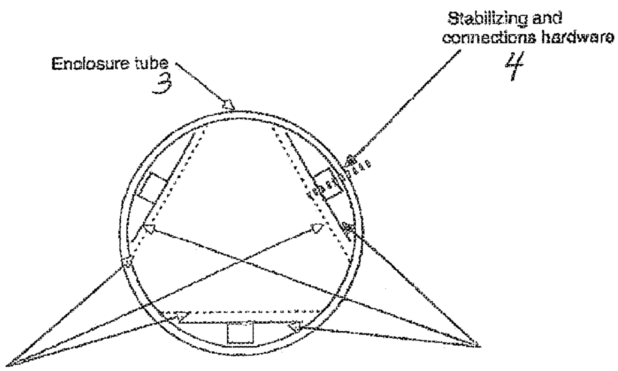
(74) *Attorney, Agent, or Firm*—Patterson, Thuente, Skaar & Christensen, P.A.

(57) **ABSTRACT**

An oxygen emitter which is an electrolytic cell is disclosed. When the anode and cathode are separated by a critical distance, very small microbubbles and nanobubbles of oxygen are generated. The very small oxygen bubbles remain in suspension, forming a solution supersaturated in oxygen. A flow-through model for oxygenating flowing water is disclosed. The use of supersaturated water for enhancing the growth of plants is disclosed. Methods for applying supersaturated water to plants manually, by drip irrigation or in hydroponic culture are described. The treatment of waste water by raising the dissolved oxygen with the use of an oxygen emitter is disclosed.

17 Claims, 8 Drawing Sheets



U.S. PATENT DOCUMENTS

5,534,143	A	7/1996	Portier et al.	
5,982,609	A	11/1999	Evans	
6,171,469	B1 *	1/2001	Hough et al.	205/743
6,315,886	B1	11/2001	Zappi et al.	
6,328,875	B1 *	12/2001	Zappi et al.	205/500
6,394,429	B2	5/2002	Ganan-Calvo	
6,689,262	B2	2/2004	Senkiw	
2002/0074237	A1 *	6/2002	Takesako et al.	205/628

FOREIGN PATENT DOCUMENTS

WO	WO 03/072507	A1	9/2003

* cited by examiner

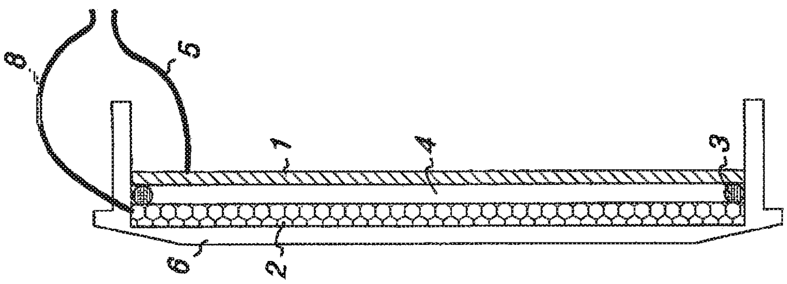


Fig. 1B

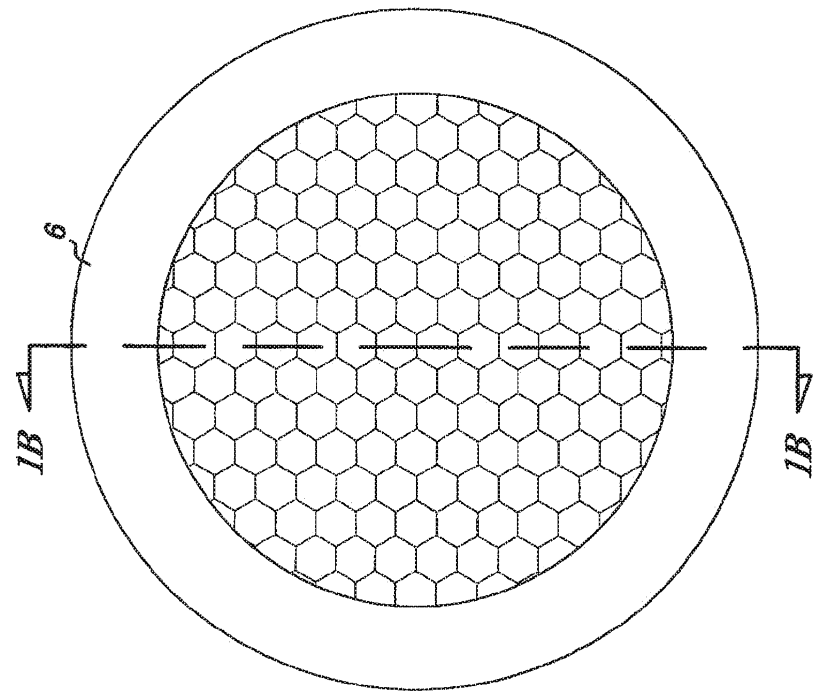


Fig. 1A

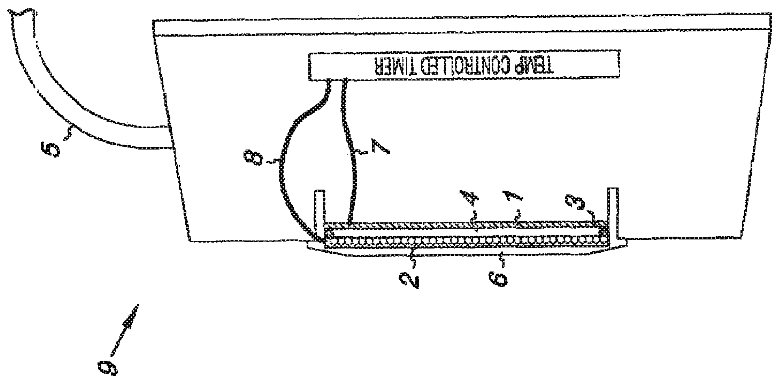


Fig. 2B

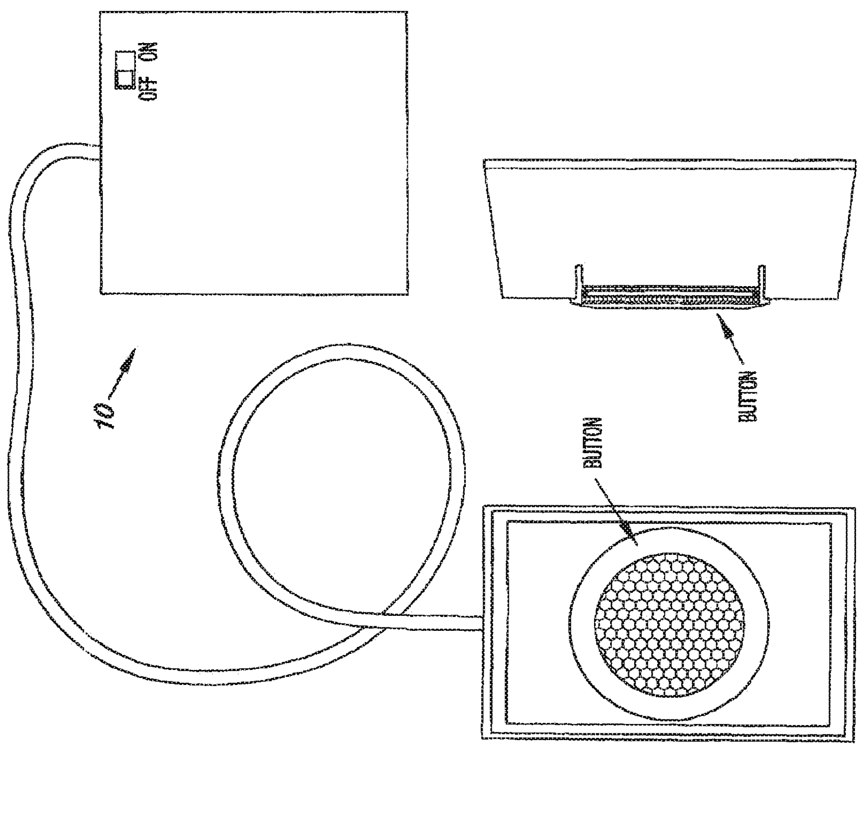


Fig. 2A

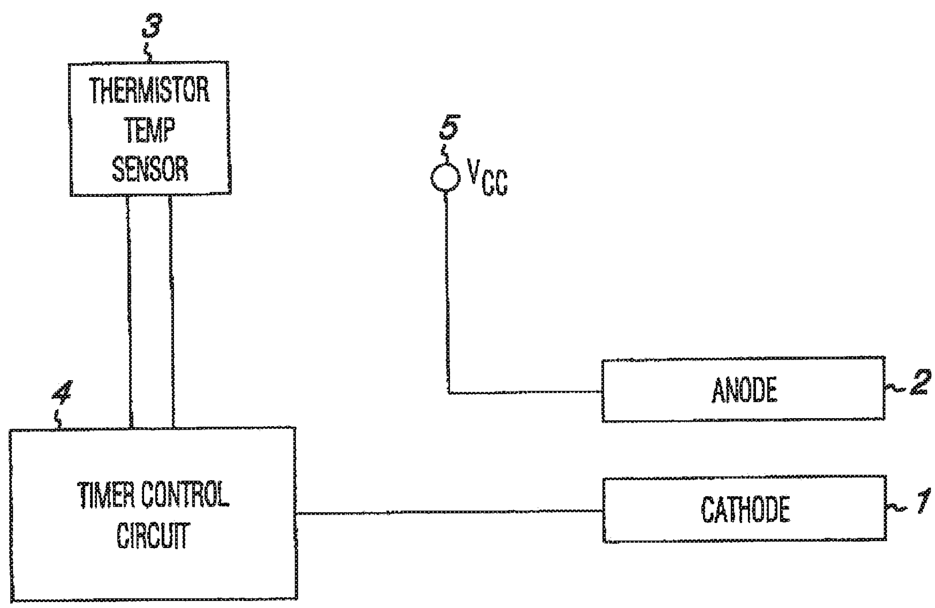

3
THERMISTOR TEMP SENSOR
5
VCC
ANODE
2
4
TIMER CONTROL CIRCUIT
CATHODE
1

Fig. 3

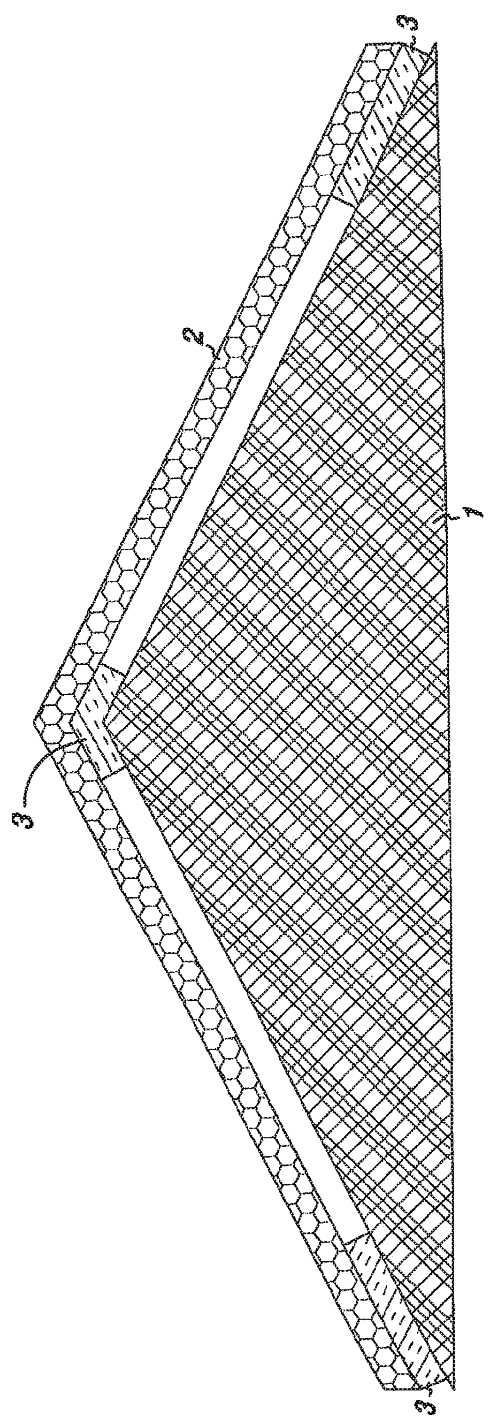


Fig. 4

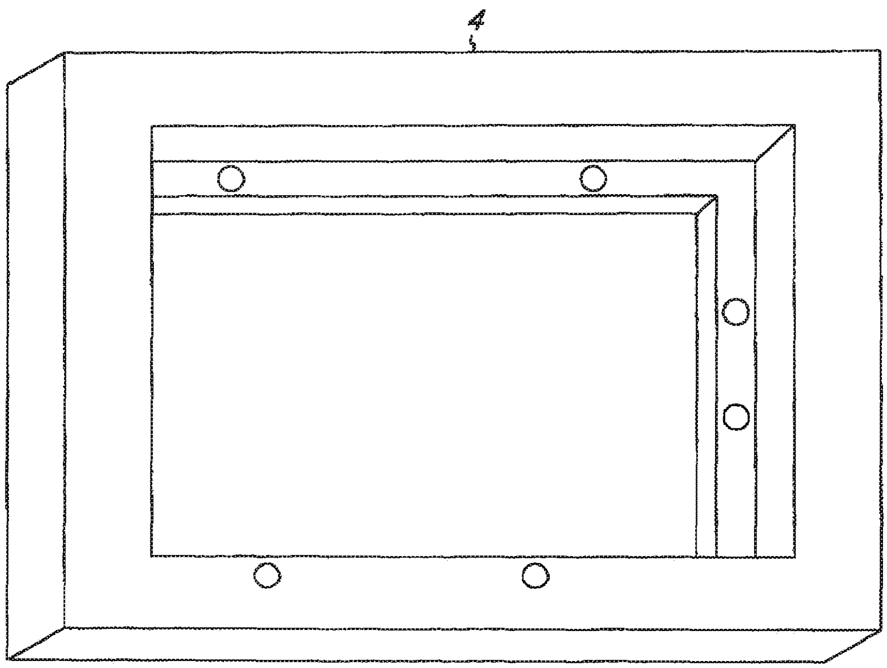


Fig. 5B

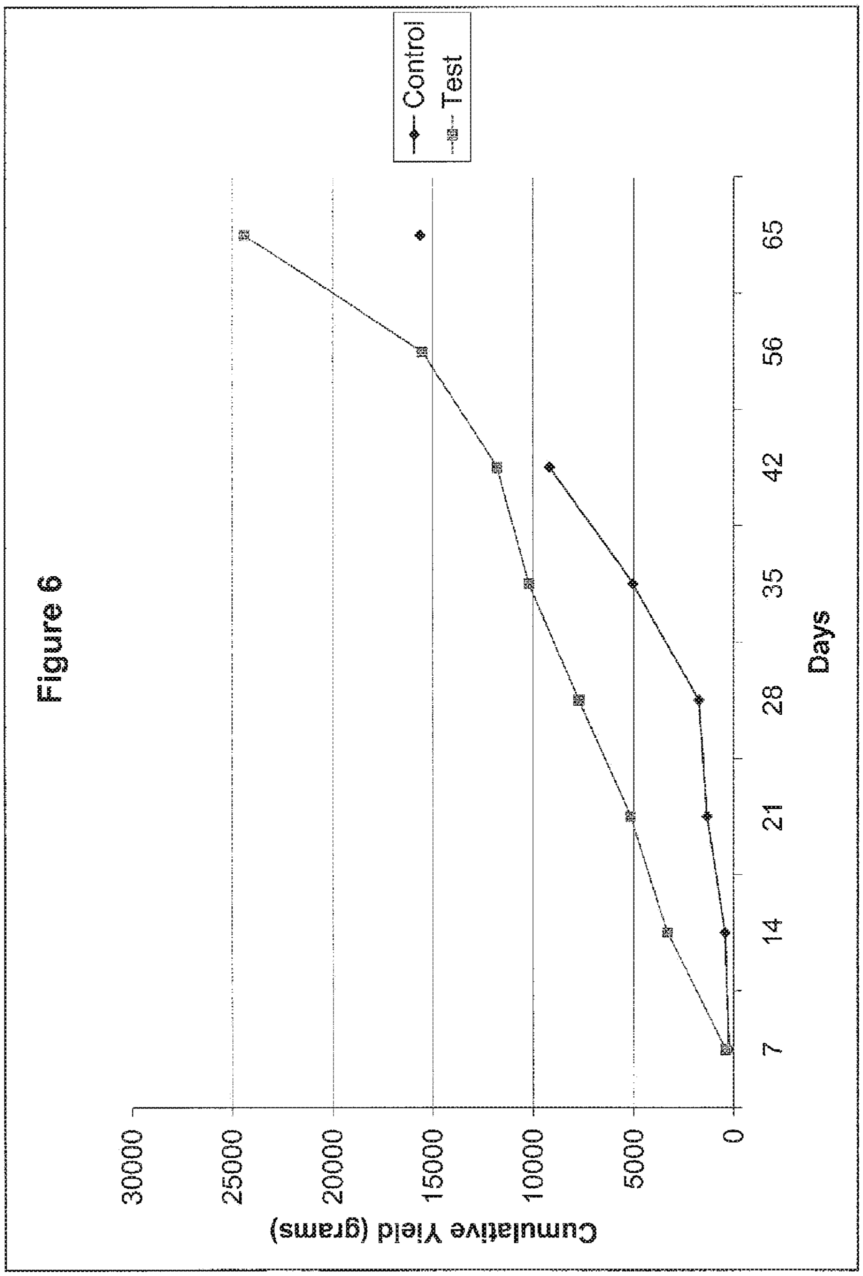
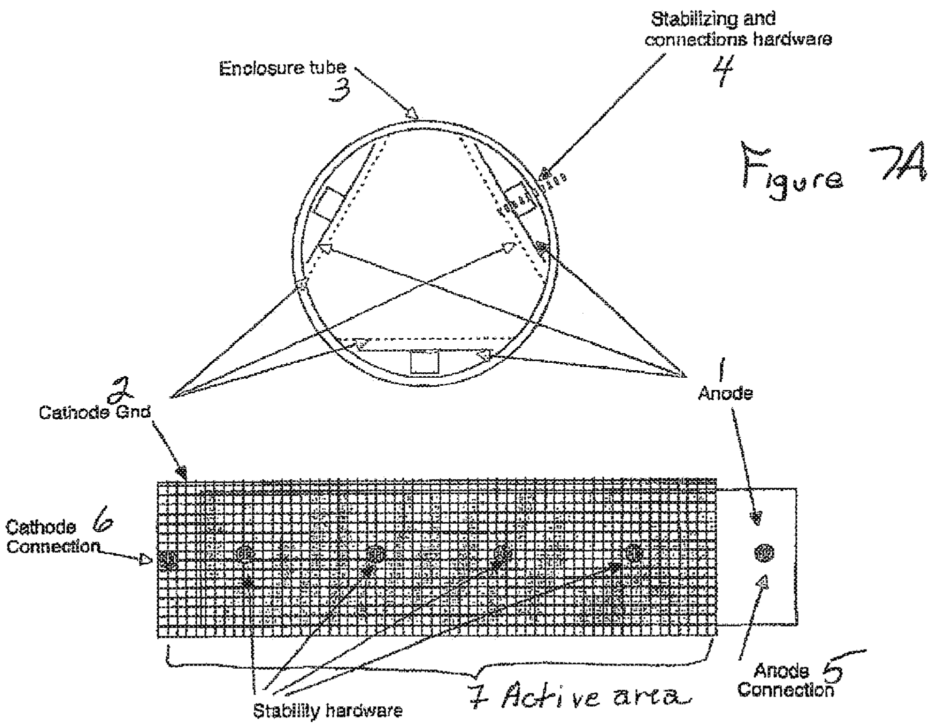

Control
Test
Cumulative Yield (grams)
30000
25000
20000
15000
10000
5000
0
7
14
21
28
35
42
56
65
Days

Figure 6

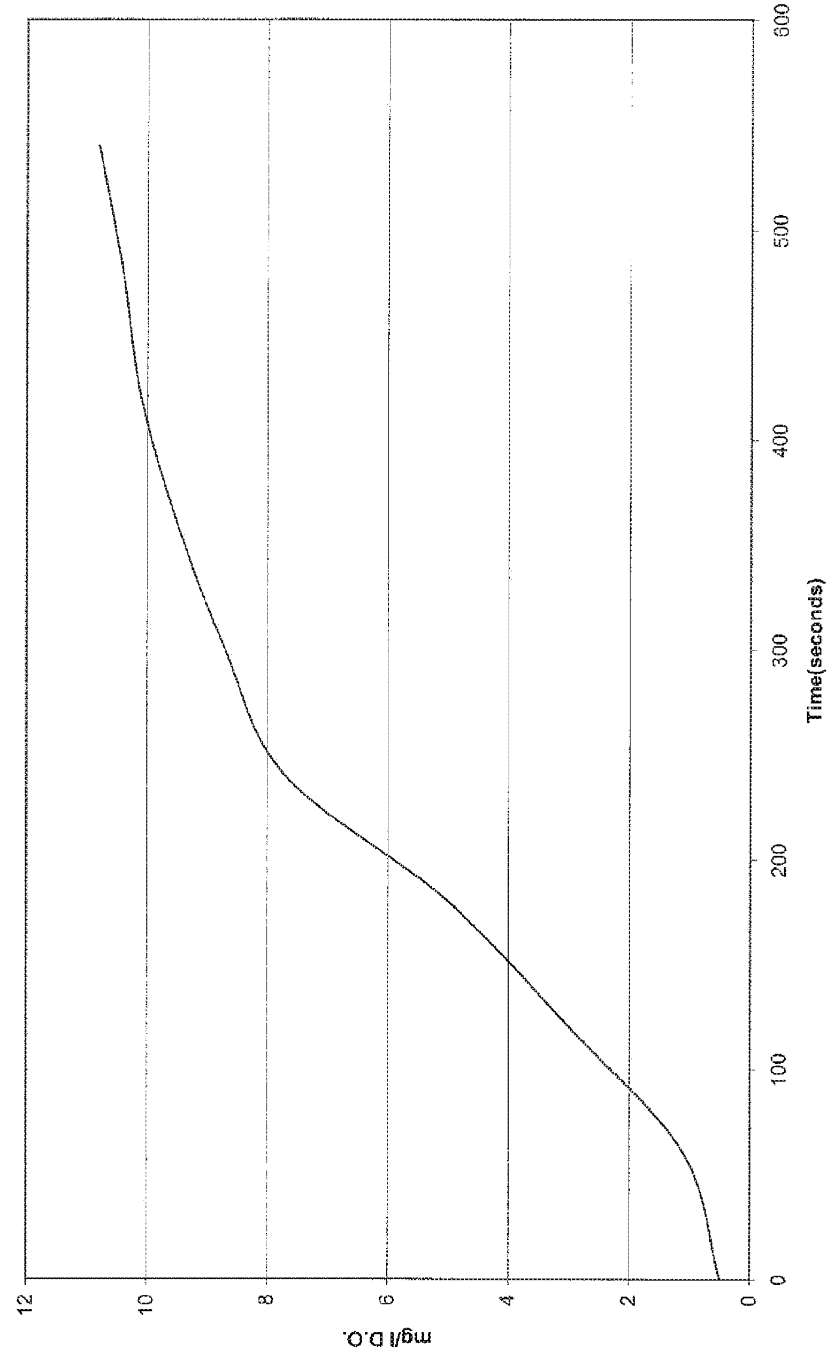
3 Element Flow Through Oxygenation Chamber



Depending on requirements tube can contain 1 2 3 4 or more elements.

Figure 7B

Fig. 8 Time vs D.O.



FLOW-THROUGH OXYGENATOR

RELATED APPLICATIONS

This application is a continuation-in-part of U.S. patent application Ser. No. 10/372,017, filed on Feb. 21, 2003, now U.S. Pat. No. 6,689,262, issued Feb. 10, 2004, which claims priority to U.S. Provisional Patent Application No. 60/358, 534, filed Feb. 22, 2002.

FIELD OF THE INVENTION

This invention relates to the electrolytic generation of microbubbles of oxygen for increasing the oxygen content of flowing water. This invention also relates to the use of super-oxygenated water to enhance the growth and yield of plants. The flow-through model is useful for oxygenating water for hydroponic plant culture, drip irrigation and waste water treatment.

BACKGROUND OF THE INVENTION

Many benefits may be obtained through raising the oxygen content of aqueous media. Efforts have been made to achieve higher saturated or supersaturated oxygen levels for applications such as the improvement of water quality in ponds, lakes, marshes and reservoirs, the detoxification of contaminated water, culture of fish, shrimp and other aquatic animals, biological culture and hydroponic culture. For example, fish held in a limited environment such as an aquarium, a bait bucket or a live hold tank may quickly use up the dissolved oxygen in the course of normal respiration and are then subject to hypoxic stress, which can lead to death. A similar effect is seen in cell cultures, where the respiring cells would benefit from higher oxygen content of the medium. Organic pollutants from agricultural, municipal and industrial facilities spread through the ground and surface water and adversely affect life forms. Many pollutants are toxic, carcinogenic or mutagenic. Decomposition of these pollutants is facilitated by oxygen, both by direct chemical detoxifying reactions or by stimulating the growth of detoxifying microflora. Contaminated water is described as having an increased biological oxygen demand (BOD) and water treatment is aimed at decreasing the BOD so as to make more oxygen available for fish and other life forms.

The most common method of increasing the oxygen content of a medium is by sparging with air or oxygen. While this is a simple method, the resulting large bubbles produced simply break the surface and are discharged into the atmosphere. Attempts have been made to reduce the size of the bubbles in order to facilitate oxygen transfer by increasing the total surface area of the oxygen bubbles. U.S. Pat. No. 5,534, 143 discloses a microbubble generator that achieves a bubble size of about 0.10 millimeters to about 3 millimeters in diameter. U.S. Pat. No. 6,394,429 ("the '429 patent") discloses a device for producing microbubbles, ranging in size from 0.1 to 100 microns in diameter, by forcing air into the fluid at high pressure through a small orifice.

When the object of generating bubbles is to oxygenate the water, either air, with an oxygen content of about 21%, or pure oxygen may be used. The production of oxygen and hydrogen by the electrolysis of water is well known. A current is applied across an anode and a cathode which are immersed in an aqueous medium. The current may be a direct current from a battery or an AC/DC converter from a line. Hydrogen gas is produced at the cathode and oxygen gas is produced at the anode. The reactions are:

AT THE CATHODE:	$4H_2O + 4e^- \rightarrow 4OH^- + 2H_2$
AT THE ANODE:	$2H_2O \rightarrow O_2 + 4H^+ + 4e^-$
NET REACTION:	$6H_2O \rightarrow 4OH^- + 4H^+ + 2H_2 + O_2$

286 kilojoules of energy is required to generate one mole of oxygen.

The gasses form bubbles which rise to the surface of the fluid and may be collected. Either the oxygen or the hydrogen may be collected for various uses. The "electrolytic water" surrounding the anode becomes acidic while the electrolytic water surrounding the cathode becomes basic. Therefore, the electrodes tend to foul or pit and have a limited life in these corrosive environments.

Many cathodes and anodes are commercially available. U.S. Pat. No. 5,982,609 discloses cathodes comprising a metal or metallic oxide of at least one metal selected from the group consisting of ruthenium, iridium, nickel, iron, rhodium, rhenium, cobalt, tungsten, manganese, tantalum, molybdenum, lead, titanium, platinum, palladium and osmium. Anodes are formed from the same metallic oxides or metals as cathodes. Electrodes may also be formed from alloys of the above metals or metals and oxides co-deposited on a substrate. The cathode and anodes may be formed on any convenient support in any desired shape or size. It is possible to use the same materials or different materials for both electrodes. The choice is determined according to the uses. Platinum and iron alloys ("stainless steel") are often preferred materials due to their inherent resistance to the corrosive electrolytic water. An especially preferred anode disclosed in U.S. Pat. No. 4,252,856 comprises vacuum deposited iridium oxide.

Holding vessels for live animals generally have a high population of animals which use up the available oxygen rapidly. Pumps to supply oxygen have high power requirements and the noise and bubbling may further stress the animals. The available electrolytic generators likewise have high power requirements and additionally run at high voltages and produce acidic and basic water which are detrimental to live animals. Many of the uses of oxygenators, such as keeping bait or caught fish alive, would benefit from portable devices that did not require a source of high power. The need remains for quiet, portable, low voltage means to oxygenate water.

It has also been known that plant roots are healthier when oxygenated water is applied. It is thought that oxygen inhibits the growth of deleterious fungi. The water sparged with air as in the '429 patent was shown to increase the biomass of hydroponically grown cucumbers and tomatoes by about 15%.

The need remains for oxygenator models suitable to be placed in-line in water distribution devices so as to be applied to field as well as hydroponic culture.

SUMMARY OF THE INVENTION

This invention provides an oxygen emitter which is an electrolytic cell which generates very small microbubbles and nanobubbles of oxygen in an aqueous medium, which bubbles are too small to break the surface tension of the medium, resulting in a medium supersaturated with oxygen.

The electrodes may be a metal or oxide of at least one metal selected from the group consisting of ruthenium, iridium, nickel, iron, rhodium, rhenium, cobalt, tungsten, manganese, tantalum, molybdenum, lead, titanium, platinum, palladium

and osmium or oxides thereof. The electrodes may be formed into open grids or may be closed surfaces. The most preferred cathode is a stainless steel mesh. The most preferred mesh is a 1/16 inch grid. The most preferred anode is platinum and iridium oxide on a support. A preferred support is titanium.

In order to form microbubbles and nanobubbles, the anode and cathode are separated by a critical distance. The critical distance ranges from 0.005 inches to 0.140 inches. The preferred critical distance is from 0.045 to 0.060 inches.

Models of different size are provided to be applicable to various volumes of aqueous medium to be oxygenated. The public is directed to choose the applicable model based on volume and power requirements of projected use. Those models with low voltage requirements are especially suited to oxygenating water in which animals are to be held.

Controls are provided to regulate the current and timing of electrolysis.

A flow-through model is provided which may be connected in-line to a watering hose or to a hydroponic circulating system. The flow-through model can be formed into a tube with triangular cross-section. In this model, the anode is placed toward the outside of the tube and the cathode is placed on the inside, contacting the water flow. Alternatively, the anodes and cathodes may be in plates parallel to the long axis of the tube, or may be plates in a wafer stack. Alternately, the electrodes may be placed in a side tube ("T" model) out of the direct flow of water. Protocols are provided to produce superoxygenated water at the desired flow rate and at the desired power usage. Controls are inserted to activate electrolysis when water is flowing and deactivate electrolysis at rest.

This invention includes a method to promote growth and increase yield of plants by application of superoxygenated water. The water treated with the emitter of this invention is one example of superoxygenated water. Plants may be grown in hydroponic culture or in soil. The use of the flow-through model for drip irrigation of crops and waste water treatment is disclosed.

DESCRIPTION OF THE DRAWINGS

FIG. **1**A is a plan view of an O_2 emitter of the invention.

FIG. **1**B is a section view of the O_2 emitter of FIG. **1**A taken at line **1**B-**1**B of FIG. **1**A.

FIG. **2**A is a plan view of an assembled O_2 emitting device.

FIG. **2**B is a perspective view of the assembled O2 emitting device of FIG. **2**A.

FIG. **3** is a diagram of the electronic controls of the O_2 emitter.

FIG. **4** shows a funnel or pyramid variation of the O_2 emitter.

FIG. **5** shows a multilayer sandwich O_2 emitter.

FIG. **6** shows the yield of tomato plants watered with superoxygenated water.

FIG. **7**A is a cross section showing arrangement of three plate electrodes.

FIG. **7**B is a longitudinal section showing the points of connection to the power source.

FIG. **8** is a graph showing the oxygenation of waste water.

DETAILED DESCRIPTION OF THE INVENTION

Definitions:

For the purpose of describing the present invention, the following terms have these meanings:

"Critical distance" means the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles.

"Critical distance" means the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles.

"O_2 emitter" means a cell comprised of at least one anode and at least one cathode separated by the critical distance.

"Metal" means a metal or an alloy of one or more metals.

"Microbubble" means a bubble with a diameter less than 50 microns.

"Nanobubble" means a bubble with a diameter less than that necessary to break the surface tension of water. Nanobubbles remain suspended in the water, giving the water an opalescent or milky appearance.

"Supersaturated" means oxygen at a higher concentration than normal calculated oxygen solubility at a particular temperature and pressure.

"Superoxygenated water" means water with an oxygen content at least 120% of that calculated to be saturated at a temperature.

"Water" means any aqueous medium with resistance less than one ohm per square centimeter; that is, a medium that can support the electrolysis of water. In general, the lower limit of resistance for a medium that can support electrolysis is water containing more than 2000 ppm total dissolved solids.

The present invention produces microbubbles and nanobubbles of oxygen via the electrolysis of water. As molecular oxygen radical (atomic weight 8) is produced, it reacts to form molecular oxygen, O_2. In the special dimensions of the invention, as explained in more detail in the following examples, O_2 forms bubbles which are too small to break the surface tension of the fluid. These bubbles remain suspended indefinitely in the fluid and, when allowed to build up, make the fluid opalescent or milky. Only after several hours do the bubbles begin to coalesce on the sides of the container and the water clears. During that time, the water is supersaturated with oxygen. In contrast, the H_2 formed readily coalesces into larger bubbles which are discharged into the atmosphere, as can be seen by bubble formation at the cathode.

The first objective of this invention was to make an oxygen emitter with low power demands, low voltage and low current for use with live animals. For that reason, a small button emitter was devised. The anode and cathode were set at varying distances. It was found that electrolysis took place at very short distances before arcing of the current occurred. Surprisingly, at slightly larger distances, the water became milky and no bubbles formed at the anode, while hydrogen continued to be bubbled off the cathode. At distance of 0.140 inches between the anode and cathode, it was observed that the oxygen formed bubbles at the anode. Therefore, the critical distance for microbubble and nanobubble formation was determined to be between 0.005 inches and 0.140 inches.

EXAMPLE 1

Oxygen Emitter

As shown in FIGS. **1**A, **1**B, **2**A and **2**B, the oxygen evolving anode **1** selected as the most efficient is an iridium oxide coated single sided sheet of platinum on a support of titanium (Eltech, Fairport Harbor, Ohio). The cathode **2** is a {fraction (1/16)}} inch mesh (size 8 mesh) marine stainless steel screen. The anode and cathode are separated by a non-conducting spacer **3** containing a gap **4** for the passage of gas and mixing of anodic and cathodic water and connected to a power source through a connection point **5**. FIG. **2**A shows a plan view of the assembled device. The O.sub.2 emitter **6** with the anode connecting wire **7** and the cathode connecting wire **8** is contained in an enclosure **9**, connected to the battery compartment **10**. The spacer thickness is critical as it sets the critical distance. It must be of sufficient thickness to prevent arcing of the current, but thin enough to separate the electrodes by no more than 0.140 inches. Above that thickness, the power needs are higher and the oxygen bubbles formed at higher voltage will coalesce and escape the fluid. Preferably, the spacer is from 0.005 to 0.075 inches thick. At the lower limits, the emitter tends to foul more quickly. Most preferably, the spacer is about 0.050 inches thick. The spacer may be any nonconductive material such as nylon, fiberglass, Teflon-.RTM. polymer or other plastic. Because of the criticality of the space distance, it is preferable to have a non-compressible spacer. It was found that Buna, with a durometer measure of 60 was not acceptable due to decomposition. Viton, a common fluoroelastomer, has a durometer measure of 90 and was found to hold its shape well.

In operation, a small device with an O_2 emitter 1.485 inches in diameter was driven by 4AA batteries. The critical distance was held at 0.050 inches with a Viton spacer. Five gallons of water became saturated in seven minutes. This size is suitable for raising oxygen levels in an aquarium or bait bucket.

It is convenient to attach a control circuit which comprises a timer that is thermostatically controlled by a temperature sensor which determines the off time for the cathode. When the temperature of the solution changes, the resistance of the thermistor changes, which causes an off time of a certain duration. In cool water, the duration is longer so in a given volume, the emitter generates less oxygen. When the water is warmer and therefore hold less oxygen, the duration of off time is shorter. Thus the device is self-controlled to use power most economically. FIG. **3** shows a block diagram of a timer control with anode **1**, cathode **2**, thermistor temperature sensor **3**, timer control circuit **4** and wire from a direct current power source **5**.

EXAMPLE 2

Measurement of O_2 Bubbles

Attempts were made to measure the diameter of the O_2 bubbles emitted by the device of Example 1. In the case of particles other than gasses, measurements can easily be made by scanning electron microscopy, but gasses do not survive electron microscopy. Large bubble may be measured by pore exclusion, for example, which is also not feasible when measuring a gas bubble. A black and white digital, high contrast, backlit photograph of treated water with a millimeter scale reference was shot of water produced by the emitter of Example 1. About 125 bubbles were seen in the area selected for measurement. Seven bubbles ranging from the smallest clearly seen to the largest were measured. The area was enlarged, giving a scale multiplier of 0.029412.

Recorded bubble diameters at scale were 0.16, 0.22, 0.35, 0.51, 0.76, 0.88 and 1.09 millimeters. The last three were considered outliers by reverse analysis of variance and were assumed to be hydrogen bubbles. When multiplied by the scale multiplier, the assumed O_2 bubbles were found to range from 4.7 to 15 microns in diameter. This test was limited by the resolution of the camera and smaller bubbles in the nanometer range could not be resolved. It is known that white light cannot resolve features in the nanometer size range, so monochromatic laser light may give resolution sensitive enough to measure smaller bubbles. Efforts continue to

increase the sensitivity of measurement so that sub-micron diameter bubbles can be measured.

EXAMPLE 3

Other Models of Oxygen Emitter

Depending on the volume of fluid to be oxygenated, the oxygen emitter of this invention may be shaped as a circle, rectangle, cone or other model. One or more may be set in a substrate that may be metal, glass, plastic or other material. The substrate is not critical as long as the current is isolated to the electrodes by the nonconductor spacer material of a thickness from 0.005 to 0.075 inches, preferably 0.050 inches. It has been noticed that the flow of water seems to be at the periphery of the emitter, while the evolved visible bubbles (H_2) arise at the center of the emitter. Therefore, a funnel or pyramidal shaped emitter was constructed to treat larger volumes of fluid. FIG. **4** is a cross sectional diagram of such an emitter. The anode **1** is formed as an open grid separated from a marine grade stainless steel screen cathode **2** by the critical distance by spacer **3** around the periphery of the emitter and at the apex. This flow-through embodiment is suitable for treating large volumes of water rapidly.

The size may be varied as required. A round emitter for oxygenating a bait bucket may be about 2 inches in diameter, while a 3-inch diameter emitter is adequate for oxygenating a 10 to 40 gallon tank. The live well of a fishing boat will generally hold 40 to 80 gallons of water and require a 4-inch diameter emitter. It is within the scope of this invention to construct larger emitters or to use several in a series to oxygenate larger volumes. It is also within the scope of this invention to vary the model to provide for low voltage and amperage in cases where the need for oxygen is moderate and long lasting or conversely, to supersaturate water very quickly at higher voltage and amperage. In the special dimensions of the present invention, it has been found that a 6 volt battery supplying a current as low as 40 milliamperes is sufficient to generate oxygen. Such a model is especially useful with live plants or animals, while it is more convenient for industrial use to use a higher voltage and current. Table I shows a number of models suitable to various uses.

TABLE I

Emitter Model	Gallons	Volts	Amps Max.	Ave	Watts
Bait keeper	5	6	0.090	0.060	0.36
Livewell	32	12	0.180	0.120	1.44
OEM 2 inch	10	12	0.210	0.120	1.44
Bait store	70	12	0.180	0.180	2.16
Double cycle	2	12	0.180	0.180	2.16
OEM 3 inch	50	12	0.500	0.265	3.48
OEM 4 inch	80	12	0.980	0.410	4.92
Water pail	2	24	1.200	1.200	28.80
Plate	250	12	5.000	2.500	30.00

EXAMPLE 4

Multilayer Sandwich O_2 Emitter

An O_2 emitter was made in a multilayer sandwich embodiment. (FIG. **5**) An iridium oxide coated platinum anode **1** was formed into a grid to allow good water flow and sandwiched between two stainless steel screen cathodes **2**. Spacing was held at the critical distance by nylon spacers **3**. The embodiment illustrated is held in a cassette **4** which is secured by nylon bolt **5** with a nylon washer **6**. The dimensions selected were:

cathode screen	0.045 inches thick
nylon spacer	0.053 inches thick
anode grid	0.035 inches thick
nylon spacer	0.053 inches thick
cathode screen	0.045 inches thick, for an overall emitter thickness of 0.231 inches.

If a more powerful emitter is desired, it is within the scope of this invention to repeat the sequence of stacking. For example, an embodiment may easily be constructed with this sequence: cathode, spacer, anode, spacer, cathode, spacer, anode, spacer, cathode, spacer, anode, spacer, cathode. The number of layers in the sandwich is limited only by the power requirements acceptable for an application.

EXAMPLE 5

Effect of Superoxygenated Water on the Growth of Plants

It is known that oxygen is important for the growth of plants. Although plants evolve oxygen during photosynthesis, they also have a requirement for oxygen for respiration. Oxygen is evolved in the leaves of the plants, while often the roots are in a hypoxic environment without enough oxygen to support optimum respiration, which can be reflected in less than optimum growth and nutrient utilization. Hydroponically grown plants are particularly susceptible to oxygen deficit in the root system. U.S. Pat. No. 5,887,383 describes a liquid supply pump unit for hydroponic cultures which attain oxygen enrichment by sparging with air. Such a method has high energy requirements and is noisy. Furthermore, while suitable for self-contained hydroponic culture, the apparatus is not usable for field irrigation. In a report available on the web, it was shown that hydroponically grown cucumbers and tomatoes supplied with water oxygenated with a device similar to that described in the '429 patent had increased biomass of about 12% and 17% respectively. It should be noted that when sparged with air, the water may become saturated with oxygen, but it is unlikely that the water is superoxygenated.

A. Superoxygenated Water in Hydroponic Culture.

Two small hydroponic systems were set up to grow two tomato plants. Circulation protocols were identical except that the 2½ gallon water reservoir for the Control plant was eroated with and aquarium bubbler and that for the Test plant was oxygenated with a five-inch strip emitter for two minutes prior to pumping. The cycle was set at four minutes of pumping, followed by four minutes of rest. The control water had an oxygen content of about 97% to 103% saturation, that is, it was saturated with oxygen. The test water had an oxygen content of about 153% to 165% saturation, that is, it was supersaturated. The test plant was at least four times the volume of the control plant and began to show what looked like fertilizer burn. At that point the fertilizer for the Test plant was reduced by half. Since the plants were not exposed to natural light but to continuous artificial light in an indoor environment without the natural means of fertilization (wind and/or insects), the experiment was discontinued after three months. At that time, the Test plant but not the Control plant had blossomed.

B. Superoxygenated Water in Field Culture.

A pilot study was designed to ascertain that plants outside the hydroponic culture facility would benefit from the application of oxygen. It was decided to use water treated with the emitter of Example 1 as the oxygen carrier. Since water so treated is supersaturated, it is an excellent carrier of oxygen.

Tomato seeds (Burpee "Big Boy") were planted in one-inch diameter peat and dirt plugs encased in cheese cloth and placed in a tray in a southwest window. Controls were watered once a day with tap water ("Control") or oxygenated water ("Test"). Both Controls and Test sprouted at one week. After five weeks, the Test plants were an average of 11 inches tall while the Controls were an average of nine inches tall. At this time, May 10, when the threat of frost in Minnesota was minimal, the plants were transplanted to 13 inch diameter pots with drainage holes. Four inches of top soil was added to each pot, topped off with four inches of Scott's Potting Soil. The pots were placed outside in a sunny area with at least eight hours a day of full sun. The plants were watered as needed with either plain tap water (Control) or oxygenated water (Test). The oxygenated water was produced by use of the emitter of Example 1 run for one-half hour in a five-gallon container of water. Previous experiments showed that water thus treated had an oxygen content from 160% to 260% saturation. The Test plants flowered on June 4, while the Controls did not flower until June 18. For both groups, every plant in the group first had flowers on the same day. All plants were fertilized on July 2 and a soaker hose provided because the plants were now so big that watering by hand was difficult. The soaker hose was run for one half to one hour each morning, depending on the weather, to a point at which the soil was saturated with water. One half hour after the soaker hose was turned off, about 750 ml of superoxygenated water was applied to each of the Test plants.

The Test plants were bushier than the Controls although the heights were similar. At this time, there were eight Control plants and seven Test plants because one of the Test plants broke in a storm. On July 2, the control plants averaged about 17 primary branches from the vine stem, while the control plants averaged about 13 primary branches from the vine stem. As the tomatoes matured, each was weighed on a kitchen scale at harvest. The yield history is shown in Table II.

TABLE II

Week of:	Control, grams tomatoes from eight plants/ cumulative total		Test, grams tomatoes from seven plants/ cumulative total	
July 27	240		400	
August 3	180	420	2910	3310
August 10	905	1325	1830	5140
August 17	410	1735	2590	7730
August 24	3300	5035	2470	10200
August 31	4150	9175	1580	11780
September 15	not weighed		3710	15490
Final Harvest September 24	6435	15620	8895	24385

The total yield for the eight Control plants was 15620 grams or 1952 grams of tomatoes per plant.

The total yield for the seven Test plants was 24385 grams or 3484 grams of tomatoes per plant, an increase in yield of about 79% over the Control plants.

FIG. **6** shows the cumulative total as plotted against time. Not only did the Test plants blossom and bear fruit earlier, but that the Control plants never caught up to the test plants in the short Minnesota growing season. It should be noted that the experiment was terminated because of predicted frost. All fruits, both green and red, were harvested and weighed at that point.

EXAMPLE 6

Flow-through Emitter for Agricultural Use

In order to apply the findings of example 5 to agricultural uses, an emitter than can oxygenate running water efficiently was developed. In FIG. **7**(A), the oxygenation chamber is comprised of three anodes **1** and cathodes **2**, of appropriate size to fit inside a tube or hose and separated by the critical distance are placed within a tube or hose **3** at 120° angles to each other. The anodes and cathodes are positioned with stabilizing hardware **4**. The stabilizing hardware, which can be any configuration such as a screw, rod or washer, is preferably formed from stainless steel. FIG. **7**(B) shows a plan view of the oxygenation chamber with stabilizing hardware **4** serving as a connector to the power source and stabilizing hardware **5** serving as a connector to the power source. The active area is shown at **6**.

This invention is not limited to the design selected for this embodiment. Those skilled in the art can readily fabricate any of the emitters shown in FIG. **4** or **5**, or can design other embodiments that will oxygenate flowing water. One useful embodiment is the "T" model, wherein the emitter unit is set in a side arm. The emitted bubbles are swept into the water flow. The unit is detachable for easy servicing. Table III shows several models of flow through emitters. The voltage and flowrates were held constant and the current varied. The Dissolved oxygen (DO) from the source was 7.1 mg/liter. The starting temperature was 12.2° C. but the flowing water cooled slightly to 11 or 11.5° C. Without undue experimentation, anyone may easily select the embodiment that best suits desired characteristics from Table III or designed with the teachings of Table III.

TABLE III

MODEL	ACTIVE ELECTRODE AREA, SQ. IN.	VOLTAGE	CURRENT, AMPS	FLOW RATE GAL/MINUTE	DO OF* SAMPLE AT ONE MINUTE
2-inch "T"	2	28.3	0.7	12	N/A
3-inch "T"	3	28.3	1.75	12	N/A
2-plate Tube	20	28.3	9.1	12	8.4
3-Plate tube	30	28.3	12.8	12	9.6

*As the apparatus runs longer, the flowing water becomes milky, indicating supersaturation. The one-minute time point shows the rapid increase in oxygenation.

The following plants will be tested for response to superoxygenated water: grape vines, lettuce, and radishes in three different climate zones. The operators for these facilities will be supplied with units for drip irrigation. Drip irrigation is a technique wherein water is pumped through a pipe or hose with perforations at the site of each plant to be irrigated. The conduit may be underground or above ground. Since the water is applied directly to the plant rather than wetting the entire field, this technique is especially useful in and climates or for plants requiring high fertilizer applications.

The superoxygenated water will be applied by drip irrigation per the usual protocol for the respective plants. Growth and yield will be compared to the same plants given only the usual irrigation water. Pest control and fertilization will be the same between test and control plants, except that the operators of the experiments will be cautioned to be aware of the possibility of fertilizer burn in the test plants and to adjust their protocols accordingly.

It is expected that the superoxygenated plants with drip irrigation will show more improved performance with more continuous application of oxygen than did the tomato plants of Example 5, which were given superoxygenated water only once a day.

EXAMPLE 7

Treatment of Waste Water

Waste water, with a high organic content, has a high BOD, due to the bacterial flora. It is desirable to raise the oxygen content of the waste water in order to cause the flora to flocculate. However, it is very difficult to effectively oxygenate such water. Using a 4 inch OEM (see Table I) with a 12 volt battery, four liters of waste water in a five gallon pail were oxygenated. As shown in FIG. **8**, the dissolved oxygen went from 0.5 mg/l to 10.8 mg/l in nine minutes.

Those skilled in the art will readily comprehend that variations, modifications and additions may in the embodiments described herein may be made. Therefore, such variations, modifications and additions are within the scope of the appended claims.

I claim:

1. A flow through oxygenator comprising:

a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen;

an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including three matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen and each matched set resides at a 120° angle to the adjacent matched sets; and

a power source in electrical communication with the oxygen emitter.

2. The flow through oxygenator of claim **1**, wherein each anode is a metal or a metallic oxide or a combination of a metal and a metallic oxide and each cathode is a metal or metallic oxide or a combination of a metal and a metallic oxide.

3. The flow through oxygenator of claim **1**, wherein the anode and cathode within each matched set are separated by a spacer such to maintain a gap of 0.005 to 0.140 inches between the anode and cathode.

4. The flow through oxygenator of claim **3**, wherein the gap is 0.045 to 0.060 inches.

5. The flow though oxygenator of claim **1** wherein each anode is platinum and iridium oxide on a support and each cathode is a metal or metallic oxide or a combination of a metal and a metallic oxide.

6. The flow though oxygenator of claim **1**, wherein the power source is electrically connected to the stabilizing hardware for powering the plurality of matched sets of anodes and cathodes.

7. The flow through oxygenator of claim **1**, wherein the plurality of matched sets of anodes and cathodes are attached to the stabilizing hardware with the anodes proximate a conduit wall and the cathodes proximate a conduit center.

8. The flow through oxygenator of claim **1**, wherein the plurality of matched sets of anodes and cathodes define plates positioned parallel to a flow axis of the conduit lumen.

9. The flow through oxygenator of claim **1**, wherein each cathode comprises a mesh screen.

10. The flow through oxygenator of claim **1**, further comprising:

a controller selectively operating the power source, such that the power source supplies power to the plurality of matched sets of anodes and cathodes when the aqueous medium is flowing through the conduit lumen and withholds power when the aqueous medium is not flowing through the conduit lumen.

11. The flow through oxygenator of claim **1**, wherein the oxygen emitter is sized to generate oxygen sufficient to form a supersaturated aqueous medium.

12. The flow through oxygenator of claim **1**, wherein the aqueous medium is water.

13. The flow through oxygenator of claim **12**, wherein the oxygen emitter is sized to generate oxygen sufficient to form superoxygenated water.

14. The flow through oxygenator of claim **1**, wherein the fluid conduit is a watering hose.

15. The flow through oxygenator of claim **1**, wherein the fluid conduit is a hydroponic circulating system.

16. A flow through oxygenator comprising:

a watering hose having a hose lumen; and

an oxygen emitter operably mounted within the hose lumen, the oxygen emitter including three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets.

17. A flow though oxygenator comprising:

a hydroponic circulating system having a circulating lumen; and

an oxygen emitter operably mounted within the circulating lumen, the oxygen emitter including three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets.

* * * * *

Exhibit C

US006689262B2

(12) **United States Patent**
Senkiw

(10) **Patent No.:** **US 6,689,262 B2**
(45) **Date of Patent:** **Feb. 10, 2004**

(54) **MICROBUBBLES OF OXYGEN**

(75) Inventor: **James Andrew Senkiw**, Minneapolis, MN (US)

(73) Assignee: **Aqua Innovation, Inc.**, Bloomington, MN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/372,017**

(22) Filed: **Feb. 21, 2003**

(65) **Prior Publication Data**

US 2003/0164306 A1 Sep. 4, 2003

Related U.S. Application Data

(60) Provisional application No. 60/358,534, filed on Feb. 22, 2002.

(51) **Int. Cl.**[7] **C25B 9/00**

(52) **U.S. Cl.** **204/278.5**; 204/272; 204/275.1; 205/755; 205/756; 205/757; 205/758; 205/626; 205/628; 205/633; 205/701

(58) **Field of Search** 205/755, 756, 205/757, 758, 626, 628, 633, 701; 204/255, 256, 263, 266, 270, 272, 275.1, 278.5

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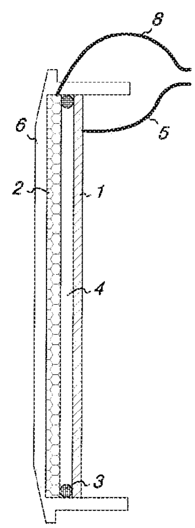
Primary Examiner—Bruce F. Bell
(74) *Attorney, Agent, or Firm*—Kathleen R. Terry

(57) **ABSTRACT**

An oxygen emitter which is an electrolytic cell is disclosed. When the anode and cathode are separated by a critical distance, very small microbubbles and nanobubbles of oxygen are generated. The hydrogen forms bubbles at the cathode, which bubbles rise to the surface. The very small oxygen bubbles remain in suspension, forming a solution supersaturated in oxygen. The electrodes may be a metal or oxide of at least one metal selected from the group consisting of ruthenium, iridium, nickel, iron, rhodium, rhenium, cobalt, tungsten, manganese, tantalum, molybdenum, lead, titanium, platinum, palladium and osmium or oxides thereof. The electrodes may be formed into open grids or may be closed surfaces. The most preferred cathode is a stainless steel mesh. The most preferred mesh is a 1/16 inch grid. The most preferred anode is platinum and iridium oxide on a support. A preferred support is titanium. Models suitable for different uses are disclosed.

14 Claims, 5 Drawing Sheets



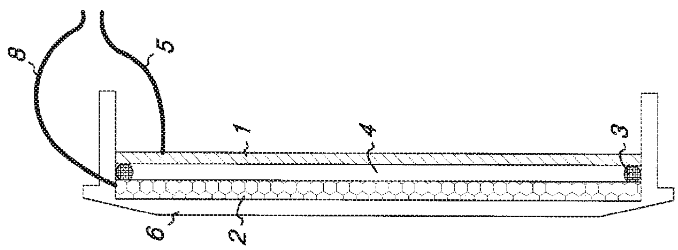


Fig. 1B

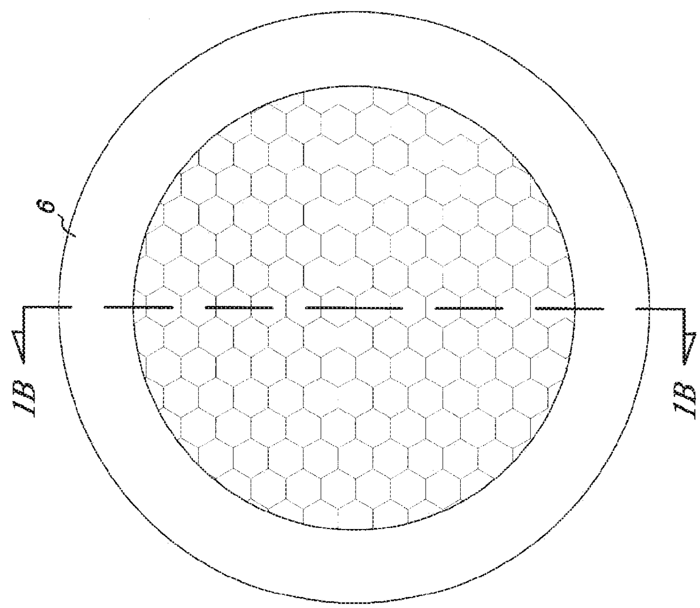


Fig. 1A

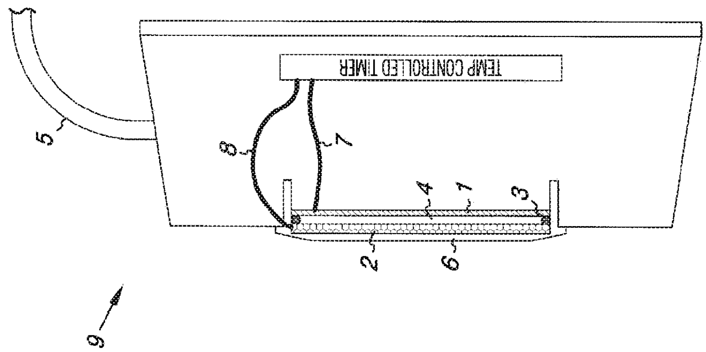


Fig. 2B

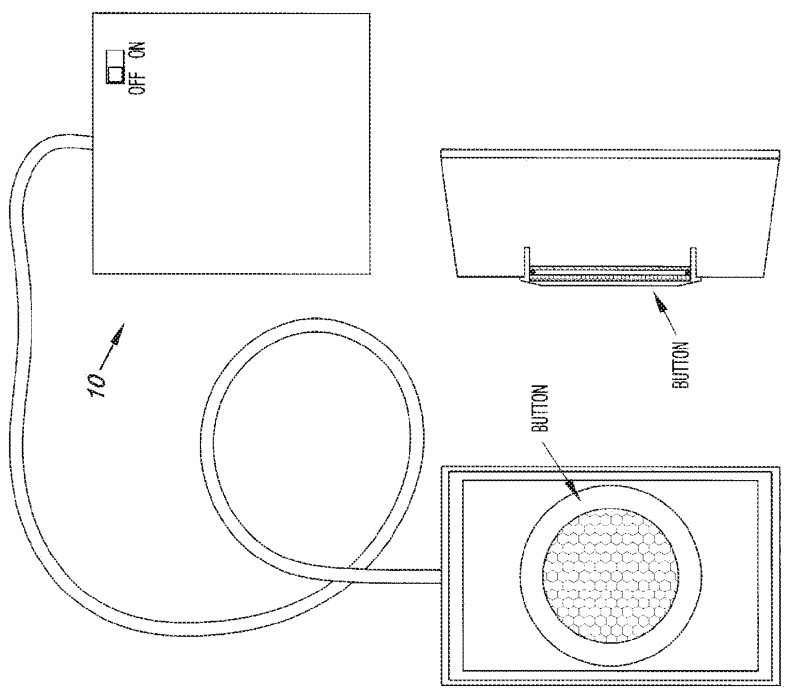


Fig. 2A

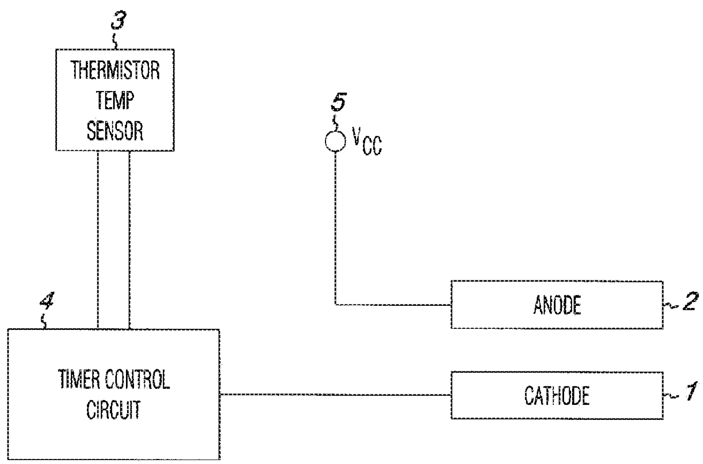

3
THERMISTOR TEMP SENSOR
5
V_{CC}
4
TIMER CONTROL CIRCUIT
ANODE
2
CATHODE
1

Fig. 3

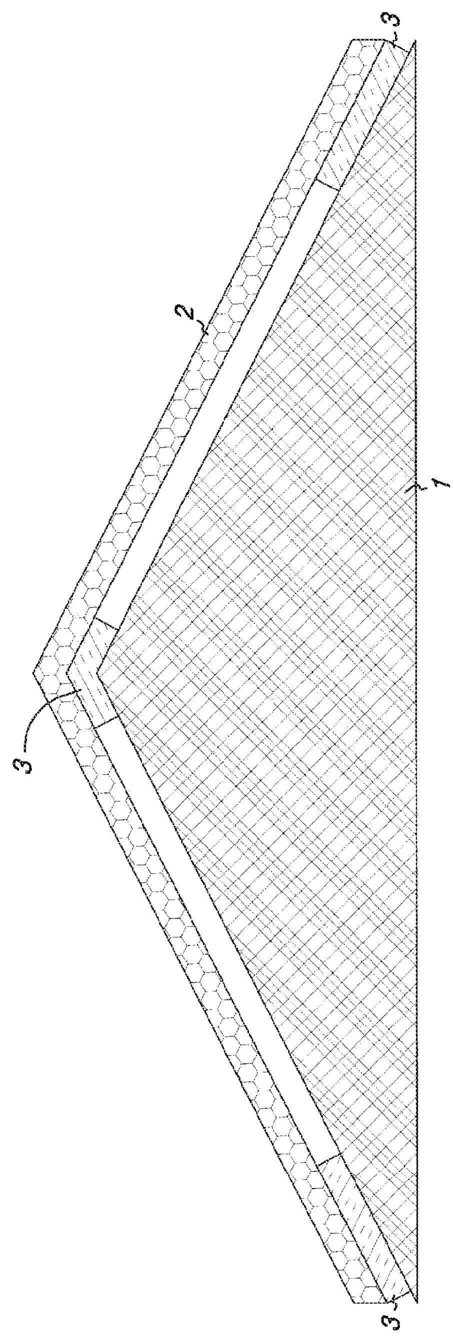


Fig. 4

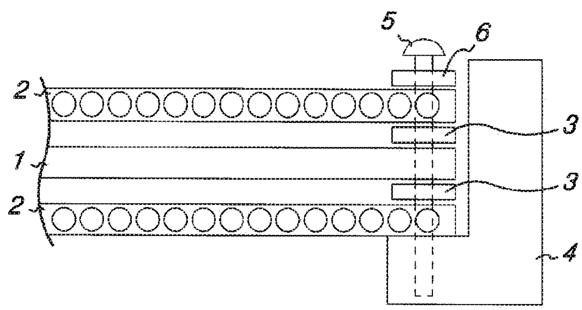


Fig. 5A

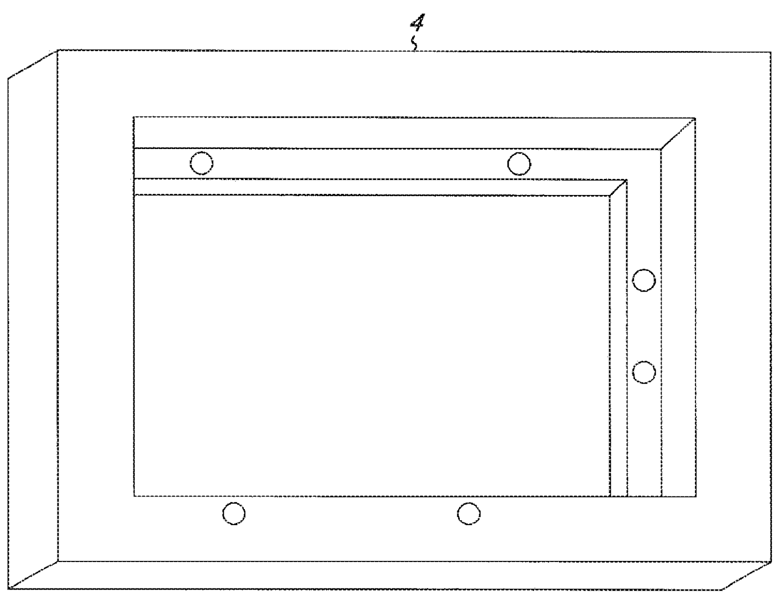


Fig. 5B

MICROBUBBLES OF OXYGEN

RELATED APPLICATIONS

This application claim the priority of U.S. Provisional Patent Application No. 60/358,534, filed Feb. 22, 2002.

FIELD OF THE INVENTION

This invention relates to the electrolytic generation of microbubbles of oxygen for increasing the oxygen content of aqueous media.

BACKGROUND OF THE INVENTION

Many benefits may be obtained through raising the oxygen content of aqueous media. Efforts have been made to achieve higher saturated or supersaturated oxygen levels for applications such as the improvement of water quality in ponds, lakes, marshes and reservoirs, the detoxification of contaminated water, culture of fish, shrimp and other aquatic animals, biological culture and hydroponic culture. For example, fish held in a limited environment such as an aquarium, a bait bucket or a live hold tank may quickly use up the dissolved oxygen in the course of normal respiration and are then subject to hypoxic stress, which can lead to death. A similar effect is seen in cell cultures, where the respiring cells would benefit from higher oxygen content of the medium. Organic pollutants from agricultural, municipal and industrial facilities spread through the ground and surface water and adversely affect life forms. Many pollutants are toxic, carcinogenic or mutagenic. Decomposition of these pollutants is facilitated by oxygen, both by direct chemical detoxifying reactions or by stimulating the growth of detoxifying microflora. Contaminated water is described as having an increased biological oxygen demand (BOD) and water treatment is aimed at decreasing the BOD so as to make more oxygen available for fish and other life forms.

The most common method of increasing the oxygen content of a medium is by sparging with air or oxygen. While this is a simple method, the resulting large bubbles produced simply break the surface and are discharged into the atmosphere. Attempts have been made to reduce the size of the bubbles in order to facilitate oxygen transfer by increasing the total surface area of the oxygen bubbles. U.S. Pat. No. 5,534,143 discloses a microbubble generator that achieves a bubble size of about 0.10 millimeters to about 3 millimeters in diameter. U.S. Pat. No. 6,394,429 discloses a device for producing microbubbles, ranging in size from 0.1 to 100 microns in diameter, by forcing air into the fluid at high pressure through a small orifice.

When the object of generating bubbles is to oxygenate the water, either air, with an oxygen content of about 21%, or pure oxygen may be used. The production of oxygen and hydrogen by the electrolysis of water is well known. A current is applied across an anode and a cathode which are immersed in an aqueous medium. The current may be a direct current from a battery or an AC/DC converter from a line. Hydrogen gas is produced at the cathode and oxygen gas is produced at the anode. The reactions are:

AT THE CATHODE:	$4\,H_2O + 4\,e^- \rightarrow 4\,OH^- + 2\,H_2$
AT THE ANODE:	$2\,H_2O \rightarrow O_2 + 4\,H^+ + 4\,e^-$
NET REACTION:	$6\,H_2O \rightarrow 4\,OH^- + 4\,H^+ + 2\,H_2 + O_2$

286 kilojoules of energy is required to generate one mole of oxygen.

The gasses form bubbles which rise to the surface of the fluid and may be collected. Either the oxygen or the hydrogen may be collected for various uses. The "electrolytic water" surrounding the anode becomes acidic while the electrolytic water surrounding the cathode becomes basic. Therefore, the electrodes tend to foul or pit and have a limited life in these corrosive environments.

Many cathodes and anodes are commercially available. U.S. Pat. No. 5,982,609 discloses cathodes comprising a metal or metallic oxide of at least one metal selected from the group consisting of ruthenium, iridium, nickel, iron, rhodium, rhenium, cobalt, tungsten, manganese, tantalum, molybdenum, lead, titanium, platinum, palladium and osmium. Anodes are formed from the same metallic oxides or metals as cathodes. Electrodes may also be formed from alloys of the above metals or metals and oxides co-deposited on a substrate. The cathode and anodes may be formed on any convenient support in any desired shape or size. It is possible to use the same materials or different materials for both electrodes. The choice is determined according to the uses. Platinum and iron alloys ("stainless steel") are often preferred materials due to their inherent resistance to the corrosive electrolytic water. An especially preferred anode disclosed in U.S. Pat. No. 4,252,856 comprises vacuum deposited iridium oxide.

Holding vessels for live animals generally have a high population of animals which use up the available oxygen rapidly. Pumps to supply oxygen have high power requirements and the noise and bubbling may further stress the animals. The available electrolytic generators likewise have high power requirements and additionally run at high voltages and produce acidic and basic water which are detrimental to live animals. Many of the uses of oxygenators, such as keeping bait or caught fish alive, would benefit from portable devices that did not require a source of high power. The need remains for quiet, portable, low voltage means to oxygenate water.

SUMMARY OF THE INVENTION

This invention provides an oxygen emitter which is an electrolytic cell which generates very small microbubbles and nanobubbles of oxygen in an aqueous medium, which bubbles are too small to break the surface tension of the medium, resulting in a medium supersaturated with oxygen.

The electrodes may be a metal or oxide of at least one metal selected from the group consisting of ruthenium, iridium, nickel, iron, rhodium, rhenium, cobalt, tungsten, manganese, tantalum, molybdenum, lead, titanium, platinum, palladium and osmium or oxides thereof. The electrodes may be formed into open grids or may be closed surfaces. The most preferred cathode is a stainless steel mesh. The most preferred mesh is a 1/16 inch grid. The most preferred anode is platinum and iridium oxide on a support. A preferred support is titanium.

In order to form microbubbles and nanobubbles, the anode and cathode are separated by a critical distance. The critical distance ranges from 0.005 inches to 0.140 inches. The preferred critical distance is from 0.045 to 0.060 inches.

Models of different size are provided to be applicable to various volumes of aqueous medium to be oxygenated. The public is directed to choose the applicable model based on volume and power requirements of projected use. Those models with low voltage requirements are especially suited to oxygenating water in which animals are to be held.

Controls are provided to regulate the current and timing of electrolysis.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is the O_2 emitter of the invention.

FIG. 2 is an assembled device.

FIG. 3 is a diagram of the electronic controls of the O_2 emitter.

FIG. 4 shows a funnel or pyramid variation of the O_2 emitter.

FIG. 5 shows a multilayer sandwich O_2 emitter.

DETAILED DESCRIPTION OF THE INVENTION

Definitions:

For the purpose of describing the present invention, the following terms have these meanings:

"Critical distance" means the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles.

"O_2 emitter" means a cell comprised of at least one anode and at least one cathode separated by the critical distance.

"Metal" means a metal or an alloy of one or more metals.

"Microbubble" means a bubble with a diameter less than 50 microns.

"Nanobubble" means a bubble with a diameter less than that necessary to break the surface tension of water. Nanobubbles remain suspended in the water, giving the water an opalescent or milky appearance.

"Supersaturated" means oxygen at a higher concentration than normal calculated oxygen solubility at a particular temperature and pressure.

"Water" means any aqueous medium with resistance less than one ohm per square centimeter; that is, a medium that can support the electrolysis of water. In general, the lower limit of resistance for a medium that can support electrolysis is water containing more than 2000 ppm total dissolved solids.

The present invention produces microbubbles and nanobubbles of oxygen via the electrolysis of water. As molecular oxygen radical (atomic weight 8) is produced, it reacts to form molecular oxygen, O_2. In the special dimensions of the invention, as explained in more detail in the following examples, O_2 forms bubbles which are too small to break the surface tension of the fluid. These bubbles remain suspended indefinitely in the fluid and, when allowed to build up, make the fluid opalescent or milky. Only after several hours do the bubbles begin to coalesce on the sides of the container and the water clears. During that time, the water is supersaturated with oxygen. In contrast, the H_2 formed readily coalesces into larger bubbles which are discharged into the atmosphere, as can be seen by bubble formation at the cathode.

The first objective of this invention was to make an oxygen emitter with low power demands, low voltage and low current for use with live animals. For that reason, a small button emitter was devised. The anode and cathode were set at varying distances. It was found that electrolysis took place at very short distances before arcing of the current occurred. Surprisingly, at slightly larger distances, the water became milky and no bubbles formed at the anode, while hydrogen continued to be bubbled off the cathode. At distance of 0.140 inches between the anode and cathode, it was observed that the oxygen formed bubbles at the anode. Therefore, the critical distance for microbubble and nanobubble formation was determined to be between 0.005 inches and 0.140 inches.

EXAMPLE 1

Oxygen Emitter

As shown in FIG. 1, the oxygen evolving anode 1 selected as the most efficient is an iridium oxide coated single sided sheet of platinum on a support of titanium (Eltech, Fairport Harbor, Ohio). The cathode 2 is a 1/16 inch mesh marine stainless steel screen. The anode and cathode are separated by a non-conducting spacer 3 containing a gap 4 for the passage of gas and mixing of anodic and cathodic water and connected to a power source through a connection point 5. FIG. 2 shows a plan view of the assembled device. The O_2 emitter 6 with the anode connecting wire 7 and the cathode connecting wire 8 is contained in an enclosure 9, connected to the battery compartment 10. The spacer thickness is critical as it sets the critical distance. It must be of sufficient thickness to prevent arcing of the current, but thin enough to separate the electrodes by no more than 0.140 inches. Above that thickness, the power needs are higher and the oxygen bubbles formed at higher voltage will coalesce and escape the fluid. Preferably, the spacer is from 0.005 to 0.075 inches thick. At the lower limits, the emitter tends to foul more quickly. Most preferably, the spacer is about 0.050 inches thick. The spacer may be any nonconductive material such as nylon, fiberglass, Teflon® polymer or other plastic. Because of the criticality of the space distance, it is preferable to have a non-compressible spacer. It was found that Buna, with a durometer measure of 60 was not acceptable due to decomposition. Viton, a common fluoroelastomer, has a durometer measure of 90 and was found to hold its shape well.

In operation, a small device with an O_2 emitter 1.485 inches in diameter was driven by 4AA batteries. The critical distance was held at 0.050 inches with a Viton spacer. Five gallons of water became saturated in seven minutes. This size is suitable for raising oxygen levels in an aquarium or bait bucket.

It is convenient to attach a control circuit which comprises a timer that is thermostatically controlled by a temperature sensor which determines the off time for the cathode. When the temperature of the solution changes, the resistance of the thermistor changes, which causes an off time of a certain duration. In cool water, the duration is longer so in a given volume, the emitter generates less oxygen. When the water is warmer and therefore hold less oxygen, the duration of off time is shorter. Thus the device is self-controlled to use power most economically. FIG. 3 shows a block diagram of a timer control with anode 1, cathode 2, thermistor temperature sensor 3, timer control circuit 4 and wire from a direct current power source 5.

EXAMPLE 2

Measurement of O_2 Bubbles

Attempts were made to measure the diameter of the O_2 bubbles emitted by the device of Example 1. In the case of particles other than gasses, measurements can easily be made by scanning electron microscopy, but gasses do not survive electron microscopy. Large bubble may be measured by pore exclusion, for example, which is also not feasible when measuring a gas bubble. A black and white digital, high contrast, backlit photograph of treated water with a millimeter scale reference was shot of water produced by the emitter of Example 1. About 125 bubbles were seen in the area selected for measurement. Seven bubbles ranging from the smallest clearly seen to the largest were measured. The area was enlarged, giving a scale multiplier of 0.029412.

Recorded bubble diameters at scale were 0.16, 0.22, 0.35, 0.51, 0.76, 0.88 and 1.09 millimeters. The last three were considered outlines by reverse analysis of variance and were assumed to be hydrogen bubbles. When multiplied by the scale multiplier, the assumed O_2 bubbles were found to range from 4.7 to 15 microns in diameter. This test was limited by the resolution of the camera and smaller bubbles in the nanometer range could not be resolved. It is known that white light cannot resolve features in the nanometer size range, so monochromatic laser light may give resolution sensitive enough to measure smaller bubbles. Efforts continue to increase the sensitivity of measurement so that sub-micron diameter bubbles can be measured.

EXAMPLE 3

Other Models of Oxygen Emitter

Depending on the volume of fluid to be oxygenated, the oxygen emitter of this invention may be shaped as a circle, rectangle, cone or other model. One or more may be set in a substrate that may be metal, glass, plastic or other material. The substrate is not critical as long as the current is isolated to the electrodes by the nonconductor spacer material of a thickness from 0.005 to 0.075 inches, preferably 0.050 inches. It has been noticed that the flow of water seems to be at the periphery of the emitter, while the evolved visible bubbles (H_2) arise at the center of the emitter. Therefore, a funnel or pyramidal shaped emitter was constructed to treat larger volumes of fluid. FIG. **4** is a cross sectional diagram of such an emitter. The anode **1** is formed as an open grid separated from a marine grade stainless steel screen cathode **2** by the critical distance by spacer **3** around the periphery of the emitter and at the apex. This flow-through embodiment is suitable for treating large volumes of water rapidly.

The size may be varied as required. A round emitter for oxygenating a bait bucket may be about 2 inches in diameter, while a 3-inch diameter emitter is adequate for oxygenating a 10 to 40 gallon tank. The live well of a fishing boat will generally hold 40 to 80 gallons of water and require a 4-inch diameter emitter. It is within the scope of this invention to construct larger emitters or to use several in a series to oxygenate larger volumes. It is also within the scope of this invention to vary the model to provide for low voltage and amperage in cases where the need for oxygen is moderate and long lasting or conversely, to supersaturate water very quickly at higher voltage and amperage. In the special dimensions of the present invention, it has been found that a 6 volt battery supplying a current as low as 40 milliamperes is sufficient to generate oxygen. Such a model is especially useful with live plants or animals, while it is more convenient for industrial use to use a higher voltage and current. Table I shows a number of models suitable to various uses.

TABLE I

Emitter Model	Gallons	Volts	Amps Max.	Ave	Watts
Bait keeper	5	6	0.090	0.060	0.36
Livewell	32	12	0.180	0.120	1.44
OEM 2 inch	10	12	0.210	0.120	1.44
Bait store	70	12	0.180	0.180	2.16
Double cycle	2	12	0.180	0.180	2.16
OEM 3 inch	50	12	0.500	0.265	3.48
OEM 4 inch	80	12	0.980	0.410	4.92
Water pail	2	24	1.200	1.200	28.80
Plate	250	12	5.000	2.500	30.00

EXAMPLE 4

Multilayer Sandwich O_2 Emitter

An O_2 emitter was made in a multilayer sandwich embodiment. (FIG. **5**) An iridium oxide coated platinum anode **1** was formed into a grid to allow good water flow and sandwiched between two stainless steel screen cathodes **2**. Spacing was held at the critical distance by nylon spacers **3**. The embodiment illustrated is held in a cassette **4** which is secured by nylon bolt **5** with a nylon washer **6**. The dimensions selected were:

cathode screen	0.045 inches thick
nylon spacer	0.053 inches thick
anode grid	0.035 inches thick
nylon spacer	0.053 inches thick
cathode screen	0.045 inches thick,

for an overall emitter thickness of 0.231 inches.

If a more powerful emitter is desired, it is within the scope of this invention to repeat the sequence of stacking. For example, an embodiment may easily be constructed with this sequence: cathode, spacer, anode, spacer, cathode, spacer, anode, spacer, cathode, spacer, anode, spacer, cathode. The number of layers in the sandwich is limited only by the power requirements acceptable for an application.

Those skilled in the art will readily comprehend that variations, modifications and additions may in the embodiments described herein may be made. Therefore, such variations, modifications and additions are within the scope of the appended claims.

I claim:

1. An emitter for electrolytic generation of microbubbles of oxygen comprising an anode separated at a critical distance from a cathode and a power source all in electrical communication with each other.

2. The emitter of claim **1** wherein the anode is a metal or a metallic oxide or a combination of a metal and a metallic oxide.

3. The emitter of claim **1** wherein the anode is platinum and iridium oxide on a support.

4. The emitter of claim **1** wherein the cathode is a metal or metallic oxide or a combination of a metal and a metallic oxide.

5. The critical distance of claim **1** which is 0.005 to 0.140 inches.

6. The critical distance of claim **1** which is 0.045 to 0.060 inches.

7. A method for lowering the biologic oxygen demand of polluted water comprising passing the polluted water through a vessel containing the emitter of claim **1**.

8. The product of claim **1** wherein the water is supersaturated with oxygen and of an approximately neutral pH.

9. An emitter for electrolytic generation of microbubbles of oxygen comprising a plurality of anodes separated at a critical distance from a plurality of cathodes and a power source all in electrical communication with each other.

10. A method for keeping aquatic animals emitter alive comprising inserting the emitter of claim **1** or claim **9** into the aquatic medium of the aquatic animals.

11. The method of claim **8** wherein the aquatic animal is a fish.

12. The method of claim **8** wherein the aquatic animal is a shrimp.

13. An emitter for electrolytic generation of microbubbles of oxygen comprising a platinum-iridium oxide anode on a titanium support separated at a critical distance of from 0.045 inches to 0.060 inches from a stainless steel screen 1/16 inch thick cathode all in electrical communication with a battery.

14. The emitter of claims **1**, **9** or **13** further comprising a timer control.

* * * * *

Exhibit D

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/601,340	01/21/2015	James Andrew Senkiw	3406.005US2	1069

38846 7590 06/05/2017
Carlson, Caspers, Vandenburgh, Lindquist &
Schuman
225 South 6th Street
Suite 4200
Minneapolis, MN 55402

EXAMINER	
JOHNSON, JERRY D	

ART UNIT	PAPER NUMBER
3991	

MAIL DATE	DELIVERY MODE
06/05/2017	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Office Action Summary	Application No. 14/601,340	Applicant(s) SENKIW, JAMES ANDREW	
	Examiner JERRY D. JOHNSON	Art Unit 3991	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *February 6, 2017*.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ______.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ______; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *13-69* is/are pending in the application.
5a) Of the above claim(s) ______ is/are withdrawn from consideration.
6)☐ Claim(s) ______ is/are allowed.
7)☒ Claim(s) *13-69* is/are rejected.
8)☐ Claim(s) ______ is/are objected to.
9)☐ Claim(s) ______ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.
11)☐ The drawing(s) filed on ______ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a)☐ All b)☐ Some** c)☐ None of the:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. ______.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date ______.
3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. ______ .
4) ☐ Other: ______.

OWT Ex. 2119
Tennant Company v. OWT
IPR2021-00625

Reissue Applications

For reissue applications filed on or after September 16, 2012, all references to 35 U.S.C. 251 and 37 CFR 1.172, 1.175, and 3.73 are to the current provisions.

On January 26, 2016, applicant filed a Request for Continued Examination (RCE) of continuation reissue application 14/601,340 of U.S. Patent No. 7,670,495 (the ‘495 patent) which issued from U.S. Patent Application No. 12/023,431 (the ‘431 application) with claims 1-12 on March 2, 2010. The ‘495 patent was previously reissued as U.S. RE45,415 on March 17, 2015, based on U.S. Application No. 13/247,241 (the ‘241 reissue application) filed September 28, 2011. The ‘495 patent is a division of U.S. Patent No. 7,396,441, (the ‘441 patent) which issued from U.S. Application No. 10/732,326 (the '326 application) which is a continuation-in-part of U.S. Patent No. 6,689,262 (the ‘262 patent).

Notice

If the patent reissue application issues without any cross reference to the continuation reissue application, amendment to the parent reissue application to include a cross-reference to the continuation reissue application must be done at the time of allowance of the continuation reissue application by Certificate of Correction. See MPEP 1451(II)(March 2014).

Scope of Claims

The present reissue application seeks to broaden the apparatus claims of the '495 patent (patented claim 2-7, 11 and 12 directed to an emitter for electrolytic generation of microbubbles of oxygen in an aqueous medium) through newly added claims 13-69. Claim 13 is representative:

> 13. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:
>
> a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;
>
> at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches up to 0.140 inches within the tubular housing;
>
> each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing and so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;
>
> a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;
>
> the power source being operable to delivery electric current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

The '495 patent specification contains the following definitions:

"O_2 emitter" means a cell comprised of at least one anode and at least one cathode separated by the critical distance. (Column 4, lines 7-8)

"Critical distance" means the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles. (Column 4, lines 1-3)

Column 3, lines 11-13 of the '495 patent teach "[i]n order to form microbubbles and nanobubbles, the anode and cathode are separated by a critical distance. The critical distance ranges from 0.005 inches to 0.140 inches."

An "O_2 emitter" is "[a]n emitter for electrolytic generation of bubbles of oxygen" as recited in claims 13-69. Accordingly, the emitter of claims 13-69 comprises at least one anode and at least one cathode separated by the critical distance of from 0.005 to 0.140 inches.

Newly presented claims 13-69 recite "**a tubular housing** having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet" (claim 13); "**a tubular housing** defining an oxygenation chamber and having a water inlet, a water outlet, a longitudinal water flow axis from the inlet to the outlet" (claim 27); "**a tubular housing** defining an oxygenation chamber and having a water inlet, and a water outlet" (claim 37); "**a tubular housing** defining an oxygenation chamber, and having an inward-facing surface that defines at least in part the oxygenation chamber, a water inlet, and a water outlet" (claim 50) and; "**a tubular housing** defining an oxygenation chamber, said housing having an outer wall that runs parallel to a longitudinal center axis of the housing, said housing having a water inlet and water outlet" (claim 62). (Emphasis added)

The term "tubular housing" does not appear in the '495 patent specification. Nor does the term "fluid conduit", which is recited in claim 1 of the '441 patent, appear in the '441 patent specification. Rather, the '441 and '495 specifications (which are essentially the same) teach that the emitter may be made to fit inside "a tube or hose" (column 9, lines 5-11 of each specification). Accordingly, the terms “tubular housing" and “fluid conduit” are considered to be descriptive of, and supported by, the terms “tube or hose”.

Consequently, the “tubular housing” having an inlet and an outlet as recited in claims 13-69 is also a “fluid conduit” as recited in claims 1-15 of the 441 patent, i.e., “a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen” (‘441 patent, claim 1). Newly presented claims 13-69, like claims 1-15 of the ‘441 patent, are therefore directed to an emitter for electrolytic generation of microbubbles of oxygen wherein the emitter is positioned within a conduit having an inlet and an outlet.

Reissue Declaration

The reissue oath/declaration filed with this application is defective (see 37 CFR 1.175 and MPEP § 1414) because of the following:

The claims of the present reissue application are directed to an invention that is patentably distinct from the claims of the '495 patent. More specifically, the reissue declaration states “[t]he ‘495 emitter claim 2, for example, is too broad in that it does not recite certain features of the disclosed emitter embodiment corresponding to FIGS. 7A and 7B which I was entitled to claim but did not claim. These features are shown in the embodiment of FIGS 7A and 7B and include, for example: the electrodes are positioned in the outer perimeter of the oxygenation chamber; this positioning of the electrodes provides an unobstructed passageway for water to flow; in that unobstructed passageway, water may flow from the water inlet to the water outlet without passing through a space between the electrodes of opposite polarity; and a portion of at least one of the first and second electrodes is in contact with a wall of the tubular housing." (Paragraph 7).

Claim 2 of the '495 patent recites:

> 2. An emitter for electrolytic generation of microbubbles of oxygen in an aqueous medium comprising:
> an anode separated at a critical distance from a cathode,
> a nonconductive spacer maintaining the separation of the anode and cathode,
> the nonconductive spacer having a spacer thickness between 0.005 to 0.050 inches such that the critical distance is less than 0.060 inches and a power source all in electrical communication with each other,
> wherein the critical distance results in the formation of oxygen bubbles having a bubble diameter less than 0.0006 inches, said oxygen bubble being incapable of breaking the surface tension of the aqueous medium such that said aqueous medium is supersaturated with oxygen.

The '431 divisional application, which became the '495 patent, was originally filed with a single claim to a method for treating waste water. Claims directed to an emitter (claims 2-7, 11 and 12), a method for oxygenating a non-native habitat (claim 8), a method for lowering the biologic oxygen demand of polluted water (claim 9), and a supersaturated aqueous product (claim 10) were added by preliminary amendment. The '495 patent issued from the '431 divisional application without any further amendments. As a result, the '495 patent **does not** contain claims to an emitter positioned within a "tubular housing" or "conduit" (as shown in Fig. 7) and recited in instant claims 13-69.

In contrast, during prosecution of the '441 patent, applicant specifically cited to Fig. 7 as support for the '441 patent claims. Moreover, as discussed below, applicant argued during prosecution of the '441 patent that claims to an emitter positioned within a conduit were patentably distinct from claims to the emitter alone. Consequently, the present continuation reissue application cannot be used to broaden the claims of the '495 patent to include the patentably distinct invention of the ‘441 divisional patent (which issued July 8, 2008). Nor can the present continuation reissue application recapture subject matter that was surrendered during the prosecution of the '441 divisional patent.

Claims 13-69 are rejected as being based upon a defective reissue declaration under 35 U.S.C. 251 as set forth above. See 37 CFR 1.175.

The nature of the defect(s) in the declaration is set forth in the discussion above in this Office action.

The ‘441 Patent

The ‘326 application, which became the ‘441 patent, was filed on December 10, 2003 with claims 1-8. In an Office Action dated November 29, 2005, the examiner restricted the claims as follows:

I. Claims 1-4, drawn to a flow-through oxygenator.

II. Claim 5, drawn to an oxygen supersaturated water product.

III. Claims 6-7, drawn to a method for enhancing the growth of plants.

IV. Claim 8, drawn to a method for treating waste water.

Applicant elected claims 1-4 to a flow-through oxygenator. Claim 1 recited:

1. A flow-through oxygenator comprising an emitter for electrolytic generation of microbubbles of oxygen comprising an anode separated at a critical distance from a cathode and a power source all in electrical communication with each other, **wherein the emitter is placed within or adjacent to a conduit for flow water**. (Emphasis added)

In a non-final Office Action dated May 24, 2007, claims 1-3 were rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,328,875 to Zappi. The examiner stated "the electrolytic apparatus as taught by Zappi is place [sic] adjacent to a conduit for flowing water" (page 4 of the Office Action mailed May 24, 2007). Claim 1-4 were also rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,225,401 to Divisek et al. (page 6 of the Office Action mailed May 24, 2007). The examiner stated "[e]ven though Divisek does not explicitly teach that its electrolyzer is place [sic] within or adjacent to a conduit for flowing water, one of ordinary skill in the art would have found the position of Divisek's electrolyzer at least adjacent to a water conduit obvious since water is added/fed to Devisek's [sic] electrolyzer for electrolysis to take place" (page 7 of the Office Action mailed May 24, 2007).

The examiner further rejected claim 1-4 and 9 of the '326 application on the grounds of non-statutory obviousness-type double patenting:

> [c]laims 1-4 and 9 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 6,689,262 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because the emitter of U.S. Patent No. 6,689,262 B2 is structurally the same as the emitter of the claimed flow-through oxygenator. Even though U.S. Patent No. 6,689,262 B2 does not explicitly teach the claimed flow through oxygenator, one of ordinary skill in the art would have found it obvious to use the instant emitter in an oxygenator as claimed since the emitter produces oxygen. (page 9 of the Office Action mailed May 24, 2007).

Claim 1 of U.S. Patent No. 6,689,262 reads as follows:

> 1. An emitter for electrolytic generation of microbubbles of oxygen comprising an anode separated at a critical distance from a cathode and a power source all in electrical communication with each other.

In a response filed August 17, 2007, applicant amended the claims to recite (bold emphasis added):

1. (Currently Amended) A flow through oxygenator ~~consisting of~~ comprising:

a fluid conduit having a fluid inlet and a fluid outlet with a conduit lumen;

an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that **the oxygen emitter is positioned within the conduit lumen** ~~comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other,~~; and

a power source ~~all~~ in electrical communication with ~~each other, wherein~~ the oxygen emitter ~~is placed within or adjacent to a conduit for flowing water~~.

Applicant also added new claims 25 and 26 (emphasis added):

25. (New) A flow through oxygenator comprising:

a watering hose having a hose lumen; and

an oxygen emitter operably mounted within the hose lumen.

26. (New) A flow through oxygenator comprising:

a hydroponic circulating system having a circulating lumen; and

an oxygen emitter operably mounted within the circulating lumen.

As to the amendment, applicant argued "Applicant has amended independent claim 1 to clarify the presently claimed flow through oxygenator as comprising an oxygen emitter positioned within a conduit lumen of a fluid conduit". "Zappi et al. is absent any disclosure relative to the positioning of an oxygen emitter directly within the conduit lumen of a fluid conduit as presently claimed" and; "Divisek does not teach an electrolyzer placed directly within a conduit as presently claimed in amended independent claim 1" (Remarks, pages 7 and 8).

As to new claims 25 and 26, applicant argued "[a]s discussed previously with respect to the present rejections to independent claim 1, none of the presently cited art considered individually or in combination teaches the positioning of an oxygen emitter directly within a conduit lumen of a fluid conduit'" (Remarks, page 9)

Applicant further argued

> [c]laims 1-4 and 9 were previously rejected on the ground of nonstatutory obviousness type double patenting. Applicant respectfully asserts that the need for a Terminal Disclaimed to overcome a nonstatutory obviousness-type double patenting rejection has been overcome through the present amendment to independent claim 1 and the addition of new independent claims 25 and 26. As claims 1, 25 and 26 are patentably distinct from claims 1-6 of U.S. Patent No. 6,689,262, Applicant respectfully requests said rejections be withdrawn. (Remarks, page 6)

The examiner responded to applicant's arguments and amendment in an Office Action mailed November 1, 2007, the examiner stating "[t]he rejection of claims 1-3 under 35 U.S.C. 102(e) as being anticipated by Zappi et al. US 6,328,875 B1 (Zappi) is withdrawn in view of applicant's claim amendment filed 17 August 2007." The examiner also withdrew the rejection of claims 1-4 over Divisek et al. stating "[t]he rejection of claims 1-4 under 35 U.S.C. 103(a) as being unpatentable over Divisek et al. US 4,225,401 (Divisek) is withdrawn in view of applicant's claim amendment filed 17 August 2007." The examiner additionally withdrew the rejection of claims 1-4 and 9 on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 6,689,262 B2.

Thus, applicant not only distinguished the claims of the '441 patent application from the cited prior art based on the amendment requiring the emitter be directly within a conduit, but also argued that such an amendment made the claims patentably distinct from claims to an emitter not within a conduit. Accordingly, new claims 13-69 are directed to a patentably distinct invention from the issued '495 patent claims.

Inasmuch as claims to an emitter within a tubular housing (as recited in claims 13-69) are patentably distinct from claims to an emitter alone (as issued in the apparatus claims of the '495 patent), it would be appropriate to restrict claims 13-69 from the instant reissue application as being directed to an invention non-elected by original presentation. However, in view of compact prosecution and the fact that applicant cannot pursue claims 13-69, which are directed to, and broader than the patentably distinct '441 patent claims (which issued more than 2 years ago), in a divisional reissue application, the specialist has not done so. Such a restriction requirement would force applicant to file a divisional application to claims which are barred by 35 U.S.C. 251. *In re Graff*, 111 F.3d 874, 877, 42 USPQ2d 1471, 1473-74 (Fed. Cir. 1997) (Broadened claims in a continuing reissue application were properly rejected under 35 U.S.C. 251 because the proposal for broadened claims was not made (in the parent reissue application) within two years from the grant of the original patent and the public was not notified that broadened claims were being sought until after the two-year period elapsed.)

35 U.S.C. § 112, 1st paragraph

The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 13-69 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

There is no support for claiming "each electrode of the emitter is positioned so that substantially all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing"; "at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes"; "each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing"; "the electrodes are positioned away from a longitudinal center axis of the tubular housing"; "the passageway running longitudinally for at least the length of that portion of one of the electrodes positioned within the tubular housing"; "the unobstructed passageway includes the center axis

and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing"; "the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is substantially less than a cross-sectional area of the unobstructed passageway"; "the passageway running for at least the length of that portion of one of the electrodes positioned within the housing"; "the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is substantially less than a cross-sectional area of the unobstructed passageway"; "a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing"; "the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing" and; "the unobstructed passageway having a substantially uniform cross-sectional area along that length."

To the extent that applicant's Reissue Declaration references Figures 7A and 7B as support for the above claim limitations, e.g., "it was an error not to include emitter claims that include varying combinations of the features disclosed in the emitter embodiment corresponding to FIGS. 7A and 7B of the '495 patent" (Page 1 of the Declaration filed January 26, 2016), Figures 7A and 7B are **not** taught as being to scale. Accordingly, Figures 7A and 7B do not provide support for limitations which are not otherwise disclosed in the '495 patent specification. Nor do Figures 7A and 7B disclose features that are now being claimed. For example, Figures 7A and 7B do not disclose wherein "the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing"; "first and second conductors coupled to the first and second electrodes"; or "first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing".

35 U.S.C. § 112, 4th paragraph

The following is a quotation of 35 U.S.C. 112(d):

(d) REFERENCE IN DEPENDENT FORMS.—Subject to subsection (e), a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

The following is a quotation of pre-AIA 35 U.S.C. 112, fourth paragraph:

Subject to the following paragraph [i.e., the fifth paragraph of pre-AIA 35 U.S.C. 112], a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

Claims 23, 26, 36, 46, 49, 58, 61 and 69 are rejected under 35 U.S.C. 112(d) or pre-AIA 35 U.S.C. 112, 4th paragraph, as being of improper dependent form for failing to further limit the subject matter of the claim upon which it depends, or for failing to include all the limitations of the claim upon which it depends.

The '495 patent teaches that a "critical distance" separating the anode and cathode ranging from 0.005 inches to 0.140 inches is the distance at which evolved oxygen forms microbubbles and nanobubbles. As each of the claims from which claims 23, 26, 36, 46 and 49 depend are already limited to the critical distance, the recitation in claims 23, 26, 36, 46 and 49 to forming microbubbles or nanobubbles is not a further limitation to these claims. In like manner, the recitation in dependent claims 58, 61 and 69 that the emitter is "operable" to create microbubbles or nanobubbles is not a further limitation to the claims.

Applicant may cancel the claim(s), amend the claim(s) to place the claim(s) in proper dependent form, rewrite the claim(s) in independent form, or present a sufficient showing that the dependent claim(s) complies with the statutory requirements.

Recapture

Claims 13-69 are rejected under 35 U.S.C. 251 as being an improper recapture of broadened claimed subject matter surrendered in the application for the patent upon which the present reissue is based. See *Greenliant Systems, Inc. et al v. Xicor LLC*, 692 F.3d 1261, 103 USPQ2d 1951 (Fed. Cir. 2012); *In re Shahram Mostafazadeh and Joseph O. Smith*, 643 F.3d 1353, 98 USPQ2d 1639 (Fed. Cir. 2011); *North American Container, Inc. v. Plastipak Packaging, Inc.*, 415 F.3d 1335, 75 USPQ2d 1545 (Fed. Cir. 2005); *Pannu v. Storz Instruments Inc.*, 258 F.3d 1366, 59 USPQ2d 1597 (Fed. Cir. 2001); *Hester Industries, Inc. v. Stein, Inc.*, 142 F.3d 1472, 46 USPQ2d 1641 (Fed. Cir. 1998); *In re Clement*, 131 F.3d 1464, 45 USPQ2d 1161 (Fed. Cir. 1997); *Ball Corp. v. United States*, 729 F.2d 1429, 1436, 221 USPQ 289, 295 (Fed. Cir. 1984). A broadening aspect is present in the reissue which was not present in the application for patent. The record of the application for the patent shows that the broadening aspect (in the reissue) relates to claimed subject matter that applicant previously surrendered during the prosecution of the application. Accordingly, the narrow scope of the claims in the patent was not an error within the meaning of 35 U.S.C. 251, and the broader scope of claim subject matter surrendered in the application for the patent cannot be recaptured by the filing of the present reissue application.

During prosecution of the '326 application, which became the '441 patent, claims 1-3 were rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,328,875 to Zappi. The examiner stated "the electrolytic apparatus as taught by Zappi is place [sic] adjacent to a conduit for flowing water" (page 4 of the Office Action mailed May 24, 2007). Claim 1-4 were also rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,225,401 to Divisek et al. (page 6 of the Office Action mailed May 24, 2007). The examiner stated "[e]ven though Divisek does not explicitly teach that its electrolyzer is place [sic] within or adjacent to a conduit for flowing water, one of ordinary skill in the art would have found the position of Divisek's electrolyzer at least adjacent to a water conduit obvious since water is added/fed to Devisek's [sic] electrolyzer for electrolysis to take place" (page 7 of the Office Action mailed May 24, 2007).

In a response filed August 17, 2007, applicant amended the claims to recite:

> 1. (Currently Amended) A flow through oxygenator ~~consisting of~~ comprising:
> a fluid conduit having a fluid inlet and a fluid outlet with a conduit lumen;
>
> an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen ~~comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other,~~; and
>
> a power source ~~all~~ in electrical communication with ~~each other, wherein~~ the oxygen emitter ~~is placed within or adjacent to a conduit for flowing water~~.

As to the amendment, applicant argued "Applicant has amended independent claim 1 to clarify the presently claimed flow through oxygenator as comprising an oxygen emitter positioned within a conduit lumen of a fluid conduit". "Zappi et al. is absent any disclosure relative to the positioning of an oxygen emitter directly within the conduit lumen of a fluid conduit as presently claimed" and; "Divisek does not teach an electrolyzer placed directly within a conduit as presently claimed in amended independent claim 1" (Remarks, pages 7 and 8). Applicant also added new claims 13-26. New claim 14 read:

> 14. (New) The flow through oxygenator of claim 1, wherein the plurality of matched sets comprises three matched sets of anodes and cathodes attached to the stabilizing hardware in adjacent relation such that each matched set resides at a 120° angle to the adjacent matched sets.

Applicant cited page 4, lines 18-28; page 13, line 22 to page 15, line 12 and Figure 7 as support for the amendment (Remarks, page 6). Page 13, lines 24-26 of the '326 application state:

> [i]n Figure 7 (A), the oxygenation chamber is comprised of three anodes 1 and cathodes 2, of appropriate size to fit inside a tube or hose and separated by the critical distance are placed within a tube or hose 3 at 102° angles to each other.

As to new independent claims 25 and 26, applicant argued "[a]s discussed previously with respect to the present rejections to independent claim 1, none of the presently cited art considered individually or in combination teaches the positioning of an oxygen emitter directly within a conduit lumen of a fluid conduit'" (Remarks, page 9)

The examiner responded to applicant's arguments and amendment in an Office Action mailed November 1, 2007, the examiner stating "[t]he rejection of claims 1-3 under 35 U.S.C. 102(e) as being anticipated by Zappi et al. US 6,328,875 B1 (Zappi) is withdrawn in view of applicant's claim amendment filed 17 August 2007." The examiner also withdrew the rejection of claims 1-4 over Divisek et al. stating "[t]he rejection of claims 1-4 under 35 U.S.C. 103(a) as being unpatentable over Divisek et al. US 4,225,401 (Divisek) is withdrawn in view of applicant's claim amendment filed 17 August 2007."

The examiner additionally entered new grounds of rejection over U.S. Patent Publication 2002/0074237 to Takesako et al (Takesako) and U.S. Patent 6,171,469 to Hough et al. (Hough). As to Takesako, the examiner rejected claims 1-3, 13, 15 and 17-22 under 35 U.S.C. 102(b) as being anticipated, stating:

> Takesako teaches a water electrolyzer comprising a fluid conduit having a fluid inlet and a fluid outlet connected with a conduit lumen (Fig. 1(a)-(b), #1, 21, 22). Takesako also teaches an electrolysis cell positioned within the conduit lumen and parallel to a flow axis of the conduit lumen (Fig. 1(b), paragraph [0021]). The electrolysis cell as taught by Takesako comprises a plurality of matched sets of anodes and cathodes and secured to electrode connecting rods by conductive bolts and spacers (Figs. 2-3, #2, 4, 25-27 and 31-33, paragraph [0056]). In addition, the electrodes are expanded metal mesh (paragraphs [0012, 0062] and the distance between the electrodes does not exceed 3.0 mm (paragraph [0017]. Takesako further teaches that the electrolysis cell in the conduit lumen is connected to a power source (Fig. 1(b)). (Office Action, page 4 and 5).

As to Hough, the examiner rejected claims 1-3, 13, 17 and 20-22 under 35 U.S.C. 102(b) as being anticipated, stating:

> Hough teaches a water electrolyzer for increasing oxygen content of water (abstract, title), wherein the water electrolyzer comprises a flow conduit having an inlet and an outlet connected to the conduit lumen (Fig. 1 #11-12). Hough also teaches a plurality of matched sets of anodes and cathodes mounted to stabilizing hardware and positioned within the conduit lumen (Fig. 2C). The electrodes are connected to a power source (Fig. 1 #14, col. 3 lines 6-11). The electrodes in the water electrolyzer of Hough are metal (col. 3 lines 1-5) and are positioned parallel to the flow axis of the conduit (Fig. 2C) (Office Action, pages 6 and 7).

The examiner also objected to claim 14 as being dependent up a rejected base claim but allowable if rewritten in independent form. The examiner stated "[t]he prior art of record does not teach or fairly suggest, either alone or in combination, the claimed flow through oxygenator comprising three matched sets of anodes and cathodes attached to stabilizing hardware in adjacent relation such that each matched set resides at a 120° angle to the adjacent matched sets." (Office Action, page 13)

In a response filed March 3, 2008, applicant amended the claims to recite:

1. (Currently Amended) A flow through oxygenator comprising:
a fluid conduit having a fluid inlet and a fluid outlet with a conduit lumen;

an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including ~~a plurality of~~ three matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen and each matched set resides at a 120° angle to the adjacent matched sets; and

a power source in electrical communication with the oxygen emitter.

25. (Currently Amended) A flow through oxygenator comprising:
a watering hose having a hose lumen; and
an oxygen emitter operably mounted with the hose lumen, the oxygen emitter including three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets.

26. (Currently Amended) A flow through oxygenator comprising:
a hydroponic circulating system having a circulating lumen; and
an oxygen emitter operably mounted within the circulating lumen, the oxygen emitter including three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets.

Applicant thus limited all the claims to include the limitation shown in Figure 7A, i.e., "three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets."

Applicant argued "[b]y way of the present amendment to independent claim 1, Applicant has incorporated the previously indicated allowable subject matter of former dependent claim 14. As such, Applicant requests said rejections be withdrawn." (Remarks, page 11)

The narrow scope of the claims in the '411 patent which recite "the oxygen emitter is positioned within the conduit lumen" (claims 1-15); "an oxygen emitter operably mounted within the hose lumen" (claim 16); and "an oxygen emitter operably mounted within the circulating lumen"(claim 17), along with "three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets" was done to overcome prior art rejections and was not an error within the meaning of 35 U.S.C. 251. The broader scope of claim subject matter surrendered in the application for the '411 patent cannot be recaptured by the filing of the present reissue application.

Response to Arguments

Applicant's arguments filed February 6, 2017 have been fully considered but they are not persuasive.

As to the §112, 1st paragraph rejections, applicant argues "the description of an article pictured can be relied on, in combination with the drawings, for what they would reasonably teach one of ordinary skill in the art (Remarks, pages 26-27) and point to the specific embodiment shown in Figure 7A as teaching the now claimed limitations (Remarks, pages 27-34). Applicant's arguments lack merit.

Figure 7A shows a single embodiment of the invention wherein "three anodes **1** and cathodes **2**, of appropriate size to fit inside a tube or hose and separated by the critical distance are placed within a tube or hose **3** at 120° angles to each other" (column 9, lines 7-11). Figure 7A, along with the description at column 9, lines 5-18 of the '495 patent, teach a single embodiment of the invention wherein three sets of anodes and cathodes (i.e., six electrodes) are arranged in an equilateral triangle (i.e., 120° angles to each other) within a tube or hose.

Applicant's claims do **not** require at least three sets of anodes and cathodes as disclosed and arranged in Figure 7A and described in column 9, lines 5-18, i.e., "at 120° angles to each other." For example, claim 13 recites "at least two electrodes". A single pair of electrodes cannot form an equilateral triangle as shown in Figure 7A and described in column 9 of the '495 patent. Nor do the additionally recited claim limitations inherently require three pairs of electrodes arranged in an equilateral triangle and it is disingenuous for applicant to point to the characteristics of an equilateral triangle as inherently supporting claims which do not require the electrodes to be arranged in an equilateral triangle.

Applicant argues

> [t]here is a difference between claiming the configuration of the electrodes and claiming a specific result from operating the electrodes in that configuration. The independent claims where they recite the separation distance are not claiming obtaining oxygen bubbles of a certain size. For example, claim 13 recites that "the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches" and the power source "is operable to produce oxygen in said water." By adding a requirement that the oxygen produced by the emitter includes bubbles of a certain size, the dependent claims are narrowing the claims. Infringement of the dependent claims may require different evidence (i.e. evidence indicative of the size of emitted bubbles), whereas there is no such requirement for determining infringement of the claims that recite the distance separating the electrodes. (Remarks, pages 34-35)

Applicant's argument lacks merit.

Applicant's claims are directed to an apparatus. The intended use of the apparatus, i.e., "obtaining oxygen bubbles of a certain size" is not a further limitation to the structure of the claimed apparatus. Accordingly, a dependent claim does not further limit the claim from which it depends by adding this "requirement."

Applicant's additional arguments filed February 6, 2017 have been fully considered but they are not persuasive for the reasons as stated in the above rejections.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Duty to Disclose

Applicant is reminded of the continuing obligation under 37 CFR 1.178(b), to timely apprise the Office of any prior or concurrent proceeding in which Patent No. 7,670,495 is or was involved. These proceedings would include interferences, reissues, reexaminations, and litigation.

Applicant is further reminded of the continuing obligation under 37 CFR 1.56, to timely apprise the Office of any information which is material to patentability of the claims under consideration in this reissue application.

These obligations rest with each individual associated with the filing and prosecution of this application for reissue. See also MPEP §§ 1404, 1442.01 and 1442.04.

Correspondence

Any inquiry concerning this communication or earlier communications from the specialist should be directed to Jerry D. Johnson whose telephone number is (571) 272-1448. The specialist can normally be reached on 5:30-3:00, M-F, alternate Fridays off.

If attempts to reach the specialist by telephone are unsuccessful, the specialist's supervisor, Stephen Stein can be reached on (571) 272-1544.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Telephone Numbers for reexamination inquiries:
Central Reexam Unit (CRU) (571) 272-7705

Please mail any communications to:
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Central Reexamination Unit
Commissioner for Patents
P. O. Box 1450
Alexandria VA 22313-1450

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Exhibit E

IN THE UNITED STATES PATENT AND TRADEMARK

S/N 14/601,340 **CONTINUATION REISSUE PATENT**

Applicant(s)	James Andrew Senkiw	**Amendment And Response**
Serial No.	14/601,340	
Filing Date	January 21, 2015	
Continuation Reissue of U.S. Patent No.	7,670,495	
Issued:	March 2, 2010	
Examiner Name	Jerry D. Johnson	
Group Art Unit	3991	
Attorney Docket No.	3406.005US2	
Customer Number:	38846	
Confirmation No.	1069	
Title:	FLOW-THROUGH OXYGENATOR	

Mail Stop Reissue
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

This amendment responds to the PTO action mailed on October 5, 2016 for Application Serial No. 14/601,340.

The Applicant petitions the Director of the United States Patent and Trademark Office to extend the time for reply to the Office action dated October 5, 2016 for any periods necessary for entry of this amendment. It is believed that only a one-month extension of time is necessary because February 5th fell on a Sunday. Nevertheless, please grant any extension of time necessary for entry, and charge any fee due to Deposit Account No. 502880.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of claims

1. (Canceled)
2. (Canceled)
3. (Canceled)
4. (Canceled)
5. (Canceled)
6. (Canceled)
7. (Canceled)
8. (Canceled)
9. (Canceled)
10. (Canceled)
11. (Canceled)
12. (Canceled)

13. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;

at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches within the tubular housing;

each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing and so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power

source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

14. (New) The emitter of claim 13 wherein the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis; wherein the electrodes extend in a direction that is parallel to the longitudinal axis; and wherein at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes.

15. (New) The emitter of claim 13 wherein the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis; wherein said electrodes extend in a direction parallel to the longitudinal axis; and wherein each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing.

16. (New) The emitter of claim 13 wherein at least one of the electrodes is a stainless steel mesh or screen.

17. (New) The emitter of claim 13 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing.

18. (New) The emitter of claim 17 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing.

19. (New) The emitter of claim 17 wherein the first and second electrodes comprise an outside electrode and an inside electrode, wherein the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing,

the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is,

wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway.

20. (New) The emitter of claim 13 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to and including the center axis, the passageway running for at least the length of one of the electrodes positioned within the housing;

wherein the first and second electrodes comprise an outside electrode and an inside electrode;

wherein the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing;

the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is;

wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway; and

wherein the tubular housing of the emitter is round.

21. (New) The emitter of claim 19 wherein said inward-facing surface is a concave surface.

22. (New) The emitter of claim 13 further including first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing.

23. (New) The emitter of claim 13 wherein the oxygen produced comprises microbubbles.

24. (New) The emitter of claim 13 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

25. (New) The emitter of claim 13 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

26. (New) The emitter of claim 13 wherein the oxygen produced comprises nanobubbles.

27. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing defining an oxygenation chamber and having a water inlet, a water outlet, a longitudinal water flow axis from the inlet to the outlet, and an inward-facing surface that runs parallel to the water flow axis and defines at least in part the oxygenation chamber;

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that is parallel to the longitudinal axis, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber,

wherein the position and size of each electrode within the chamber defines a cross-section of the chamber that has a water flow area within the oxygenation chamber through which water may flow without passing between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches, wherein the water flow area is greater than an area at the cross-section equal to the total area between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches,

wherein at least a portion of the outside electrode positioned in the chamber is closer to the inward-facing surface of the oxygenation chamber than said distance separating the inside electrode from the outside electrode; and

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power

source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the chamber of the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

28. (New) The emitter of claim 27 wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a longitudinal center axis of the oxygenation chamber.

29. (New) The emitter of claim 27 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber.

30. (New) The emitter of claim 29 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber.

31. (New) The emitter of claim 30 wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway.

32. (New) The emitter of claim 27 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing.

33. (New) The emitter of claim 27 wherein the oxygen produced comprises nanobubbles.

34. (New) The emitter of claim 27 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

35. (New) The emitter of claim 27 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

36. (New) The emitter of claim 35 wherein the oxygen produced comprises nanobubbles.

37. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing defining an oxygenation chamber and having a water inlet, and a water outlet;

at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the oxygenation chamber, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches, a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber, said portion being a portion that opposes the other of the first and second electrodes, wherein each electrode is positioned within the oxygenation chamber so that a cross section of the oxygenation chamber includes a water flow area that allows water to avoid passing between electrodes separated by 0.005 inches to 0.140 inches;

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

38. (New) The emitter of claim 37 wherein the tubular housing has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal center axis; and wherein each electrode of the emitter is positioned so that all points midway between all opposing electrodes inside the chamber are closer to said inwardly-facing surface than to the longitudinal center axis.

39. (New) The emitter of claim 37 wherein the chamber has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal axis, wherein the electrodes extend in a direction that is parallel to the longitudinal axis, and wherein at least one of the first and second electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes.

40. (New) The emitter of claim 39 wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to the longitudinal center axis of the oxygenation chamber.

41. (New) The emitter of claim 37 wherein the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing.

42. (New) The emitter of claim 37 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber.

43. (New) The emitter of claim 42 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the chamber.

44. (New) The emitter of claim 42 wherein the chamber has an inward-facing surface that runs parallel to the longitudinal axis; wherein the first and second electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is; and wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway.

45. (New) The emitter of claim 37 further including first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a

radial direction relative to a longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing.

46. (New) The emitter of claim 37 wherein the oxygen comprises microbubbles.

47. (New) The emitter of claim 37 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

48. (New) The emitter of claim 37 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

49. (New) The emitter of claim 37 wherein the oxygen produced comprises nanobubbles.

50. (New) An emitter for electrolytic generation of bubbles of oxygen in an aqueous medium comprising:

a tubular housing defining an oxygenation chamber, and having an inward-facing surface that defines at least in part the oxygenation chamber, a water inlet, and a water outlet;

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that runs parallel to the inward-facing surface, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the inward-facing surface of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber;

wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a midpoint of the tubular housing and so that at least some water may flow through an unobstructed passageway from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches.

51. (New) The emitter of claim 50 wherein at least one of the inside and outside electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes, and wherein the tubular housing defines a longitudinal center axis that lies in the oxygenation chamber and wherein the unobstructed passageway includes the longitudinal center axis.

52. (New) The emitter of claim 50 wherein at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber.

53. (New) The emitter of claim 52 wherein the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing.

54. (New) The emitter of claim 50 wherein the unobstructed passageway is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber.

55. (New) The emitter of claim 54 wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway.

56. (New) The emitter of claim 55 wherein said inward-facing surface is a concave surface.

57. (New) The emitter of claim 50 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing.

58. (New) The emitter of claim 50 wherein the emitter is operable when connected to a power source to create microbubbles of oxygen in water flowing through the oxygenation chamber.

59. (New) The emitter of claim 50 coupled to a power source wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

60. (New) The emitter of claim 50 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

61. (New) The emitter of claim 50 wherein the emitter is operable when connected to a power source to create nanobubbles of oxygen in water flowing through the oxygenation chamber.

62. (New) An emitter for electrolytic generation of bubbles of oxygen in an aqueous medium comprising:

a tubular housing defining an oxygenation chamber, said housing having an outer wall that runs parallel to a longitudinal center axis of the housing, said housing having a water inlet and a water outlet,

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches;

the electrodes being positioned away from the center axis and maintaining a longitudinal, unobstructed passageway parallel to and including the center axis that runs for at least the length of one of the electrodes positioned within the chamber, the unobstructed passageway having a uniform cross-sectional area along that length, the electrodes being positioned so that water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;

wherein the outside electrode defines a cross-sectional area between the outside electrode and the outer wall of the chamber that is less than said cross-sectional area of the unobstructed passageway.

63. (New) The emitter of claim 62 wherein at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber.

64. (New) The emitter of claim 63 wherein the electrode in contact with a wall of the tubular housing is in contact with the outer wall which is a curved wall of the tubular housing.

65. (New) The emitter of claim 62 wherein the unobstructed passageway is multiple times wider than the distance separating the opposing outside and inside electrodes within the chamber.

66. (New) The emitter of claim 62 wherein said outer wall includes an inwardly-facing concave surface.

67. (New) The emitter of claim 62 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing.

68. (New) The emitter of claim 62 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

69. (New) The emitter of claim 68 wherein the emitter is operable when connected to a power source to create nanobubbles of oxygen in water flowing through the oxygenation chamber.

REMARKS

Claims 13-69 are pending in this application. Claims 1-12 were previously canceled. The claims are marked with respect to the claims of the original patent being reissued, U.S. Patent No. 7,670,495. Claims 13-15, 17, 19, 20, 27, 29, 31, 37-39, 42, 44, 50, 55, 61 and 62 have been amended as discussed herein. Reconsideration of claims 13-69 is respectfully requested in light of the amendments and the following remarks.

Defective Oath

The office action sates that the reissue oath/declaration is defective because it does not identify an alleged error to be corrected by this continuation reissue application. Applicant respectfully traverses this rejection. Paragraphs 5-10 of the inventor's reissue declaration identifies multiple errors, including:

(i) claim 2 of the '495 patent is too narrow in that it requires a spacer separating the electrodes (see 1/11/16 Reissue Declaration at ¶ 9), the present reissue claims do not include this limitation;

(ii) claim 2 of the '495 patent is too narrow in that it requires that water be "supersaturated" (see 1/11/16 Reissue Declaration at ¶ 9), the present reissue claims do not include this limitation; and

(iii) claim 2 of the '495 patent is too broad in that it did not recite certain features of the arrangement of the electrodes that are shown in FIGS. 7A and 7B (see 1/11/16 Reissue Declaration at ¶¶7-8).

First, the office action appears to have overlooked and does not address the errors identified in paragraphs i and ii above (spacer, supersaturated). There is no basis for finding that these do not identify an error to be corrected by this reissue.

With respect to the third category, that these narrowing limitations relate to how the electrodes of the emitter are positioned within a housing or chamber does not make these narrowing limitations improper for reissue. These limitations were never previously presented or abandoned. It was an error not to include these limitations, and claim 2 of the '495 patent is too broad in that it was not limited in these respects.

The office action states that the claims of the '441 patent cannot be broadened by this reissue, and that the present continuation reissue cannot recapture subject matter surrendered during prosecution of the '441 patent. The applicant respectfully notes that it is claim 2 of the '495 patent that is being reissued, not the '441 patent claims. In addition, claim 2 of the '495 patent itself was already broader than the claims of the '441 patent. Further, the limitations that seem to be causing the most concern for the examiner (the limitations relating to how the emitter electrodes are positioned inside a housing or chamber) are narrowing limitations, they do not broaden claim 2 of the '495 patent at all. That other, different features shown in FIG. 7 may have been claimed in the '441 patent is not a basis to find the present reissue oath to be defective here. The same features are not being claimed. Finally, as discussed below under the specific recapture heading, the present claims are not recapturing surrendered subject matter.

Scope of the Claims

The office action includes a section under the heading "Scope of the Claims." No rejection of the claims is made in this section, but Applicants note the following. Applicants agree that the pending claims are limited to emitters having electrodes separated by a distance of from 0.005 to 0.140 inches. Applicants, however, respectfully disagree that the pending claims are limited by the defined terms "critical distance," or "O_2 emitter." These two phrases do not appear in the pending claims. The claims should, therefore, be examined based on a scope commensurate with the limitations of the claims as written, not based on definitions of these two terms that do not appear in the claims.

Applicants also respectfully disagree with the further characterization of what claims 13-69 are "directed to". The characterization omits substantial material limitations in the pending claims and uses terms that are not present in the claims (e.g., "conduit"). While there are certainly some similarities between limited portions of the presently pending claims and the claims of the '441 patent, such should be expected where they are related applications, based on the same specification, and especially where during original prosecution the claims of the '495 patent were issued a double-patenting rejection in light of the '441 patent claims. Any similarity of phrases, without more, does not form a basis for rejecting the present claims, nor does any similarity warrant construing the claims differently than as presently written. The claims should be examined based on a scope commensurate with the limitations of the claims as written, not based on any similarity of certain phrases to phrases used in related patent claims.

Explanation of Support

The office action states that the amendment filed January 26, 2016 is improper and notes that each claim amendment must be accompanied by an explanation of support in the disclosure. At page 14 of the January 26, 2016 amendment, Applicants noted the changes to the claims as compared to the claims previously considered by the examiner. Specifically, the preamble of the claims was amended to use the alternate phrasing of an "emitter for electrolytic generation of bubbles of oxygen" instead of an "electrolysis system for generating oxygenated water" or an "electrolysis cell," and conforming amendments were made to the body of the claims, for example, to refer back to "the emitter" instead of to "the system."[1] Support for this amendment can be found, for example, in the disclosure of the patent at the Abstract ("An oxygen emitter which is an electrolytic cell is disclosed…"); col. 1:15-21 ("This invention relates to the electrolytic generation of microbubbles of oxygen…"); col. 2:63-67 ("This invention provides an oxygen emitter which is an electroliytic cell which generates very small microbubbles and nanobubbles of oxygen in an aqueous medium…"); 4:58 ("Oxygen Emitter"); 5:44-45 ("Attempts were made to measure the diameter of the O_2 bubbles emitted by the device…"); 6:6 ("Other Models of Oxygen Emitter"); 9:3-18 ("Flow-through Emitter for Agricultural Use…"); 10:31-32 ("An emitter for electrolytic generation of microbubbles of oxygen in an aqueous medium…"); as well as throughout the specification.

Also, as compared to the claims previously considered by the examiner, the January 26, 2016 amendment amended dependent claims 26, 33, 36, 49, 61, and 69 to call out nanobubbles instead of microbubbles. Support for this amended language can be found, for example, at column 2, lines 63-65 ("This invention provides an oxygen emitter which is an electrolytic cell which generates very small microbubbles and nanobubbles of oxygen in an aqueous medium…"). No new matter was entered by the amendment filed January 26, 2016. To aid the examiner in finding support for each and every claim limitation found in the claims, applicants have prepared the following chart mapping every claim limitation to exemplary specification

1 One additional such conforming amendment to claim 61 is made herein, replacing "electrolysis cell" with "emitter" which was overlooked at the time of the January 26, 2016 amendment.

support.

Claim Limitations	Support Location
Claim 13	
an emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;	3:26-32 9:7-11 FIGS. 7A-7B
at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches within the tubular housing;	FIG. 7A 3:11-14 4:54 5:4-11
each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing	FIG. 7A 9:5-33
and so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 9:5-33 3:23-30 3:11-14
a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;	9:35-45
the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.	3:27-35 2:63-67
Claim 14	
the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis	FIG. 7A 9:7-12
the electrodes extend in a direction that is parallel to the longitudinal axis	FIG. 7A FIG. 7B

	9:7-12 3:25-30
at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes	FIG. 7A 9:7-12
Claim 15	
the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis	FIG. 7A 9:7-12
electrodes extend in a direction parallel to the longitudinal axis	FIG. 7A FIG. 7B 9:7-12 3:25-30
each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing	FIG. 7A 9:7-12
Claim 16	
at least one of the electrodes is a stainless steel mesh or screen	3:6-8 4:63-64
Claim 17	
the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing	FIG. 7A FIG. 7B 9:7-18
Claim 18	
the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing	FIG. 7A
Claim 19	
the first and second electrodes comprise an outside electrode and an inside electrode, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is	3:25-28 FIG 7A 9:7-18
the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis	FIGS. 7A-7B 9:7-12 3:25-30
the first and second electrodes extend in a longitudinal direction parallel to an inward-facing surface of the tubular housing	FIG. 7A 9:7-12
the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is	FIG. 7A 9:7-18

less than a cross-sectional area of the unobstructed passageway	
Claim 20	
the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to and including the center axis, the passageway running for at least the length of one of the electrodes positioned within the housing	FIG. 7A FIG. 7B 9:7-18
the first and second electrodes comprise an outside electrode and an inside electrode, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is	3:25-28 FIG 7A 9:7-18
the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing	FIGS. 7A-7B 9:7-12 3:25-30
the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway	FIG. 7A 9:7-18
the tubular housing of the emitter is round	FIG. 7A
Claim 21	
said inward-facing surface is a concave surface	FIG. 7A
Claim 22	
first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing	FIG 7A 9:11-17
Claim 23	
the oxygen produced comprises microbubbles	2:63-67 3:11-14 4:10-11 4:27-28
Claim 24	
the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode	9:35-45 (Table III)
Claim 25	
a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions	FIG. 7A 9:7-11 3:25-28
Claim 26	
the oxygen produced comprises nanobubbles	2:63-67

	3:11-14 4:12-15 4:27-28
Claim 27	
An emitter for electrolytic generation of bubbles of oxygen in water	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing defining an oxygenation chamber and having a water inlet, a water outlet, a longitudinal water flow axis from the inlet to the outlet, and an inward-facing surface that runs parallel to the water flow axis and defines at least in part the oxygenation chamber	3:26-32 9:7-12 FIG. 7A
at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that is parallel to the longitudinal axis	3:25-30 FIG. 7A FIG. 7B 9:7-18
the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber	FIG. 7A 3:11-14 4:54 5:4-11
the position and size of each electrode within the chamber defines a cross-section of the chamber that has a water flow area within the oxygenation chamber through which water may flow without passing between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches, wherein the water flow area is greater than an area at the cross-section equal to the total area between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 9:5-33 3:23-30 3:11-14
a portion of the outside electrode positioned in the chamber is closer to the inward-facing surface of the oxygenation chamber than said distance separating the inside electrode from the outside electrode	FIG. 7A 3:25-28
a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps	9:35-45
the power source being operable to deliver electrical current to the electrodes while water flows through the chamber of the tubular	3:27-35 2:63-67

housing and is in contact with the electrodes to produce oxygen in said water via electrolysis	
Claim 28	
each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a longitudinal center axis of the oxygenation chamber	FIG. 7A 9:7-12
Claim 29	
electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber	FIG. 7A FIG. 7B 9:7-18
Claim 30	
the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber	FIG. 7A
Claim 31	
the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway	FIG. 7A 9:7-18
Claim 32	
first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing	FIG 7A 9:11-17
Claim 33	
the oxygen produced comprises nanobubbles	2:63-67 3:11-14 4:12-15 4:27-28
Claim 34	
the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode	9:35-45 (Table III)
Claim 35	
the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions	FIG. 7A 9:7-11 3:25-28
Claim 36	
the oxygen produced comprises nanobubbles	2:63-67 3:11-14 4:12-15 4:27-28

Claim 37	
an emitter for electrolytic generation of bubbles of oxygen in water	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing defining an oxygenation chamber and having a water inlet, and a water outlet	3:26-32 9:7-12 FIG. 7A
at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the oxygenation chamber, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 3:11-14 4:54 5:4-11
a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber, said portion being a portion that opposes the other of the first and second electrodes	FIG. 7A
each electrode is positioned within the oxygenation chamber so that a cross section of the oxygenation chamber includes a water flow area that allows water to avoid passing between electrodes separated by 0.005 inches to 0.140 inches	FIG. 7A 9:5-33 3:11-14
a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps	9:35-45
the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis	3:27-35 2:63-67
Claim 38	
the tubular housing has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal center axis	FIG. 7A 3:26-32 9:7-12
each electrode of the emitter is positioned so that all points midway between all opposing electrodes inside the chamber are closer to said inwardly-facing surface than to the longitudinal center axis	FIG. 7A
Claim 39	

the chamber has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal axis, wherein the electrodes extend in a direction that is parallel to the longitudinal axis	3:26-32 9:7-12 FIG. 7A
at least one of the first and second electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes	FIG. 7A 9:7-12
Claim 40	
each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to the longitudinal center axis of the oxygenation chamber	FIG. 7A 9:7-12
Claim 41	
the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing	FIG. 7A
Claim 42	
the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber	FIG. 7A FIG. 7B 9:7-18
Claim 43	
the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the chamber	FIG. 7A
Claim 44	
the chamber has an inward-facing surface that runs parallel to the longitudinal axis	FIG. 7A 3:26-32 9:7-12
the first and second electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is	3:25-28 FIG 7A 9:7-18
the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway	FIG. 7A 9:7-18
Claim 45	
first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing	FIG 7A 9:11-17
Claim 46	

the oxygen comprises microbubbles	2:63-67 3:11-14 4:10-11 4:27-28
Claim 47	
the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode	9:35-45 (Table III)
Claim 48	
the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions	FIG. 7A 9:7-11 3:25-28
Claim 49	
the oxygen produced comprises nanobubbles	2:63-67 3:11-14 4:12-15 4:27-28
Claim 50	
an emitter for electrolytic generation of bubbles of oxygen in an aqueous medium	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing defining an oxygenation chamber, and having an inward-facing surface that defines at least in part the oxygenation chamber, a water inlet, and a water outlet	3:26-32 9:7-12 FIGS. 7A-7B
at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that runs parallel to the inward-facing surface, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the inward-facing surface of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is	3:25-28 FIG 7A 9:7-18
the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber	3:11-14 4:54 5:4-11
each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a midpoint of the tubular housing and	FIGS. 7A-7B 9:7-11

so that at least some water may flow through an unobstructed passageway from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches	3:23-30 3:11-14
Claim 51	
at least one of the inside and outside electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes	FIG. 7A 9:7-11
the tubular housing defines a longitudinal center axis that lies in the oxygenation chamber and wherein the unobstructed passageway includes the longitudinal center axis	FIG. 7A 9:7-11
Claim 52	
at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber	FIG. 7A
Claim 53	
the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing	FIG. 7A
Claim 54	
the unobstructed passageway is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber	FIG. 7A
Claim 55	
the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway	FIG. 7A 9:7-18
Claim 56	
the inward-facing surface is a concave surface	FIG. 7A
Claim 57	
first and second conductors coupled to the outside and inside electrodes, respectively, and exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing	FIG 7A 9:11-17
Claim 58	
the emitter is operable when connected to a power source to create microbubbles of oxygen in water flowing through the oxygenation chamber	2:63-67 3:11-14 4:10-11 4:27-28
Claim 59	
a power source wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode	9:35-45 (Table III)
Claim 60	
a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each	FIG. 7A 9:7-11

being parallel to respective opposing cathode electrode portions	3:25-28
Claim 61	
the emitter is operable when connected to a power source to create nanobubbles of oxygen in water flowing through the oxygenation chamber.	2:63-67 3:11-14 4:10-11 4:27-28
Claim 62	
an emitter for electrolytic generation of bubbles of oxygen in an aqueous medium	Abstract 1:15-21 2:63-67 3:24-35 4:58 5:44-45 6:6 9:3-18 10:31-32
a tubular housing defining an oxygenation chamber, said housing having an outer wall that runs parallel to a longitudinal center axis of the housing, said housing having a water inlet and a water outlet	3:26-32 9:7-12 FIGS. 7A-7B
at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is	3:25-28 FIG 7A 9:7-18
the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 3:11-14 4:54 5:4-11
the electrodes being positioned away from the center axis and maintaining a longitudinal, unobstructed passageway parallel to and including the center axis that runs for at least the length of one of the electrodes positioned within the chamber, the unobstructed passageway having a uniform cross-sectional area along that length	FIG. 7A FIG. 7B 9:7-18
the electrodes being positioned so that water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 9:7-12 3:23-30 3:11-14
the outside electrode defines a cross-sectional area between the outside electrode and the outer wall of the chamber that is less than said cross-sectional area of the unobstructed passageway	FIG. 7A 9:7-18
Claim 63	

at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber	FIG. 7A
Claim 64	
the electrode in contact with a wall of the tubular housing is in contact with the outer wall which is a curved wall of the tubular housing	FIG. 7A
Claim 65	
the unobstructed passageway is multiple times wider than the distance separating the opposing outside and inside electrodes within the chamber	FIG. 7A
Claim 66	
said outer wall includes an inwardly-facing concave surface	FIG. 7A
Claim 67	
first and second conductors coupled to the outside and inside electrodes, respectively, and exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing	FIG 7A 9:11-17
Claim 68	
at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions	FIG. 7A 9:7-11 3:25-28
Claim 69	
the emitter is operable when connected to a power source to create nanobubbles of oxygen in water flowing through the oxygenation chamber	2:63-67 3:11-14 4:10-11 4:27-28

35 U.S.C. §112, 1st Paragraph

Claims 13-69 were rejected as failing to comply with the written description requirement. The Office Action lists thirteen phrases as containing subject matter which was not described in the specification. See Action at p. 8. Each of these limitations is addressed below. As a preliminary point, however, Applicant notes that to satisfy the written description requirement, a patent specification need only describe the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention. Further, even the figures of a patent may satisfy the written description requirement of §112 when they allow persons of ordinary skill in the art to recognize that he invented what is claimed. See Vas-Cath, Inc. v. Mahurkar, 935 F.2d 1555, 1563-64, 19 USPQ2d 1111 (Fed. Cir. 1991) (finding that utility application claim limitations relating to the relative size and shape of a catheter lumen were adequately disclosed by the drawings of a design patent). In other words, the description of an article pictured can be relied on, in combination with the drawings, for what they would reasonably teach one of ordinary skill in the art. See also MPEP 2163.[2]

1. "at least portions of the first and second electrodes being positioned in the tubular housing"

Although Applicant does not agree with the premise of this rejection, to expedite prosecution, the phrase "at least portions of" where it precedes "the first and second electrodes being positioned in the tubular housing" has been removed from the claims. Applicant notes that the scope of the claims will reach any emitter having electrodes that satisfy the claim limitations, and this claim amendment is not intended to and does not narrow the scope of the claims.

2-4. "each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing"

"the electrodes are positioned away from a longitudinal center axis of the tubular housing"

"each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing" [3]

Each of these limitations relates to positioning the electrodes inside the housing so that the electrodes are arranged toward the outside, away from the centerpoint of the housing. This arrangement is clearly shown in FIG. 7A. As shown in FIG. 7A, three sets of electrodes (1, 2) are arranged along the lines of a triangle. The written description confirms that the three sets of anode and cathode pairs are each at the same 120 degree angle with respect to each other (i.e. the

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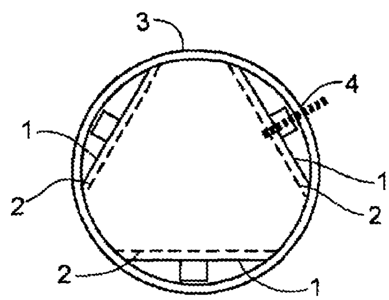
[2] MPEP 2163 states: "An applicant may show possession of an invention by disclosure of drawings or structural chemical formulas that are sufficiently detailed to show that applicant was in possession of the claimed invention as a whole. See, e.g., Vas-Cath,935 F.2d at 1565, 19 USPQ2d at 1118 ("drawings alone may provide a 'written description' of an invention as required by Sec. 112"); In re Wolfensperger, 302 F.2d 950, 133 USPQ 537 (CCPA 1962) (the drawings of applicant's specification provided sufficient written descriptive support for the claim limitation at issue); Autogiro Co. of Am. v. United States, 384 F.2d 391, 398, 155 USPQ 697, 703 (Ct. Cl. 1967) ("In those instances where a visual representation can flesh out words, drawings may be used in the same manner and with the same limitations as the specification.")"

[3] Claims 13 and 38 have been amended to omit the term "substantially" that had modified "all points midway…".

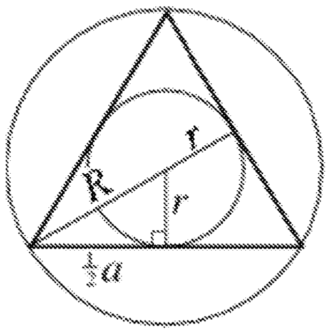
triangle is an equilateral triangle). See Col. 9:10-11. FIG. 7A also shows that the electrodes terminate at the inside surface of the tube wall, and the electrodes do not complete the corners of the triangle. In other words, the points of the triangle would fall outside the tube 3.

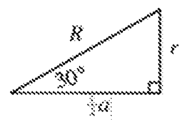
Fig. 7A



The electrodes shown in FIG. 7A do not pass through the center axis of the tube but instead are positioned away from the center axis and closer to the wall of the tube than they are to the center axis of the tube. Therefore, the figure clearly supports each of the limitations listed above.

These limitations do not rely on the scale of the drawing. Geometry mathematically dictates that electrodes positioned along the lines of an equilateral triangle centered on a round tube with its corners located outside the tube, will necessarily be located closer to the outer wall than to the center point of the tube. It is mathematically impossible for electrodes in this configuration to be closer to the center of the tube than the wall of the tube. It doesn't matter how large or small you make the housing or the electrodes: if the electrodes are arranged as chords of a circle along the sides of an equilateral triangle having its points outside the circle as is clearly shown in FIG 7A and also described at 9:7-11, the electrodes can <u>never</u> be closer to the center point of the tube than to the circular wall of the tube. This is pure math and does not rely on any drawing being to scale. It is dictated by the shapes shown in FIG. 7A (concentric circle and equilateral triangle). Consider the following:





sin 30° = ½ = r/R.

See http://mathworld.wolfram.com/EquilateralTriangle.html. This simple calculation shows that *r* (the distance each side of the triangle is away from the center point of the circle) shrinks to ½ R (half the radius of the outer circle) only when the triangle fits <u>inside</u> the circle. If the corners of the triangle fall outside the circle (as shown in FIG. 7A), then *r* will necessarily be greater than ½ R. In other words, when the corners of the triangle fall outside the circle, the sides of the triangle will always be closer to the outer circle than to the center point or axis of that circle. Therefore, not only does FIG. 7A disclose the relationships recited in these limitations between the electrodes, tube wall and tube center, but even if the scale of the drawing were altered or changed, the relationship would still necessarily be satisfied. The Declaration of Dr. Strykowski filed herewith supports these findings. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 at ¶¶ 4-8.

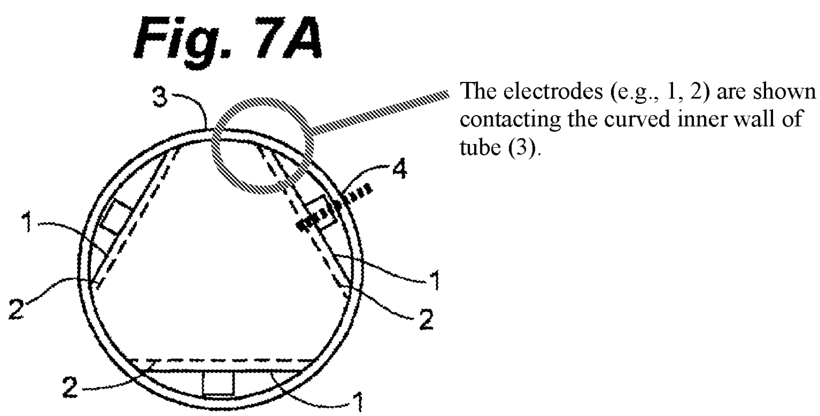
Nothing in this section is intended to import a limitation that the electrodes be configured in a triangular configuration. This section is merely meant to point out that the limitations noted above are supported by the disclosure and are not dependent on the scale of the figures.

5-7. "a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing"

"the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing"

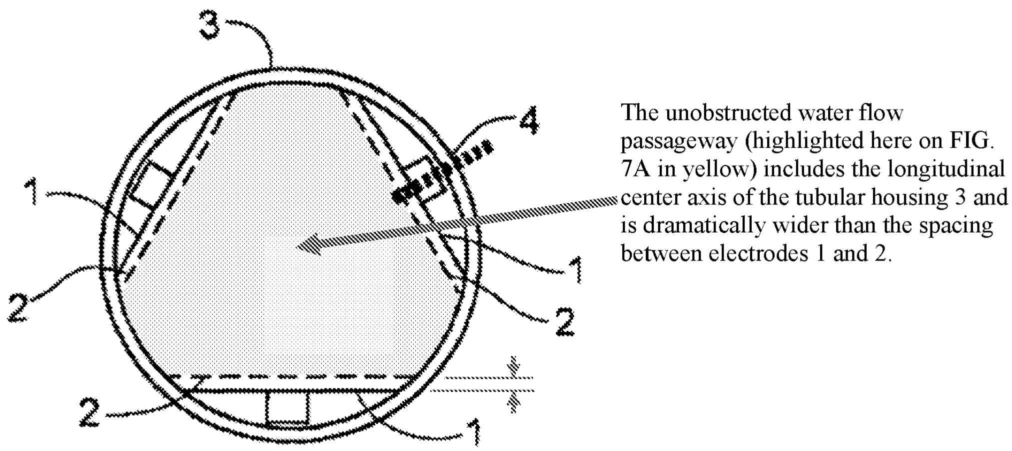
"at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes"

FIG. 7A shows the electrodes (1, 2) in contact with the curved inner wall of the circular tube 3. Because the electrodes contact the wall, each is closer to that wall than the distance separating the electrodes. Components that are touching or contacting each other are necessarily closer together than components that are separated. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 at ¶¶ 4, 9-10.



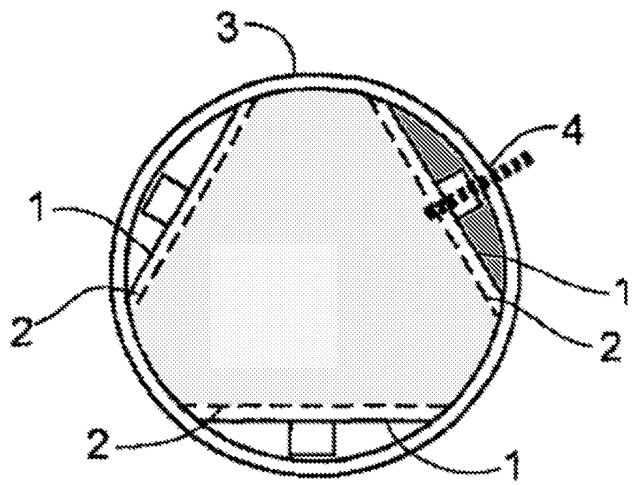
7. "the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing"

FIG. 7A shows the electrodes supported by stabilizing hardware 4 that does not cross into the center of the tube. Instead, the stabilizing hardware extends generally radially outward to support the electrodes against the wall of the tube. As shown in the figure, this creates an unobstructed passageway through the tube that includes the center axis of the tube. The passageway is dramatically wider than the narrow distance separating the first and second electrodes. One of skill in the art would recognize from FIG. 7A that the electrode pairs are spaced apart to form a water flow passage at the center of the tube that is multiple times wider than the distance between the electrodes of a pair. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 at ¶¶ 4, 11-12.



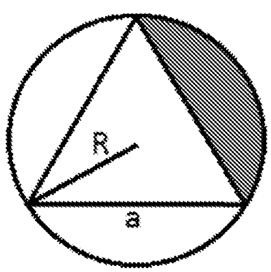
8. "the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway"

Dependent claims 19, 20, 44 have all been amended to remove the word "substantially" where it modifies "less than…" In addition, Applicant notes that FIG. 7A shows the area between the electrodes and the housing (highlighted in red in the figure below) is less than (and is even dramatically less than) the cross-sectional area of the unobstructed passageway (highlighted in yellow in the figure below). One of skill in the art would recognize from FIG. 7A that by positioning the electrode pairs closer to the outer wall of the tube, a larger area for water to flow is created at the center of the tube and there is less area between the electrode and the wall of the tube for water to pass. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 at ¶¶ 4, 13-14.



The area highlighted in red is significantly less than the area highlighted in yellow.

This relationship is not dependent on the scale of the drawing. As noted above, where an equilateral triangle is positioned over a circle with its corners falling outside the circle, the area shown in the above figure will necessarily be less than the area shown in yellow.



1. The area of the equilateral triangle is $\frac{a^2\sqrt{3}}{4} = .43\ a^2$ (rounding)
2. The area of the circle is πR^2.
3. $\cos 30° = \frac{\sqrt{3}}{2} = \frac{a}{2R}$, therefore $R = \frac{a}{\sqrt{3}}$
4. The area of the portion in red $= \frac{1}{3}(\pi R^2 - \frac{a^2\sqrt{3}}{4})$
$$= (\frac{\pi}{9} - \frac{\sqrt{3}}{12})\ a^2$$
$$= .20\ a^2 \qquad \text{(rounding)}$$
5. $0.20a^2 < 0.43a^2$

As shown in the equations to the right of the figure, where the triangle is shown to fit precisely within the circle, the area between one of the triangle sides and the circle (shown in red) will necessarily be less than half the area of the triangle. Where the corners of the triangle fall outside the circle, as shown in FIG. 7A of the '495 patent, the area shown in red will be an even smaller fraction of the area of the triangle inside the circle. Therefore, not only does FIG. 7A show the relationship recited in the limitation above, but this relationship will necessarily be maintained for any arrangement where there the electrodes are positioned along the sides of any equilateral triangle with its corners located outside the tubular housing, as shown in FIG. 7A. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 at ¶¶ 4, 13-14.

9-11. "the passageway running for at least the length of one of the electrodes positioned within the housing"

"the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing"

"the unobstructed passageway having a uniform cross-sectional area along that length."

As described above, each of claims 17, 20, 29, 42, and 62 have been amended to remove the reference to a “portion” of the electrodes. Further, claim 62 has been amended to remove the term “substantially” modifying “uniform”.

FIGS. 7A and 7B are described as showing the oxygenation chamber of an emitter. Col. 3:55-59 (“FIG. 7 shows an oxygenation chamber suitable for flow-through applications. FIG. 7A is a cross section showing arrangement of three plate electrodes. FIG. 7B is a longitudinal section showing the points of connection to the power source.”); col. 9:7-17 (“In FIG. 7(A), the oxygenation chamber is comprised of three anodes 1 and cathodes 2, of appropriate size to fit inside a tube or hose and separated by the critical distance are placed within a tube or hose 3 at 120° angles to each other. The anodes and cathodes are positioned with stabilizing hardware 4. …FIG. 7(B) shows a plan view of the oxygenation chamber…with stabilizing hardware 5 serving as a connector to the power source.”).

Fig. 7A

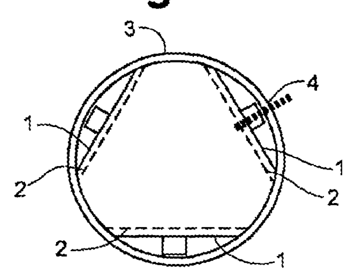
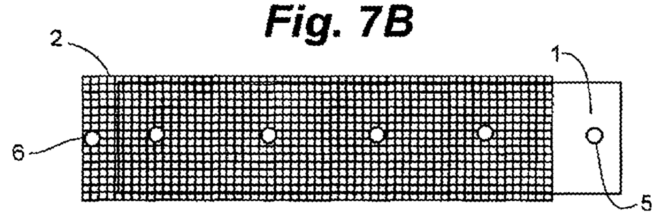


Fig. 7B



As shown in these figures, there is an unobstructed passageway at the center of the tube that runs the length of the electrodes 1, 2. The length of the electrodes is shown in FIG. 7B. FIG. 7A, which shows a cross-sectional view of the oxygenation chamber, shows how hardware is positioned toward the outside of the electrodes so that there are no obstructions in the passageway for the length of the electrodes, and the passageway has a uniform cross sectional area inside the oxygenation chamber. There is no reliance on the scale of the drawings to satisfy these claim limitations. Therefore, the disclosures of FIGS. 7A and 7B and their description in the specification reasonably convey to the artisan that the inventor had possession of the invention at least as of the time the ‘495 patent was filed. See Declaration of Dr. Paul Strykowski under 37 C.F.R. §1.132 at ¶¶ 4, 15-17 By disclosing an example emitter oxygenation chamber with a passageway satisfying these limitations, the inventor met the written description requirement of 35 U.S.C. §112.

35 U.S.C. §112, 2nd Paragraph

The examiner rejected claims 13-27, 31, 38, 55, 56, 62-69, because of the use of the term “substantially.” By this amendment the term “substantially” has been deleted from claims 13, 19, 20, 31, 38, 44, 55, 62. It is believed that the rejection of claim 27 on this basis was in error as the word “substantially” does not occur in claim 27.

35 U.S.C. §112, 4th Paragraph

The examiner rejected claims 23, 26, 36, 46, 49, 58, 61 and 69 which specifically call out microbubbles or nanobubbles on the grounds that the claims from which these depend are already limited to a “critical distance” which is defined in the specification at 4:1-3 to be “the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles.” Elsewhere, the specification also states, “The critical distance ranges from 0.005 inches to 0.140 inches.” See 3:12-13. The applicant would agree with the examiner’s rejection had any of the claims used the defined term “critical distance.” None of the claims, however, use the phrase “critical distance.” Claim 13, for example, only recites that the electrodes are “separated by a distance of between 0.005 inches to 0.140 inches.” There is a difference between claiming the configuration of the electrodes and claiming a specific result from operating the electrodes in that configuration. The independent claims where they recite the separation distance are not claiming obtaining oxygen bubbles of a certain size. For example, claim 13 recites that "the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches" and that the power source "is operable to produce oxygen in said water." By adding a requirement that the oxygen produced by the emitter includes bubbles of a certain size, the dependent claims are narrowing the claims. Infringement of the dependent claims may require different evidence (i.e. evidence indicative of the size of emitted bubbles), whereas there is no such requirement for determining infringement of the claims that recite the distance separating the electrodes.

Recapture

The examiner rejected all claims (13-69) as improperly recapturing subject matter surrendered during prosecution of U.S. Patent No. 7,396,441. The '441 patent is not being reissued. The '495 patent, however, which is presently being reissued, claims priority to the '441 patent. The examiner notes that during prosecution of the '441 patent, to overcome a prior art rejection the claims were amended to recite "three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets." Merely for ease of reference, this limitation will be referred to herein as "the triangle limitation." This triangle limitation does not appear in pending claims 13-69. Therefore, the examiner has rejected the present claims for recapture. Applicants respectfully traverse this rejection. In short, because the issued claims of the '495 patent did not include this limitation, the recapture rejection should be withdrawn.

For reference, the related prosecution history is as follows: (i) Provisional Application No. 60/358,534, filed on February 22, 2002; (ii) Application No. 10/372,017, filed February 21, 2003, now U.S. Patent No. 6,689,262, (i); (iii) continuation-in-part Application No. 10/732,326, filed on December 10, 2003, now U.S. Patent No. 7,396,441; (iv) divisional Application No. 12/023,431, filed January 31, 2008, now U.S. Patent No. 7,670,495, (v) reissue Application No. 13/247,241, filed September 28, 2011, now U.S. Patent No. RE45,415; (vi) continuation reissue Application No. 14/601,340, filed January 21, 2015 (the present application); and (vii) pending continuation reissue Application No. 15/085,741, filed March 30, 2016.

The three part test for analyzing recapture is as follows.[4] First, the reissue claims are analyzed to determine whether and in what aspects the reissue claims are broader than the original patent claims. The original patent is the patent actually being reissued. Second, if the reissue claims are broader in some aspects, it must be determined whether the patentee surrendered subject matter and whether any of the broader aspects of the reissue claim relate to that surrendered subject matter. Note that the second step has two subparts: (i) determine whether the patentee surrendered any subject matter, and (ii) determine whether any of the broader aspects identified in the first step relate to the surrendered subject matter. In the third step, the claims must be analyzed to determine whether the reissued claims were materially narrowed in other respects to avoid the recapture rule.

The first step in the analysis is a comparison of the reissue claims to the claims of the patent being reissued, i.e., the "original" patent.[5] To determine in what respects a reissue claim has been broadened (the first step of the recapture analysis), the reissue claims are <u>not</u> compared to claims in related applications, only to the original patent claims being reissued. It is incorrect in the first step of the analysis to assert that the pending reissue claims are broadened based on a comparison to claims in the other patents not being reissued such as the '441 issued claims. How the claims are "broader" is determined only by a comparison to the claims of the patent actually being reissued.

The issued emitter claims of the '495 patent (the "original" patent) did not include the triangle limitation. Therefore, the pending reissue claims have not "broadened" the '495 patent claims based on any lack of the triangle limitation. In other words, the triangle limitation is not

4 See, e.g., <u>MBO Laboratories, Inc. v. Becton, Dickinson & Co.</u>, F.3d 1306 (Fed. Cir. 2010); citing <u>In re Clement</u>, 131 F.3d 1464, 1468 (Fed. Cir. 1997).
5 The MPEP makes clear that the first step of recapture analysis is a comparison to the claims of the patent being reissued. See MPEP 1412.02 ("In every reissue application, the examiner must first review each claim for the presence of broadening, as compared with the scope of <u>the claims of the patent to be reissued</u>.")(emphasis added). By contrast, the MPEP also makes clear that the second step of the recapture analysis looks to the patent family's entire prosecution to determine what may have been surrendered. See MPEP 1412.02 ("Where a claim in a reissue application is broadened in some respect as compared to the patent claims, the examiner must next determine whether the broadening aspect(s) of that reissue claim relate(s) to subject matter that applicant previously surrendered during the prosecution of the original application (which became the patent to be reissued). The "original application" includes the patent family's entire prosecution history.")

one way in which the reissue claims are broader than the claims of the patent being reissued. It is not one of the differences between the reissue claims and the claims of the patent being reissued. In the present case, as identified in the inventors oath, the reissue claims are broader than the original claims being reissued, for example, in that the new claims do not recite a spacer between the electrodes (Senkiw Decl. ¶9), not because the new claims do not recite the triangle limitation. When the proper claim comparison under the first step of recapture analysis is performed, the triangle limitation is not a way or aspect in which the reissue claims are broadening. Because the reissue claims have not broadened the '495 patent claims with respect to the triangle limitation, the recapture rejection based on the triangle limitation should be withdrawn.

It is true that the second step of the analysis—determining what has been surrendered—considers arguments and amendments made during prosecution of related applications. The second step must determine whether any of the broadened aspects of the reissue claims (identified in step 1) relate to subject matter surrendered during prosecution of the patent being reissued or surrendered during any related prosecution. See, e.g., MBO Laboratories, Inc. v. Becton, Dickinson & Co., F.3d 1306 (Fed. Cir. 2010)("The term 'original patent' [for the first step] refers to the patent corrected by reissue; it does not limit the universe of patents and their prosecution histories that can be the basis for surrendered subject matter [under the second step]." Determining what subject matter has been surrendered is based on a review of all related applications.

Even for this second step, however, the Court in MBO Labs. noted that the recapture doctrine, like the doctrine of prosecution history estoppel, looks to related applications for surrendered subject matter when the claims being reissued and the claims in a related application have a limitation in common. That is, an argument related to a limitation in a related application will be binding in subsequent related prosecutions where the claims include that same limitation. MBO Labs. at 1318 (The prosecution history of a related patent can be relevant if, for example, it addresses a limitation in common with the patent in suit. …When multiple patents derive from the same initial application, the prosecution history regarding a claim limitation in any patent that has issued applies with equal force to subsequently issued patents that contain the same claim limitation.") (emphasis added).

In the present case, however, the triangle limitation is not present in both the ‘441 and the ‘495 issued claims. It is only found in the ‘441 claims. Because the applicant continued to pursue and was eventually granted claims that did not include the triangle limitation in a continuing application, the triangle limitation is not surrendered subject matter. In other words, because the claims of the ‘495 patent did not repeat or include the triangle limitation, there is no basis to conclude that the triangle limitation constitutes surrendered subject matter for purposes of reissuing the ‘495 patent claims. The Federal Circuit has stated that where a continuing application is filed to pursue broader claims, it is inappropriate to find recapture based on a narrowing amendment in an earlier application:

> Although the recapture rule does not apply in the absence of evidence that the applicant's amendment was “an admission that the scope of that claim was not in fact patentable,” “the court may draw inferences from changes in claim scope when other reliable evidence of the patentee's intent is not available.” Deliberately canceling or amending a claim in an effort to overcome a reference strongly suggests that the applicant admits that the scope of the claim before the cancellation or amendment is unpatentable, but it is not dispositive because other evidence in the prosecution history may indicate the contrary. n.2 For example, if an applicant amends a broad claim in an effort to distinguish a reference and obtain allowance, but promptly files a continuation application to continue to traverse the prior art rejections, circumstances would suggest that the applicant did not admit that broader claims were not patentable-assuming that the applicant does not ultimately abandon the continuation application because the examiner refuses to withdraw the rejections.

In re Clement, 131 F.3d 1464, 1469 (Fed. Cir. 1997)(citations omitted, emphasis added).

In addition, even assuming for the sake of argument that the triangle limitation were considered surrendered subject matter for the ‘495 patent, none of the broadening aspects of the reissue claims relate to the triangle limitation. As stated above, the broadened aspects of the pending reissue claims (when properly compared to the claims of the ‘495 patent being reissued) relate to the spacer between the electrodes and the supersaturated limitation, not to any triangle limitation. Therefore, even assuming the triangle limitation constitutes surrendered subject matter, the broadening aspects of the pending claims do not relate to that subject matter.

Applicants respectfully submit that for at least these reasons, the recapture rejection should be withdrawn.

Response to Statements Suggesting that the '441 Patent (and Not the '495 Patent) is the Reference Patent for Determining Whether the Pending Claims Can Be Pursued in a Reissue Application Filed on the '495 Patent

This office action, and previous office actions, make statements suggesting that the '441 patent (and not the '495 patent) is the reference patent for determining whether the pending claims can be pursued in a reissue application filed on the '495 patent. The current office action at page 4, for example, states:

> The '495 patent does not contain claims to an emitter positioned within a conduit (as shown in Fig. 7), rather, it is the '441 divisional patent which claims an emitter positioned within a conduit. During prosecution of the '441 patent application, applicant specifically cited to Fig. 7 as support for the '441 patent claims. The present continuation reissue application cannot broaden the claims of the '441 divisional patent (which issued July 8, 2008). Nor can the present continuation reissue application recapture subject matter that was surrendered during the prosecution of the '441 divisional patent.
>
> Claims 13-69 are rejected as being based upon a defective reissue declaration under 35 U.S.C. 251 as set forth above. See 37 CPR 1.175.

A. Summary of Response

The process for assessing whether claims can be pursued in a broadening reissue application starts with identifying the "original patent" which, by statute, is the patent being reissued. *MBO Laboratories, Inc. v. Becton, Dickinson & Co.*, 602 F.3d 1306, 1316 (2010) (the Federal Circuit has construed "original patent" to be the actual patent being reissued). Respectfully, by making statements such as "the present continuation reissue application cannot broaden the claims of the '441 divisional patent (which issued July 8, 2008)" this office action and previous office actions appear to confuse the '441 patent with the '495 patent. The '495 patent is in fact the original patent, and it issued March 2, 2010, less than two years from the date applicant filed its application to reissue the '495 patent.

The ultimate question is whether or not there is any point of law which would bar applicant from pursing the pending claims in a reissue application filed on the '495 patent. The examiner has stated or suggested that the pending claims violate three points of law. In the application of each point of law, however, the examiner reverts back to the '441 patent, effectively using it as the original patent in analyzing the legal issues.

First, the examiner has suggested pending claims violate the two year rule for broadening reissues, and references the issue date of the '441 patent. The law, however, makes clear that the reference point for measuring the two year period is the issue date of the original patent which is the '495 patent. The two year rule has been satisfied and does not bar the pending claims.

Second, the examiner has stated that the pending claims violate the *Orita* doctrine and references a restriction requirement that was made in the '441 patent prosecution, not the '495 patent prosecution. As is the case with the application of the two-year rule, the *Orita* analysis starts with the '495 patent and its prosecution, and not the '441 patent. Here, there was no restriction made in the '495 patent prosecution. The examiner in the '495 patent prosecution did not make, repeat or refer to the prior restriction from the '441 patent. MPEP 819 ("A restriction requirement (and election thereto) made in a parent application does not carry over to a continuation, CIP, <u>or divisional</u> application.") (emphasis added). There being no restriction or narrow constructive election in the '495 patent, the *Orita* doctrine does not apply or bar the pending claims.

Third, the examiner states that the pending claims violate the recapture doctrine. Again, the examiner starts with the '441 patent and its prosecution as the starting point. That, again, is a misapplication of the law of recapture. As discussed above, the first and second steps of the recapture analysis starts with the claims of the '495 patent. Here, it is clear that recapture does not apply because the triangle limitation found in the '441 patent claims is not even present in the already issued '495 claims. As a matter of law, because the applicant continued to pursue and was eventually granted claims that did not include the triangle limitation in a continuing application which resulted in the '495 patent, the triangle limitation is <u>not</u> surrendered subject matter.

In the application of each of these three legal principles the examiner has incorrectly used the '441 patent as the reference, instead of the '495 patent which is in fact the original patent. Reconsideration is respectfully requested.

B. Detailed Discussion

Since the office action continues to suggest that the pending claims are barred by the *Orita* doctrine and the two-year rule, applicant includes the details of the prior response to those rejections. The Senkiw Declaration reference below is in the record. It was filed with applicant's request for continued examination.

1. There was no restriction requirement in the '495 patent prosecution that would have precluded the present claims from being prosecuted in the '495 patent.

The Federal Circuit has provided the following guidance on the application of the *Orita* doctrine: (1) restriction requirements from prior related applications do not carry over into continuing applications unless the restriction is specifically repeated or referred to in the continuing application, (2) the *Orita* doctrine is only applied to reject reissue claims that could not have been prosecuted in the patent being reissued, and (3) reissue claims can only be rejected based on the *Orita* doctrine where the reissue claims are identical or substantially identical to claims that were subject to a prior restriction.

While not actually citing the *Orita* doctrine, the office action's reference to the '495 being a divisional of the '411 patent continues to suggest that the *Orita* doctrine is being applied to bar the presently pending claims. Prior rejections were premised on there being a restriction requirement in the '495 patent prosecution that would prevent the present claims from being prosecuted in the '495 case. That premise is false, however, because there was no restriction made in the '495 patent prosecution. The examiner did not make, repeat or refer to the prior restriction from the '441 patent. MPEP 819 ("A restriction requirement (and election thereto) made in a parent application does not carry over to a continuation, CIP, <u>or divisional</u> application.") (emphasis added). There being no restriction or narrow constructive election in the '495 patent, the *Orita* doctrine does not apply and the Applicant should be permitted to pursue the pending claims in a reissue of the '495 patent.

Not only did the examiner of the '495 patent not make a restriction, but he also rejected the claims of the '495 patent for double patenting based on the claims of the '441 patent. The claims of the '441 patent <u>included</u> the "within a conduit" limitation. In effect, the examiner of the '495 patent found that the apparatus claims of the '495 patent, including claim 2 of the '495 patent, were essentially the same invention and should have been prosecuted together with the claims of the '441 patent that included the "within a conduit" limitation. See Senkiw Decl. ¶¶ 13-14, 17. As a result, the Applicant was required to file a terminal disclaimer, forfeiting a portion of the term of the '495 patent and to commit the two patents to common ownership to overcome the double patenting rejection. The prosecution record is clear that the examiner of the '495 patent did not believe the claims in the '495 patent were patentably distinct from claims that included this particular limitation and, in fact, found the '495 claims to be essentially the same invention as claims that included this limitation.

The Patent Office cannot assert that the claims of the '495 patent are not patentably distinct from claims that include the "within a conduit" limitation during original prosecution of the '495 patent, and then take the opposite position that the same claims are patentably distinct on this basis during reissue of the '495 patent.

The mere fact of identifying a continuing application as a "divisional," by itself, does not limit or restrict the scope of claims that may be filed or prosecuted in that application. It is common that applicants, by adding or amending claims, end up with claims in an application filed **as a divisional** that are not patentably distinct from claims prosecuted in the parent application. Such claim sets are said to be **not consonant** with the prior restriction, and the only consequence is that the patent will lose the benefit of Section 121's safe harbor protection against double patenting findings. The case law is full of examples where applicants filed and were issued claims in divisional applications that later were said to be not consonant with prior restricted claim sets. Symbol Techs., Inc. v. Opticon, Inc., 935 F.2d 1569 (Fed. Cir. 1991); Gerber Garment Tech., Inc. v. Lectra Sys., Inc., 916 F.2d 683 (Fed. Cir. 1990); St. Jude Med., Inc. v. Access Closure, Inc., 729 F.3d 1369, 1377 (Fed. Cir. 2013); Lerner v. Ladd, 216 F. Supp. 81 (D.D.C. 1962).

Significantly, the examiner of the '495 patent even had the opportunity to issue a restriction requirement between claims in the '495 patent itself on this basis because there were claims in the '495 patent application that included the "within a conduit" limitation. To be clear, there were claims in the '495 patent both with and without the "within a conduit" limitation. Despite this, the examiner issued no restriction requirement. Claim 1 of the '495 patent included the limitation, "providing a flow through oxygenator comprising an emitter…placing the emitter within a conduit…" (emphasis added). By contrast, claim 2 of the '495 patent did not include a limitation that the emitter was "within a conduit". The examiner of the '495 patent was squarely presented with the opportunity to restrict claim 1 from claim 2 based on this limitation, but did not do so. Instead, he rejected claim 2 for double patenting based on claims in the '441 patent that included the "within a conduit" limitation. The record cannot be more clear that the examiner of the '495 patent did not restrict out or prevent or bar claims in the '495 patent based on the presence or absence of the limitation that the emitter be positioned "within a conduit".

In all three prosecutions ('262, '441, and '495), the Applicant consistently pursued claims to an emitter for electrolytic generation of bubbles of oxygen. See Senkiw Decl. ¶¶ 13-14. There is no basis for asserting that the present claims which are similarly directed to an emitter for the electrolytic generation of bubbles of oxygen could not have been prosecuted with the claims of the '495 patent. There being no restriction or narrow constructive election in the '495 patent (and instead a double patenting rejection), Applicant should be permitted to pursue the pending claims in a reissue of the '495 patent to correct the error in claim 2 of the '495 patent identified in paragraphs 7 and 8 of the Senkiw declaration.

2. When claiming an emitter for generating oxygen bubbles in water, reciting that the electrodes are "within a conduit" does not make the claims patentably distinct from claims that do not recite that limitation.

It makes sense that the phrase "within a conduit" would not make claims to an emitter for generating oxygen bubbles in water patentably distinct from claims that do not. As explained in the reissue declaration, to generate oxygen bubbles in water, of course, some type of water container or vessel is needed to bring the electrodes into contact with the water. Senkiw Decl. ¶ 15. Therefore, simply adding "within a conduit" is not a patentable step, as it does not add any significant feature that wouldn't already inherently be needed to make an emitter create bubbles in water. Senkiw Decl. ¶ 16.

3. Applicant never argued that the limitation "within a conduit" made claims patentably distinct.

It was also suggested in prior office actions that an argument had been made during prosecution of the '441 patent that placing the electrodes "within a conduit" was a patentably distinct limitation. No such argument was made. See Senkiw Decl. ¶¶ 18-21. In an office action dated May 25, 2007, claim 1 of Application No. 10/732,326 was rejected for double patenting based on claims in the '262 patent. In response, in an amendment dated August 17, 2007, multiple changes were made to the claim, and the Applicant stated that the double patenting rejection no longer applied. The following chart shows the claim both before and after the amendment.

Claim discussed in '441 prosecution **prior to** amendment	Claim discussed in '441 prosecution **after** amendment (with and without markings to show changes)
1. A flow through oxygenator consisting of an emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other, and a power source all in electrical communication with each other, wherein the emitter is placed within or adjacent to a conduit for flowing water.	1. A flow through oxygenator ~~consisting of~~ comprising: a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen; an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen ~~comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other,~~ and a power source ~~all~~ in electrical communication with ~~each other wherein~~ the oxygen emitter ~~is placed within or adjacent to a conduit for flowing water~~. Clean version (without markings) 1. A flow through oxygenator comprising: a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen; an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen; and a power source in electrical communication with the oxygen emitter.

The remarks section filed with the amendment included the generic statement:

> "Applicant respectfully asserts that the need for a Terminal Disclaimer to overcome a non-statutory obviousness-type double patenting rejection has been overcome through the present amendment to independent claim 1… As claims 1 [and others] are patentably distinct from claims 1-6 of U.S. Patent No. 6,689,262, Applicant respectfully requests said rejection be withdrawn."

From the marked changes it is clear that multiple changes were made to the claim. The amendments to the claim included: changing the preamble from "consisting of" to "comprising"; removing any reference to a critical distance between electrodes; adding a limitation that there be a plurality of anodes and a plurality of cathodes; adding a limitation that the electrodes now be arranged in a plurality of "matched sets"; adding features of a fluid conduit; and adding completely new structure, "stabilizing hardware", that was not previously recited. The limitation that the electrodes be "positioned within the conduit lumen" was never called out as being the basis for making the claims patentably distinct. In fact, no one limitation was specifically identified as the basis for making the claim patentably distinct, and there is no more reason in the prosecution history to pin the distinction on the "within a conduit" limitation than there is to pin the distinction on the new "stabilizing hardware" limitation, for example, or the "plurality of matched sets" limitation. In fact, the language that the electrodes be "placed within or adjacent to a conduit" had already been in the claim prior to the amendment which suggests that the "positioned within the conduit" limitation was not the basis for arguing the claim was now patentably distinct.

In addition, in the very next office action, the examiner disagreed that even all of these amendments combined made the claims patentably distinct. The examiner maintained the double patenting rejection. Only after several more later amendments that did not relate to the electrodes being positioned "within a conduit" did the examiner finally withdraw the double patenting rejection. Therefore, the prosecution history of the '441 patent does not support any finding that either the Applicant or the examiner ever argued or asserted that the "positioned within a conduit" limitation made claims patentably distinct from claims that did not recite that limitation.

4. The present claims are not identical or substantially identical to any restricted claims

Since there was no restriction requirement made in the '495 patent application, the *Orita* doctrine does not apply. Further, even assuming that the restriction in the ‘441 application was referred to and imposed by the examiner in the ‘495 prosecution (which did not happen), any attempt to apply the *Orita* doctrine by the examiner must include a finding, supported by an articulation of the reasoning therefore, that the claims are identical or substantially identical to claims that were subject to a prior restriction requirement. See *Ex parte Belliveau*, decision of the Board of Patent Appeals and Interferences, Appeal No. 2010-007121, Application No. 10/801,177, Patent No. RE43,017 (Aug. 30, 2010) (reversing examiner’s *Orita* rejection for failure to make any finding that the claims were identical or substantially identical to claims subject to the restriction requirement).[1] The office action makes no finding that these claims are identical or substantially identical to the claims that were subject to the ’441 restriction requirement. The present claims, while directed to an emitter for electrolytic generation of bubbles of oxygen, are, in fact, not identical or substantially identical to the claims in the ’441 patent that were subject to the restriction requirement at least because of the very features and limitations noted in the present reissue oath relating to FIGS. 7A and 7B. The rejection should be withdrawn.

5. The two-year period for filing a broadening reissue is measured from the issue date of the ‘495 patent, not the prior ‘441 patent.

In a prior advisory action dated Nov. 25, 2015, the examiner suggested an alternative argument that, if the claims of the ‘495 patent are not patentably distinct from the earlier-issued ‘441 patent, then the two year rule for a broadening reissue on the ‘495 patent is measured from the issue date of the ‘441 patent.[2] Since the first broadening reissue on the ‘495 patent was filed

[1] In addition to being accessible via PAIR, this case is also published on LEXIS at *Ex parte Belliveau*, 2010 Pat. App. LEXIS 17175 (B.P.A.I. Aug. 30, 2010).

[2] While unrelated to examiner’s view of the two-year rule, the examiner made a statement characterizing the present reissue claims that is based on flawed logic and goes too far. The examiner stated: “If the ‘495 oxygen emitter claims are not patentably distinct from the ’441 flow-through oxygenator claims, then the instant reissue claims to an emitter positioned within a conduit are also not patentably distinct from the ‘441 claims.” It is true that each of the applications (the ‘441 case, ‘495 case, and the present reissue) include claims directed to an

more than two years after the '441 parent patent issue date, the examiner suggests the two-year rule would bar the claims. That is not the law.

As set out in 35 U.S.C. §251, the two year period is measured from the issue date of the "original patent." The Federal Circuit has construed "original patent" to be the actual patent being reissued. *MBO Laboratories, Inc. v. Becton, Dickinson & Co.*, 602 F.3d 1306, 1316 (2010). As explained in the *MBO Labs.*, the patent office may look to other related applications to determine if there has been any recapture, but the two year date runs from the actual patent being reissued. *MBO Laboratories, Inc. v. Becton, Dickinson & Co.*, 602 F.3d 1306, 1316 (2010). Here, that is the issue date of the '495 patent, not the '441 or '262 patent. The error being corrected occurs in the '495 patent, and it is the '495 patent that is being reissued.

The Applicants previously provided a copy of the decision in *Ex Parte Taylor*, 2015 Pat. App. LEXIS 953 (PTAB Feb. 12, 2015)(App. No. 13/067,574) as an example that contradicts the position stated in the advisory action. In *Ex Parte Taylor*, the PTAB expressly found the broadening reissue application to be timely filed, even though the reissue claims were clearly broader than and filed more than two years after the issuance of an earlier related patent. The PTAB expressly finds that "Taylor timely seeks broadening reissue under 35 U.S.C. § 251 n5 of U.S. Patent No. 7,582,597 B1 *Products, methods and equipment for removing stains from fabrics*. n6." In footnote six, the Board's opinion points out that the '597 patent was a continuation claiming priority back to a prior '157 patent which had issued (Sept. 2006) almost five years prior to the filing date of the reissue application (June 2011). Despite this fact, the Board found the broadening reissue application to be timely filed because it was filed within two

emitter for electrolytic generation of bubbles of oxygen. It is also true adding "within a conduit" **alone** does not render a claim patentably distinct from an emitter claim without that limitation. It does not follow, however that the present reissue claims are not patentably distinct from the claims in the '441 patent. Nor has the Applicant argued that the present reissue claims are not patentably distinct from the claims in the '441 patent. The position taken by the Applicant is that, because the examiner of the '495 patent did not use the "within a conduit" limitation to restrict claims from the '495 patent, the present reissue claims cannot be barred from a reissue of the '495 patent on this basis. In other words, the present reissue claims clearly could have been prosecuted in the '495 patent, which is sufficient to satisfy the *Orita* doctrine.

years of the patent actually being reissued. It is significant to note that the reissue claims were clearly broader than not only the claims of the patent being reissued, but also broader than the claims of the related patent that had issued nearly five years prior to the filing of the reissue.

The finding in *Ex Parte Taylor*, therefore, contradicts the position taken in the advisory action. As long as the claims are careful not to recapture surrendered subject matter, a broadening reissue application is timely if filed within two years of the patent being corrected, regardless whether the reissue claims would be broader than other claims in related cases.

As mentioned in *MBO Labs* the prohibition on recapture, of course, may look to other related applications. The recapture doctrine, however, does not alter how the two year term for broadening is measured. Indeed, if there were a blanket rule prohibiting reissue claims that are broader than claims more than two years old in earlier-issued, related patents, then there would be no need to apply the recapture doctrine in such cases. In other words, that the recapture doctrine is applied in such cases contradicts the legal theory asserted by the examiner.

6. The present reissue claims are directed to the invention disclosed in the '495 patent.

It was also stated in prior office actions that the reissue claims are directed to a "different" invention than the *claims* of the '495 patent. This is not the test for satisfying the requirement in 35 U.S.C. §251 that a reissue patent be "for the invention disclosed in the original patent." MPEP § 1412.01 makes clear that the new claims need only be for the same general invention as measured against the specification disclosure, not the prior claims. If there is support under § 112 for the newly added claims and there is no other indication in the specification of an intent not to claim the invention, then the newly added claims satisfy the requirement of 35 U.S.C. §251 that the reissue patent be issued for the "same invention." Therefore, the prior office action's assertion that the newly added claims are directed to a "different" invention as compared to the claims of the '495 patent is improper and provides no basis for rejecting the claims.

Conclusion

For the foregoing reasons the Applicant respectfully requests reconsideration and withdrawal of the pending rejection.

Respectfully Submitted,
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Date ________________ By:

Philip P. Caspers
Reg. No. 33,227

Exhibit F

S/N 14/601,340 **CONTINUATION REISSUE PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	James Andrew Senkiw	Examiner: Jerry D. Johnson
Serial No.:	14/601,340	Group Art Unit: 3991
Filed:	January 21, 2015	Atty. Docket No.: 3406.005US2
Continuation Reissue of U.S. Patent No. 7,670,495		Issued March 2, 2010
Title: FLOW-THROUGH OXYGENATOR		Customer Number: 38846

DECLARATION OF DR. PAUL STRYKOWSKI
UNDER 37 C.F.R. §1.132

I, Dr. Paul Strykowski, declare as follows:

1. I hold Ph.D. and M.S. degrees in Mechanical Engineering from Yale University and a B.S. degree in Mechanical Engineering from the University of Wisconsin. I currently teach undergraduate and graduate fluid mechanics as the Morse Alumni Professor in the College of Science & Engineering at the University of Minnesota.

2. In my research I have examined both fundamental flow physics and applied fluid mechanics of nonreacting and reacting free shear flows, and I have performed studies of transitional and turbulent free shear flows experiencing density variation, curvature, compressibility, and heat release. My curriculum vitae is attached as exhibit A.

3. I have read the disclosure of U.S. Patent No. 7,670,495.

4. I can see each of the claim limitations discussed below in the disclosure of the '495 patent, and for the reasons given below, it is my opinion that the claim limitations discussed herein for an electrolysis emitter were sufficiently disclosed in the specification and figures of the '495 patent such that one of ordinary skill in this art would have understood that Mr. Senkiw possessed the invention at the time he filed his application for the '495 patent. Because these features are disclosed and supported in large part merely by understanding the cross sectional drawings of the electrolysis chamber, I believe one of ordinary skill in this art would recognize these elements in the disclosure of the '495 patent even if the level of ordinary skill in this art were to be defined to be relatively low (two years of undergraduate training in mechanical engineering or equivalent work experience). The level of ordinary skill in this art is not less

than this low level of skill which is more than sufficient to understand how to identify the characteristics of the electrolysis chamber shown in cross-sectional drawings discussed herein.

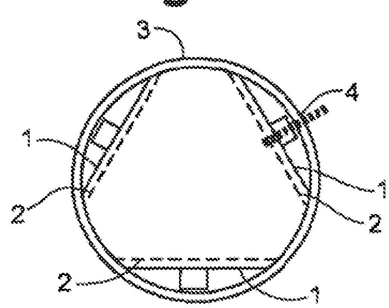
Limitations regarding the Electrodes Being Closer to the Tubular Housing than a Center Axis of the Tubular Housing

5. Each of the following claim limitations are disclosed in the description provided in the '495 patent such that one of ordinary skill in this art would have understood that Mr. Senkiw possessed the invention at the time he filed his application for the '495 patent:

> "each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing"
>
> "the electrodes are positioned away from a longitudinal center axis of the tubular housing"
>
> "each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing"

6. Each of these limitations relates to positioning the electrodes inside the housing so that the electrodes are arranged toward the outside, away from the center point of the housing. This arrangement is clearly shown in FIG. 7A. As shown in FIG. 7A, three sets of electrodes (1, 2) are arranged along the lines of a triangle. The written description confirms that the three sets of anode and cathode pairs are each at the same 120 degree angle with respect to each other (i.e. the triangle is an equilateral triangle). See Col. 9:10-11. FIG. 7A also shows that the electrodes terminate at the inside surface of the tube wall, and the electrodes do not complete the corners of the triangle. In other words, the points of the triangle would fall outside the tube 3.

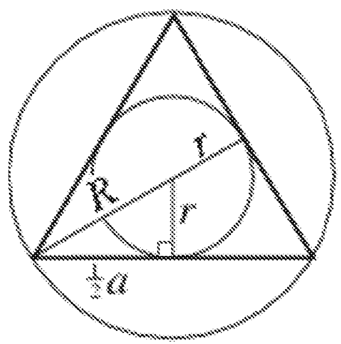
Fig. 7A

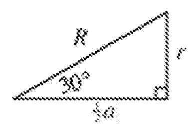


7. The electrodes shown in FIG. 7A do not pass through the center axis of the tube

but instead are positioned away from the center axis and closer to the wall of the tube than they are to the center axis of the tube. Therefore, the figure clearly supports each of the limitations listed above.

8. These limitations do not rely on the scale of the drawing. Geometry mathematically dictates that electrodes positioned along the lines of an equilateral triangle centered on a round tube with its corners located outside the tube, will necessarily be located closer to the outer wall than to the center point of the tube. It is mathematically impossible for electrodes in this configuration to be closer to the center of the tube than the wall of the tube. It does not matter how large or small you make the housing or the electrodes: if the electrodes are arranged as chords of a circle along the sides of an equilateral triangle having its points outside the circle as is clearly shown in FIG 7A and also described at 9:7-11, the electrodes can <u>never</u> be closer to the center point of the tube than to the circular wall of the tube. This is dictated by the shapes shown in FIG. 7A (concentric circle and equilateral triangle). Consider the following:





sin 30° = ½ = r/R.

See http://mathworld.wolfram.com/EquilateralTriangle.html. This simple calculation shows that r (the distance each side of the triangle is away from the center point of the circle) shrinks to ½ R (half the radius of the outer circle) only when the triangle fits inside the circle. If the corners of the triangle fall outside the circle (as shown in FIG. 7A), then r will necessarily be greater than ½ R. In other words, when the corners of the triangle fall outside the circle, the sides of the triangle will always be closer to the outer circle than to the center point or axis of that circle. Therefore, not only does FIG. 7A disclose the relationships recited in these limitations between the electrodes, tube wall and tube center, but even if the scale of the drawing were altered or changed, the relationship would still necessarily be satisfied.

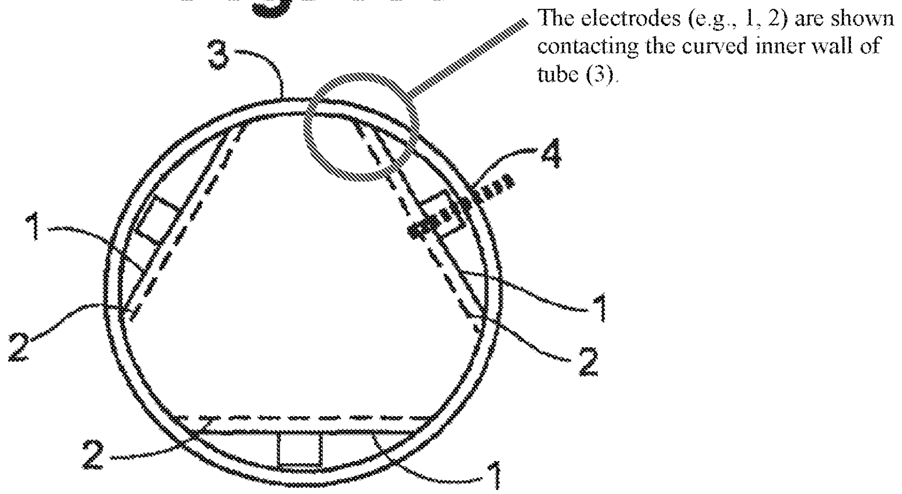
<u>Limitations regarding the Electrodes Being in Contact with the Wall of the Tubular Housing or Closer to the Wall than the Distance Separating the Electrodes</u>

9. Each of the following claim limitations are disclosed in the description provided in the '495 patent such that one of ordinary skill in this art would have understood that Mr. Senkiw possessed the invention at the time he filed his application for the '495 patent:

> "a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing"
>
> "the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing"
>
> "at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes"

10. FIG. 7A shows the electrodes (1, 2) in contact with the curved inner wall of the circular tube 3. Because the electrodes contact the wall, each is closer to that wall than the distance separating the electrodes. Components that are touching or contacting each other are necessarily closer together than components that are separated.

Fig. 7A

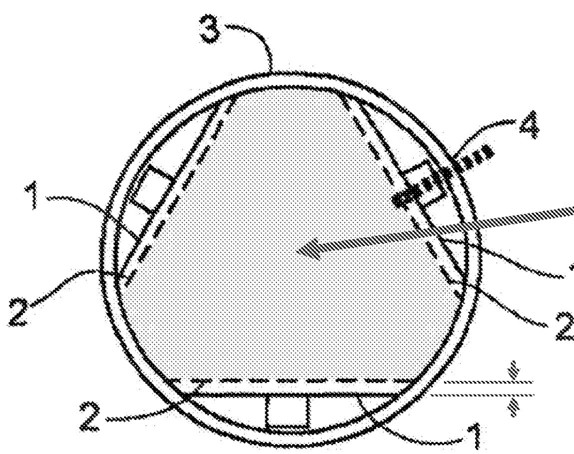


Limitation regarding an Unobstructed Passageway that includes the Center Axis and is Multiple Times Wider than the Electrode Separation Distance

11. The following claim limitation is disclosed in the description provided in the '495 patent such that one of ordinary skill in this art would have understood that Mr. Senkiw possessed the invention at the time he filed his application for the '495 patent:

> "the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing"

12. FIG. 7A shows the electrodes supported by stabilizing hardware 4 that does not cross into the center of the tube. Instead, the stabilizing hardware extends generally radially outward to support the electrodes against the inner wall of the tube. As shown in the figure, this creates an unobstructed passageway through the tube that includes the center axis of the tube. The passageway is dramatically wider than the narrow distance separating the first and second electrodes. One of skill in the art would recognize from FIG. 7A that the electrode pairs are spaced apart to form a water flow passage at the center of the tube that is multiple times wider than the distance between the electrodes of a pair.



The unobstructed water flow passageway (highlighted here on FIG. 7A in yellow) includes the longitudinal center axis of the tubular housing 3 and is dramatically wider than the spacing between electrodes 1 and 2.

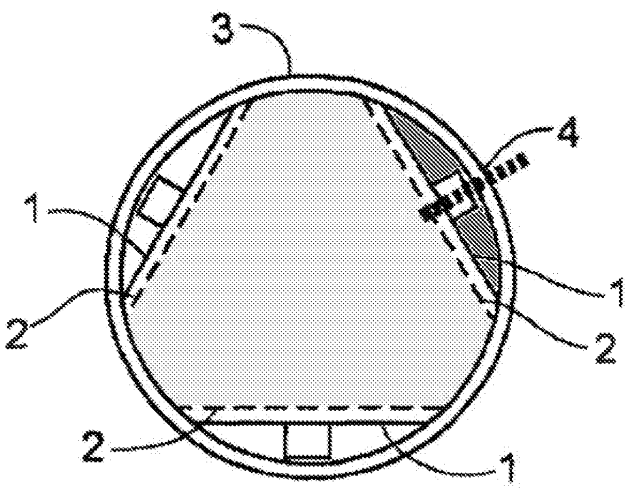
Limitation regarding the Area of the Passageway and the Area between Electrodes and Tube

13. The following claim limitation is disclosed in the description provided in the '495 patent such that one of ordinary skill in this art would have understood that Mr. Senkiw

possessed the invention at the time he filed his application for the '495 patent:

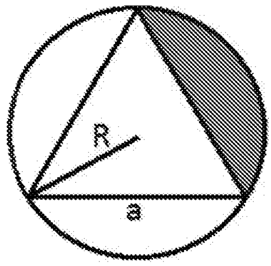
> "the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway"

14. FIG. 7A shows the area between the electrodes and the housing (highlighted in red in the figure below) is less than (and is even dramatically less than) the cross-sectional area of the unobstructed passageway (highlighted in yellow in the figure below). One of skill in the art would recognize from FIG. 7A that by positioning the electrode pairs closer to the outer wall of the tube, a larger area for water to flow is created at the center of the tube and there is considerably less area between the electrodes and the wall of the tube for water to pass.



The area highlighted in red is significantly less than the area highlighted in yellow.

This relationship is not dependent on the scale of the drawing. As noted above, where an equilateral triangle is positioned over a circle with its corners falling outside the circle, the area shown in the above figure will necessarily be less than the area shown in yellow.



1. The area of the equilateral triangle is $\frac{a^2\sqrt{3}}{4} = .43\ a^2$ (rounding)
2. The area of the circle is πR^2.
3. $\cos 30° = \frac{\sqrt{3}}{2} = \frac{a}{2R}$, therefore $R = \frac{a}{\sqrt{3}}$
4. The area of the portion in red $= \frac{1}{3}(\pi R^2 - \frac{a^2\sqrt{3}}{4})$

$$= (\frac{\pi}{9} - \frac{\sqrt{3}}{12})\ a^2$$

$$= .20\ a^2 \qquad \text{(rounding)}$$

5. $0.20a^2 < 0.43a^2$

As shown in the equations to the right of the figure, where the triangle is shown to fit precisely within the circle, the area between one of the triangle sides and the circle (shown in red) will necessarily be less than half the area of the triangle. Where the corners of the triangle fall outside the circle, as shown in FIG. 7A of the '495 patent, the area shown in red will be an even smaller fraction of the area of the triangle inside the circle. Therefore, not only does FIG. 7A show the relationship recited in the limitation above, but this relationship will necessarily be maintained for any arrangement where the electrodes are positioned along the sides of any equilateral triangle with its corners located outside the tubular housing, as shown in FIG. 7A.

Limitations regarding an Unobstructed Passageway Running for the Length of an Electrode and Having a Uniform Cross Sectional Area

15. The following claim limitations are disclosed in the description provided in the '495 patent such that one of ordinary skill in this art would have understood that Mr. Senkiw possessed the invention at the time he filed his application for the '495 patent:

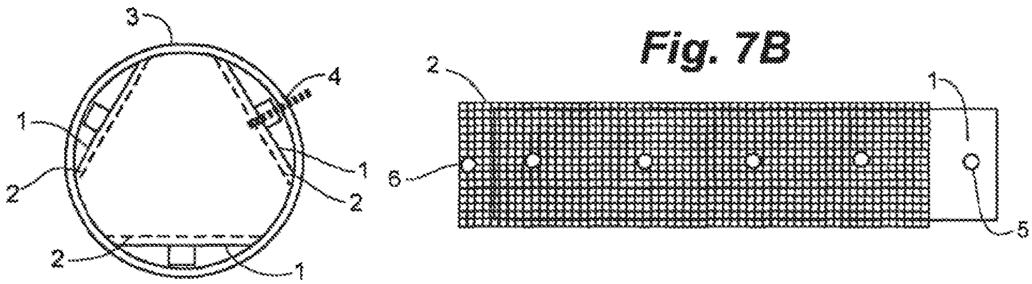
> "the passageway running for at least the length of one of the electrodes positioned within the housing"
>
> "the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing"
>
> "the unobstructed passageway having a uniform cross-sectional area along that length."

16. FIGS. 7A and 7B are described as showing the oxygenation chamber of an emitter. Col. 3:55-59 ("FIG. 7 shows an oxygenation chamber suitable for flow-through

applications. FIG. 7A is a cross section showing arrangement of three plate electrodes. FIG. 7B is a longitudinal section showing the points of connection to the power source."); col. 9:7-17 ("In FIG. 7(A), the oxygenation chamber is comprised of three anodes 1 and cathodes 2, of appropriate size to fit inside a tube or hose and separated by the critical distance are placed within a tube or hose 3 at 120° angles to each other. The anodes and cathodes are positioned with stabilizing hardware 4. …FIG. 7(B) shows a plan view of the oxygenation chamber…with stabilizing hardware 5 serving as a connector to the power source.").

Fig. 7A

Fig. 7B



17. As shown in these figures, there is an unobstructed passageway at the center of the tube that runs the length of the electrodes 1, 2. The length of the electrodes is shown in FIG. 7B. FIG. 7A, which shows a cross-sectional view of the oxygenation chamber, shows how hardware is positioned toward the <u>outside</u> of the electrodes so that there are no obstructions in the passageway for the length of the electrodes, and the passageway has a uniform cross sectional area inside the oxygenation chamber. FIGS. 7A and 7B and their description in the specification reasonably convey to the artisan that the inventor had possession of the invention at least as of the time the '495 patent was filed.

18. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above referenced application or any patent issuing thereon.

Date: 2/3/17

Dr. Paul Strykowski

Exhibit A

PAUL JOHN STRYKOWSKI
Horace T. Morse Professor
Associate Dean for Undergraduate Programs

College of Science and Engineering
University of Minnesota – Twin Cities
Minneapolis, Minnesota 55455
pstry@umn.edu

EDUCATION

Ph.D.	Mechanical Engineering, Yale University, December 1986
M.Phil.	Mechanical Engineering, Yale University, December 1985
M.S.	Mechanical Engineering, Yale University, December 1983
B.S.	Mechanical Engineering with Distinction, University of Wisconsin, May 1982

PROFESSIONAL EXPERIENCE – UNIVERSITY OF MINNESOTA

Associate Dean for Undergraduate Programs, 2007 –
Professor, Department of Mechanical Engineering, September 1997 –
Associate Professor, Department of Mechanical Engineering, September 1993 – August 1997
Assistant Professor, Department of Mechanical Engineering, September 1988 – August 1993

PROFESSIONAL EXPERIENCE – OTHER ACADEMIC

Doctoral Co-Directive Status, Department of Mechanical Engineering, Florida State University, June 1995 – 2000
Adjunct Professor, Department of Mechanical Engineering, Florida A&M University, June – Aug., 1992 – 1994
Post Doctoral Fellowship, German Aerospace Research Establishment, Göttingen, Germany, Oct. 1986 – June 1988
Graduate Research Assistant, Department of Mechanical Engineering, Yale University, Sept. 1982 – Sept. 1986
Undergraduate Research Assistant, Chemical Engineering, University of Wisconsin, Sept. 1981 – May 1982

RECOGNITIONS AND AWARDS

George W. Taylor Distinguished Teaching Professor, 2011
Seven Wonders of Engineering Awards, Minnesota Society of Professional Engineers, 2004
Distinguished University Teaching Professor – Academy of Distinguished Teachers, 2000
Charles E. Bowers Faculty Teaching Award, 2000
George Taylor Alumni Association Distinguished Teaching Award, 1999
Ralph R. Teetor Educational Award, SAE, 1994
George Taylor Career Development Award, 1993
Minnesota Young Mechanical Engineer of the Year, ASME, 1992
University Scholars Faculty Appreciation Award, 1990, 1992
Outstanding Professor Award, Mechanical Engineering, 1989, 1999
Sheffield Scientific Fellowship, Yale University, 1982

RESEARCH INTERESTS

Fundamental flow physics and applied fluid mechanics of non-reacting and reacting flows. Research includes transitional and turbulent free shear flows experiencing density variation, curvature, compressibility, excitation and heat release. Particular attention is paid to local and global stability characteristics and the extent to which hydrodynamic instability impacts flow control. Spatio-temporal theory is used to understand flow receptivity, most notably in scenarios where absolute instability dictates flow physics. Dynamic conditions range from low-speed liquid flows to supersonic compressible gas flows to reacting flows.

OTHER PROFESSIONAL ACCOMPLISHMENTS

President, Trio Engineering Design, LLC, engineering consulting firm founded 2004
Board Member, St. Paul Partners, a non-profit organization that raises awareness and financial support for the development of potable water delivery systems in rural Tanzania. Technical proposals are written by CSE undergraduates in ME3080, Design for Life: Water in Tanzania.

TEACHING INTERESTS

Primary teaching interests in the following areas: thermodynamics, fluid mechanics, heat transfer, gas dynamics, combustion, experimental methods, gas turbines, and convection.

Courses taught at the University of Minnesota include: ME 3080 (Design for Life: Water in Tanzania), ME 3331 (thermodynamics), ME 3332 (fluid mechanics), ME 4054 (senior design), ME 4331 (thermal engineering laboratory), ME 5344 (gas dynamics); ME 5446 (combustion), ME 5462 (gas turbine engines), ME 8331 (convection), ME 8337 (experimental methods), ME 8390 (turbulent shear layers)

Course development: CSE 1001 (First Year Experience in the College of Science and Engineering)

ASSOCIATE DEAN FOR UNDERGRADUATE PROGRAMS – CURRENT RESPONSIBILITIES

Collegiate Life
- Student recruitment: freshmen and transfer students (in coordination with office of admissions)
- Residential housing opportunities
- Outreach: K-12 and community
- Equity and Diversity
- North Star STEM Alliance (NSF Center)
- Scholarships and student awards
- Undergraduate research opportunities
- Student group involvement and leadership opportunities
- Collegiate Level ABET coordination (engineering programs)
- Collegiate events: Sneak Preview, Welcome Week, Dean's Showcase, Gold Carpet Events, Commencement, CSE Week, CSE Expo
- PLTW Summer Institutes
- International experiences for undergraduates

Academic Advising
- Holistic academic advising for all pre-major students
- Advising/counseling support for students admitted to the major (upper division)
- Advanced placement, course articulation, degree planning
- Summer orientation
- Academic Advising Blog
- Four-Year Plans to graduate
- Probation and suspension
- Major Declaration holds
- Readmission/Leave of Absence
- 13 Credit Exemptions
- APAS questions, updates and corrections
- Transfer admissions
- Admission into major
- CSE Scholastic Committee
- Academic Standards Committee
- Collegiate Curriculum Committee

Career Center for Science and Engineering

Fall and spring career fairs
Interview preparation and facilitation
Job search preparation, resumes, cover letters, follow up conversations
Transition to employment and graduate/professional schools

Other
Develop enrollment management model
Develop new curriculum for First Year Experience Course
Launch e-learning/a-learning initiative in CSE
CSE Curriculum and Academics Standards Committees

SOCIETAL AFFILIATIONS
American Physical Society
American Society of Mechanical Engineers
American Society of Engineering Education
American Institute of Aeronautics and Astronautics

SELECTED SERVICE ACTIVITIES
University
General Research Advisory Committee, 1997 – 2010; Chair 2005 – 2010
Preparing Future Faculty Advisees: A. Fleischer 1998-99, R. Kaszeta 1998-99; L. Cao 1999 – 00; A. Behrens 2004 – 05; V. Srinivasan 2004 – 05; M. Hallberg 2006 – 07; T. Shepard 2008 – 09
Bush Program Resource Teacher, 1998 – 99, Advisees: T. Augst, English, J. Tsai, Psychology; D. Frisbie, Chem. Engr.; P. Novak, Civil E.; S. Kuftinec, Theater Art & Dance; A. Sage, Clinical & Population Sciences
Consultative Committee, 2002 – 2003
Faculty Development Working Group, 2000 – 2001
Tau Beta Pi, Faculty Advisor, 1993 – 1997
Departmental
Post Tenure Review Committee, 2006 – 2010, 2013 –
ABET Review, Chair 2005 – 2008
Thermal Sciences Division Director, 2005 – 2008
Promotion & Tenure Committee, 2006 – 2007
Strategic Planning Committee, 2000 – 2006; Chair 2005 – 2006
Undergraduate Curriculum Committee, Chair 1997 – 2006
Latin Honor's Program, Chair 1997 – 2002
K-12 Outreach
Young Scientists Roundtable (Cable TV) – The Amazing World of Fluid Mechanics
Young Scientists Roundtable (Cable TV) – Why Airplanes Fly and Knuckleballs Dance
Edina Scientific Youth Forum – Introducing Young Scientists to Fun Fluid Mechanics
Center for Fluid Power – The Magic of Fluid Mechanics (Fond du Lac Tribal College; Henry High School)
Zachary Lane Elementary School – Why Things Fly
Other Professional Service Activities
Reviewer: J. Fluid Mech., Phys. Fluids, AIAA J., J. Fluids Engr., J. Comp. Phys., Exp. Fluids, others
Organizer of International Symposium on Combustion and Noise Control, Kauai, Hawaii, Dec. 2008
Review Panel, Northeastern University Graduate Program, Mechanical Engineering, Boston, Feb. 2005
Office Naval Research Program Review, MIT, Cambridge, June 2004
NATO Consultant to Portuguese Air Force Academy – RTA, Lisbon, Portugal 2002
Organizer of 13th Propulsion Conference, Hyatt Hotel Minneapolis, 10-12 August 2000
Organizing Committee, 4th AIAA Shear Flow Control Conference, Snowmass, CO., June 29 – July 2, 1997
NSF Research Panel Equipment Grants, Washington, D.C., May 1992

GRADUATE STUDENT ADVISED — Ph.D.
A. Alshare, "Simulations of flow and heat transfer in a serpentine heat exchanger having dispersed resistance with porous-continuum and continuum models," Ph.D. Thesis, University of Minnesota, April 2007 (co-advised with T. Simon).
A.A. Behrens, "Reacting flow studies in a dump combustor: enhanced volumetric heat release rates and flame anchorability," Ph.D. Thesis, University of Minnesota, January 2007.
D.J. Forliti, "Controlling dump combustor flows using countercurrent shear," Ph.D. Thesis, University of Minnesota, October 2001.
S.B. Lonnes, "Flame speed control using a countercurrent swirl combustor," Ph.D. Thesis, University of Minnesota, May 1998.

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Tennant Company v. OWT
IPR2021-00625

A.S.D. Khemakhem, "An experimental study of turbulent countercurrent shear layers," Ph.D. Thesis, University of Minnesota, Sept. 1997.
R.K. Wilcoxon, "Mixing enhancement in an axisymmetric jet with annular counterflow," Ph.D. Thesis, University of Minnesota, Sept. 1996.
S. Jendoubi, "Local and global instability of axisymmetric jets with external flow," Ph.D. Thesis, University of Minnesota, June 1995.
S.G. Russ, "Turbulence and entrainment in plasma and heated jets," Ph.D. Thesis, University of Minnesota, March 1993 (co-advised with E. Pfender).

GRADUATE STUDENTS ADVISED – Master of Science

J. Lutz, "Instantaneous flame anchor measurements behind a rearward-facing step," Master of Science, University of Minnesota, May 2014
D. Vetter, "Enhancement of turbulent mixing in a rearward-facing step geometry using microjets," Master of Science, University of Minnesota, May 2014.
S. Moore, "Frequency scaling and characterization of the isothermal flow in a step combustor," Master of Science, University of Minnesota, September 2013.
S. Beard, "The effect of microjets on heat release rates in an axisymmetric dump combustor," Master of Science, University of Minnesota, June 2011.
V. Yu, M.D., "Resistance-compliance product in parallel fluidic systems in a fluid dynamics model of the inner ear," Master of Science, University of Minnesota, May 2009 (co-advised with R. Odland, M.D.)
D. Kacmarynski, M.D., "An engineering model used to evaluate the nasal airway of a child with vomer flap repair of wide cleft palate deformity," Master of Science, University of Minnesota, May 2007. (co-advised with J.D. Sidman, M.D. and S.C. Levine, M.D.)
T. Gehrett, "Evaluation of recoverable steam turbine efficiency losses: a presentation and critical review of the popular steam path audit," Master of Science, University of Minnesota, August 2006.
T. Horner, "Emission characteristics and performance of a microturbine engine," Master of Science, University of Minnesota, Feb. 2005
N. Sundquist, "Alternative fuel sources for the internal combustion engine: biodiesel," Master of Science, University of Minnesota, May 2004
S. White, "Automating the SR-30 gas turbine engine," Master of Science, University of Minnesota, April 2003.
B.A. Tang, "An experimental investigation of planar countercurrent turbulent shear layers," Master of Science, University of Minnesota, May 2002.
D.A. Wulfman, "Thermo/mechanical design, modeling, and testing of shape memory actuated minimal and micro invasive probe systems, Master of Science, University of Minnesota, May 2002 (co-advised with A. Erdman)
C. Rumchik, "Modeling counterflow thrust vectoring with Fluent," Master of Science, University of Minnesota, August 2002.
A. Witkowski, "Thermodynamic analysis of SR-30 gas turbine engine," Master of Science, University of Minnesota, September 2001.
R.D. Gillgrist, "A fundamental study of thrust vector control using counterflow," Master of Science, University of Minnesota, March 1999.
G. Schmid, "An experimental and modeling study of jet attachment during counterflow thrust vectoring," Master of Science, University of Minnesota, June 1996.
M.R. Van der Veer, "Counterflow thrust vectoring of a subsonic rectangular jet," Master of Science, University of Minnesota, March 1995.
G.L. Dittmann, "Controlling vortex shedding behind bluff objects," Master of Science, University of Minnesota, Jan. 1993.
P.J. Trongard, "Nucleation of supersaturated solutions," Master of Science, University of Minnesota, January 1993.

M.L. Miller, "The universal nature of vortex shedding behind circular cylinders at low Reynolds numbers," Master of Science, University of Minnesota, Sept. 1991.

D.L. Niccum, "The influence of velocity ratio on a counterflowing circular jet," Master of Science, University of Minnesota, Dec. 1990.

UNDERGRADUATE RESEARCH ASSISTANTS

C. Thyen UROP 1989; P. Tuma NSF-UROP 1990; S. Gunderson NSF-UROP 1991; D. Forliti NSF-UROP 1992; M. Walberg NSF-UROP 1992; B. Wilson Research Scholarship 1992; G. King Honor's Thesis 1993; D. Wulfman Honor's Thesis 1994; J. Weiler Honor's Thesis 1994; A. Krolnick Honor's Thesis 1994; D. Wangensteen Honor's Thesis 1995; M. Berrada Research Assistant 1997; C. Lau Presidential Mentoring 1997; M. Anderson Research Assistant 2003; P. Cronin Research Assistant 2004; R. Anderson NSF-UROP 2004; J. Mach NSF-UROP 2004; V. Wang NSF-UROP 2005; J. Lutz Research Assistant 2005; J. Wanner Honor's Thesis 2005; B. Hathaway NSF-UROP 2006; C. McMahon Research Assistant 2006; I. Beavers Research Assistant 2008; D. Lindblom Research Assistant 2008; G. Erzberge Research Assistant 2008; P. Tracy Research Assistant 2009-12 Summa Cum Laude; L. McDonald Research Assistant 2010-11 Summa Cum Laude; B. Yan Research Assistant 2010-11 Latin Honor's Thesis; V. Troutman Research Assistant 2012-13 Latin Honor's Thesis.

INVITED SEMINARS AND LECTURES

Workshop on Fluid Mechanics Research: Historical Review, Present Challenges and Future Prospects, Florida State University. Tallahassee, Florida, October 18-19, 2013. Keynote Lecture: "High-speed flow research: accomplishments made through collaboration."

University of Minnesota – Duluth, Mechanical Engineering Departmental Seminar, Duluth, MN, October 1, 2012, "Experimental and computational studies to advance the operability and performance of combustion systems adopting fluidic control."

Louisiana State University, Mechanical Engineering Departmental Seminar, Baton Rouge, LA, February 6, 2009, "Local and global instabilities: free shear layers and their control."

International Centre for Mechanical Sciences (CISM) Udine, Italy, June 9-13, 2008, " Advanced School: Instabilities of flow with and without heat transfer and chemical reaction." 5-day short course

University of Illinois at Chicago, Mechanical and Industrial Engineering Department, Chicago, IL, February 7, 2006, "On the universality and control of global instabilities in free shear flows."

International Symposium on Recent Advances in Aeroacoustics and Active Flow-Noise Control, Jan. 4-6, 2005, Fort Aguada Beach, Goa, India, "Manipulating free shear layers to control reacting and non-reacting flows."

NASA Langley Research Center, Hypersonic Air Breathing Propulsion Branch, June 30, 2004, Langley, VA, "Low Mach scramjet flameholder stabilization."

University of Virginia, Department of Mechanical and Aerospace Engineering Seminar, Charlottesville, VA, 4 March 2004, "Flow control exploiting shear-layer instabilities."

Florida State University, Tallahassee, FL, 12 November 2003, "Stability of spatial and temporal modes in free shear layers."

Yale University, New Haven, CT, February 5, 2003, "Control of non-reacting and reacting free shear flows."

Naval Air Warfare Center, China Lake, CA, 18 October 2002, "Transitioning fundamental science to technology: thrust vector control at supersonic off-design conditions."

NATO Research and Technology Organization, 28-30 July 2002, Portuguese Air Force Academy, Sintra, Portugal, "Non-Reacting and Reacting Shear Flow Control,"

Science & Technology Workshop for Reducing Naval Aircraft Noise, 30-31 October 2001, Arlington, VA, "Novel Approaches for Noise Abatement."

Naval Air Warfare Center, China Lake, CA, 12 February 2001, "Thrust Vector Control using Counterflow."

Indian Institute of Technology, Recent Advances in Experimental Fluid Mechanics, Kanpur, India, 18-20 December 2000, "Flow Control Applications using Countercurrent Shear."

IEEE International Conference on Control Applications, August 22-26, 1999, Kohala Coast, Hawaii, "Controlling Flame Speed using Countercurrent Shear."

Pratt & Whitney Nozzle Technology Seminar, April 17, 1998, West Palm Beach, Florida. "Counterflow Fluidic Thrust Vector Control for Propulsion Applications."

International Conference on Thermomechanics and Hydrodynamics, June 17-19, 1997, Brno, Czech Republic, "Vectoring Thrust using Shear Layer Control."

Euromech Colloquium -- Dynamics of Localized Disturbances in Engineering Flows, April 1-3, 1996, Karlsruhe, Germany. "Local and Global Instabilities of Jet Flow Fields."

Wright Patterson Air Force Base, 28 February 1996, Dayton, Ohio, "Multiaxis Thrust Vector Control of Supersonic Jets using Counterflow."

Stanford University, Fluid Mechanics Seminar, Feb. 27, 1996, Stanford, California, "Exploring the Connection between Local Stability Concepts and Global Shear Flow Control."

NASA Langley Research Center, Jan. 24, 1996, Hampton, Virginia, "Thrust Vectoring and Mixing of Supersonic Jets using Counterflow."

ASME/JSME Fluids Engineering Conference, Aug. 13-18, 1995, Hilton Head, S.C., "The Role of Velocity Ratio on Supersonic Jet Mixing."

Pratt & Whitney Aircraft Engines, West Palm Beach, Florida, 17 February 1994, "Counterflow Supersonic Nozzle Technology."

McDonnell Douglas Aerospace, St. Louis, Missouri, 28 July 1994, "Fluidic Control of High Temperature Subsonic Jets."

Florida A&M and Florida State Universities, Department of Mechanical Engineering, 3 September 1991, "Self-Excitation and Mixing in Variable-Density Subsonic Jets with Counterflow."

University of Wisconsin, Engineering Research Center for Plasma-Aided Manufacturing, 14 December 1990, "The Effects of Density and Velocity Ratio on the Stability of Subsonic Jets."

University of Minnesota, Department of Aerospace Engineering & Mechanics, 26 October 1990, "The Global Instability of Countercurrent Mixing Layers."

JOURNAL PUBLICATIONS & BOOK CHAPTERS

T.G. Shepard, J. Lee, B. Yan, and P.J. Strykowski, "Parameters affecting bubble formation and size distribution from porous media," *J. Fluids Engineering*, Volume 138, Number 3, 2016, 031202.

H. Kanchi, K. Russell, M.J. Anderson, S.P. Beard, P.J. Strykowski, and F. Mashayek, "Fluidic control with microjets in dump combustors," *International Journal of Heat and Mass Transfer*, Volume 54, 2011, pp. 5395-5405.

A.A. Alshare, P.J. Strykowski, and T.W. Simon, "Modeling of unsteady and steady fluid flow, heat transfer and dispersion in porous media using unit cell scale," *International Journal of Heat and Mass Transfer*, Volume 53, 2010, pp. 2294-2310.

V.M. Yu, P.J. Strykowski, and R.M. Odland, "A preliminary theoretical model of hydrodynamics in the inner ear," *Ear, Nose and Throat Journal*, Volume 89, Number 4, 2010, pp 164-168.

V. Srinivasan, M.P. Hallberg, and P.J. Strykowski, "Viscous linear stability of axisymmetric low-density jets: parameters influencing absolute instability," *Physics of Fluids*, Volume 22, Number 2, 2010, 024103.

A.A. Alshare, T.W. Simon, and P.J. Strykowski, "Simulations of flow and heat transfer in a serpentine heat exchanger having dispersed resistance with porous-continuum and continuum models," *International Journal of Heat and Mass Transfer*, Volume 53, 2010, pp. 1088-1099.

A.A. Behrens, J.M Lutz, and P.J. Strykowski, "Instantaneous flame anchor measurements behind a rearward-facing step," *AIAA Journal*, Volume 47, Number 6, 2009, pp. 1350-1357.

M.P. Hallberg and P.J. Strykowski, "Open-loop control of fully nonlinear self-excited oscillations," *Physics of Fluids*, Volume 20, 2008, 041703.

A.A. Behrens and P.J. Strykowski, "Controlling volumetric heat release rates in a dump combustor using countercurrent shear," *AIAA Journal*, Volume 45, Number 6, 2007, pp. 1317-1323.

M.P. Hallberg, V. Srinivasan, P. Gorse, and P.J. Strykowski, "Suppression of global modes in low-density axisymmetric jets using coflow," *Physics of Fluids*, Volume 19, 2007, 014102.

R.D. Gillgrist, D.J. Forliti, and P.J. Strykowski, "On the mechanisms affecting fluidic vectoring using suction," *Journal of Fluids Engineering*, Volume 129, Number 1, 2007, pp. 91-99.

M.P. Hallberg and P.J. Strykowski, "On the universality of global modes in low-density jets," *Journal of Fluid Mechanics*, Volume 569, 2006, pp. 493-507.

D.J. Forliti, A.A. Behrens, B.A. Tang, and P.J. Strykowski, "Prevaporized JP-10 combustion and the enhanced production of turbulence using countercurrent shear," *Combustion Processes in Propulsion*, Chapter 8, Elsevier Press, 2006, pp. 75-86.

D.J. Forliti, B.A. Tang, and P.J. Strykowski, "An experimental investigation of planar countercurrent turbulent shear layers," *Journal of Fluid Mechanics*, Volume 530, 2005, pp. 241-264.

D.J. Forliti and P.J. Strykowski, "Controlling turbulence in a rearward-facing combustor using countercurrent shear," *Journal of Fluids Engineering*, Volume 127, Number 5, 2005, pp. 438-448.

A.A. Behrens, M.P. Hallberg, D.J. Forliti, and P.J. Strykowski, "Combustion control of premixed & prevaporized JP-10 in air downstream of a backward-facing step using steady counterflow," *Advances in Combustion and Noise Control*, Chapter 7, Cranfield University Press, 2005, pp. 99-114.

S. Lonnes, D. Hofeldt, and P. Strykowski, "Flame speed control using a countercurrent swirl combustor," *Advances in Chemical Propulsion: Science to Technology*, Chapter 17, CRC Press, 2002, pp. 277-290.

F.S. Alvi, P.J. Strykowski, A. Krothapalli, and D.J. Forliti, "Vectoring thrust in multiaxes using confined shear layers," *Journal of Fluids Engineering*, Volume 122, Number 3, 2000, pp. 3-13.

D.J. Forliti, P.J. Strykowski and K. Debatin, "Bias and precision errors of digital particle image velocimetry," *Experiments in Fluids*, Volume 28, Number 5, 2000, pp. 436-447.

P.J. Strykowski, and A. Krothapalli, "Vectoring thrust using confined shear layers," *Naval Research Reviews*, Volume 51, Numbers 3-4, 1999, pp. 24-34.

F.S. Alvi and P.J. Strykowski, "Forward flight effects on counterflow thrust vector control of a supersonic jet," *AIAA Journal*, Volume 37, Number 2, 1999, pp. 279-281.

A. Krothapalli, P.J. Strykowski, and C.J. King, "Origin of streamwise vortices in supersonic jets," *AIAA Journal*, Volume 36, Number 5, 1998, pp. 869-872.

M.R. Van der Veer and P.J. Strykowski, "Counterflow thrust vector control of subsonic jets: continuous and bistable regimes," *AIAA Journal of Propulsion and Power*, Volume 13, Number 3, 1997, pp. 412-420.

P.J. Strykowski, A. Krothapalli and D.J. Forliti, "Counterflow thrust vectoring of supersonic jets," *AIAA Journal*, Volume 34, Number 11, 1996, pp. 2306-2314.

D.M. Washington, F.S. Alvi, P.J. Strykowski and A. Krothapalli, "Multiaxis fluidic thrust vector control of a supersonic jet using counterflow," *AIAA Journal*, Volume 34, Number 8, 1996, pp. 1734-1736.

P.J. Strykowski, A. Krothapalli, and S. Jendoubi, "The effect of counterflow on the development of compressible shear layers," *Journal of Fluid Mechanics*, Volume 308, 1996, pp. 63-96.

S. Russ, E. Pfender, and P.J. Strykowski, "Unsteadiness and mixing in thermal plasma jets," *Plasma Chemistry and Plasma Processing*, Volume 14, Number 4, 1994, pp. 425-436.

S. Jendoubi and P.J. Strykowski, "Absolute and convective instability of axisymmetric jets with external flow," *Physics of Fluids*, Volume 6, Number 9, 1994, pp. 3000-3009.

S. Russ, P.J. Strykowski, and E. Pfender, "Mixing in plasma and low density jets," *Experiments in Fluids*, Volume 16, 1994, pp. 297-307.

S. Russ and P.J. Strykowski, "Turbulent structure and entrainment in heated jets: the effect of initial conditions," *Physics of Fluids A*, Volume 5, Number 12, 1993, pp. 3216-3225.

P.J. Strykowski, A. Krothapalli, and D. Wishart, "The enhancement of mixing in high-speed heated jets using a counterflowing nozzle." *AIAA Journal,* Volume 31, Number 11, 1993, pp. 2033-2038.

P.J. Strykowski and R.K. Wilcoxon, "Mixing enhancement due to global oscillations in jets with annular counterflow." *AIAA Journal,* Volume 31, Number 3, 1993, pp. 564-570.

P.J. Strykowski and S. Russ, "The effect of boundary-layer turbulence on mixing in heated jets." *Physics of Fluids A,* Volume 4, Number 5, 1992, pp. 865-868.

P.J. Strykowski and D.L. Niccum, "The influence of velocity and density ratio on the dynamics of spatially developing mixing layers." *Physics of Fluids A,* Volume 4, Number 4, 1992, pp. 770-781.

P.J. Strykowski and D.L. Niccum, "The stability of countercurrent mixing layers in circular jets." *Journal of Fluid Mechanics,* Volume 227, 1991, pp. 309-343.

P.J. Strykowski and K. Hannemann, "Temporal simulation of the wake behind a circular cylinder in the neighborhood of the critical Reynolds number." *Acta Mechanica,* Volume 90, 1991, pp. 1-20.

P.J. Strykowski and K.R. Sreenivasan, "On the formation and suppression of vortex 'shedding' at low Reynolds numbers." *Journal of Fluid Mechanics,* Volume 218, 1990, pp. 71-107.

K.R. Sreenivasan and P.J. Strykowski, "Stabilization effects in flow through helically coiled pipes." *Experiments in Fluids,* Volume 1, 1983, pp. 31-36.

K.R. Sreenivasan and P.J. Strykowski, "An instability associated with a sudden expansion in a pipe flow." *Physics of Fluids,* Volume 26, Number 10, 1983, pp. 2766-2768.

CONFERENCE PROCEEDINGS

D. Law, T. Shepard, and P.J. Strykowski, "Numerical simulations of near-nozzle exit characteristics for an effervescent atomizer at low gas to liquid mass flow ratio," Proceedings of ASME 2014 4th Joint US-European Fluids Engineering Division Summer Meeting, Paper FEDSM2014-21290, Chicago, IL, 3-7 August, 2014.

H. Kanchi, K. Russell, S. Hedeyat, F. Mashayek, M.J. Anderson, S.P. Beard, and P.J. Strykowski, "Experimental and computational studies to advance operability and performance of combustion systems adopting fluidic control," Proceedings 23rd Propulsion Conference, Washington, DC, September 13-15, 2011, pp. 1-49.

P. Kalghatgi, S. Acharya, and P.J. Strykowski, "Mean flow characteristics of planar countercurrent shear flow in dump geometry," Proceedings ASME International Mechanical Engineering Congress and Exposition, Paper IMECE2011-63312, Denver, CO, 11-17 November, 2011.

H. Kanchi, K. Russell, F. Mashayek, M.J. Anderson, S.P. Beard, and P.J. Strykowski, "Experimental and computational studies to advance operability and performance of combustion systems adopting fluidic control," Proceedings 22nd Propulsion Conference, Washington, DC, June 22-25, 2010.

M.J. Anderson and P.J. Strykowski, "Exploiting global instabilities for efficient flame anchoring and compact combustion," Proceedings 21st Propulsion Conference, Monterey, CA, June 9-11, 2009.

J.M. Lutz, A.B. Hoxie, and P.J. Strykowski, "Performance of suction-based counterflow in reacting step geometries," Proceedings 20th Propulsion Conference, Alexandria, VA, Dec. 12-14, 2007.

D. Outcalt, M. Hallberg, G. Yang, J. Heberlein, P. Strykowski, and E. Pfender, "Diagnostics and control of instabilities in a plasma spray torch," 18th International Symposium on Plasma Chemistry, Kyoto, Japan, Aug. 26-31, 2007.

A.A. Behrens, J.M. Lutz, and P.J. Strykowski, "Instantaneous flame anchor measurements behind bluff bodies," Proceedings 19th Propulsion Conference, Costa Mesa, CA, Dec. 18-20, 2006.

M.P. Hallberg and P.J. Strykowski, "Stability and control of very low density axisymmetric jets," 3rd AIAA Flow Control Conference, paper AIAA-2006-3704, San Francisco, CA, 5-8 June 2006.

J. Heberlein, J.P. Trelles, D. Outcalt, M. Hallberg, P. Strykowski and E. Pfender, "Control of fluid dynamic instabilities in plasma torches – key to reproducible atmospheric pressure plasma spray coatings," 9th Materials Science Workshop, Technical University Chemnitz, Chemnitz, Germany, Sept. 7 and 8, 2006, Proceedings pp. 257-262.

D. Dores, M. Madruga Santos, A., Krothapalli, L. Lourenco, E. Collins Jr., F. Alvi, and P.J. Strykowski, "Characterization of a counterflow thrust vectoring scheme on a gas turbine engine exhaust jet," 3rd AIAA Flow Control Conference, paper AIAA-2006-3516, San Francisco, CA, 5-8 June 2006.

D. Outcalt, M. Hallberg, G. Yang, J. Heberlein, E. Pfender, P. Strykowski, "Instabilities in plasma spray jets," International Thermal Spray Conference, Seattle, WA, 15-18 May 2006.

D.J. Forliti, A.A. Behrens, P.J. Strykowski, and B.A. Tang, "Enhancing combustion in a dump combustor using countercurrent shear. Part I: nonreacting flow control and preliminary combustion results," Proceedings ASME International Mechanical Engineering Congress and Exposition, Paper IMECE2005-81267, Orlando, FL., 5-11 Nov. 2005.

A.A. Behrens, M.J. Anderson, P.J. Strykowski, and D.J. Forliti, "Enhancing combustion in a dump combustor using countercurrent shear. Part II: heat release rate measurements and geometry effects," Proceedings ASME International Mechanical Engineering Congress and Exposition, Paper IMECE2005-81274, Orlando, FL., 5-11 Nov. 2005.

J. Heberlein, D. Outcalt, M. Hallberg, G. Yang, P. Strykowski, E. Pfender, "Fluid dynamic stability of plasma spray jets," International Thermal Spray Conference and Exposition, Basil, Switzerland, 2-4 May 2005.

A.A. Behrens, M.J. Anderson, and P.J. Strykowski, "PIV measurements in a premixed JP10/air dump combustor: role of counterflow on turbulence and heat release," Proceedings 18th Propulsion Conference, Monterey, CA, Aug. 24-26, 2005, pp. 143-148.

A.A. Behrens, M.J. Anderson, D.J. Forliti, and P.J. Strykowski, "The role of enhanced recirculation in controlling turbulent combustion and flame anchoring in a step combustor," Proceedings of 17th Propulsion Conference, Cambridge, MA, June 16-18, 2004, pp. 27-32.

E.G. Collins, Jr., Y. Zhao, F. Alvi, M. Alidu, and P.J. Strykowski, "Feedback control for counterflow thrust vectoring," Proceedings of the American Control Conference, Vol. 4, 2004, pp. 3654-3659.

D.J. Forliti, A.A. Behrens, and P.J. Strykowski, "Combustion control in a dump combustor using countercurrent shear," Proceedings International Colloquium on Combustion and Noise Control, Ed. G. Roy, 12-15 August 2003, Cranfield, England, pp. 140-146.

T. Witkowski, S. White, C. Ortiz Duenas, P. Strykowski, and T. Simon, "Characterizing the performance of the SR-30 turbojet engine," Proceedings of the 2003 ASEE Conference & Exposition, paper 2003-1397, Nashville, TN. 22-25 June 2003.

A.A. Behrens, M.P. Hallberg, D.J. Forliti, and P.J. Strykowski, "Control of a backward-facing step combustor employing suction at the dump plane," Proceedings of 16th Propulsion Conference, Los Angeles, CA, 9-11 June 2003, pp. 208-213.

D. Wulfman, A.G. Erdman, and P.J. Strykowski, "Thermo/mechanical design, modeling, and testing of shape memory actuated minimal and micro invasive probe systems," ASME International Mechanical Engineering Congress, New Orleans, LA, Nov. 17-22, 2002.

D.J. Forliti, A.A. Behrens, B.A. Tang, and P.J. Strykowski, "Prevaporized JP-10 combustion and the enhanced production of turbulence using countercurrent shear," Proceedings of 15th Propulsion Conference, Washington, DC, Aug., 5-7, 2002, pp. 35-40.

D.J. Forliti, P.J. Strykowski, and R.D. Gillgrist, "The role of irreversibility in vectoring thrust using counterflow control," 1st AIAA Flow Control Conference, paper AIAA-2002-2950, St. Louis, MO, 24-26 June 2002.

D.J. Forliti, and P.J. Strykowski, "Performance and control of dump combustor flows using counter-current shear," Proceedings of 14th Propulsion Conference, Chicago, IL, Aug., 8-10, 2001, pp. 48-53.

P.J. Strykowski, and D.J. Forliti, "Flow control applications using countercurrent shear," Proceedings of the International Symposium on Recent Advances in Experimental Fluid Mechanics, Indian Institute of Technology, Kanpur, India, 18-20 Dec. 2000.

C.C. Hayes, Y. Ketema, S.C. Mantell, S.E. Marino, R.M. Quanbeck, K.A. Stelson and P.J. Strykowski, "Rocket camp: a hands-on introduction to science and engineering for high school girls," Proceedings of ASEE 2000, Teaching and Learning in the 21st Century, Minneapolis, MN, September 28-30, 2000.

D.J. Forliti and P.J. Strykowski, "Examining the application of counterflow in dump combustors," Proceedings of 13th Propulsion Conference, Minneapolis, MN, Aug., 10-12, 2000, pp. 57-62.

G.F. Schmid, P.J. Strykowski, M. Madruga, D. Das & A. Krothapalli, "Jet attachment behavior using counterflow thrust vectoring," Proceedings of 13th Propulsion Conference, Minneapolis, MN, Aug., 10-12, 2000, pp. 63-68.

P.J. Strykowski, D.J. Forliti, and R.D. Gillgrist, "Controlling flame speed using countercurrent shear," Proceedings of IEEE International Conference on Control Applications, Kohala Coast, Hawaii, Aug. 22-26, 1999.

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3M Foundation, "Merit scholarship endowment and 3M Scholars grant," 01/04/11 – 01/03/16. $1,250,000

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3M Foundation, "Experiential learning faculty pilot grant," 01/04/11 – 01/03/13. $250,000

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National Science Foundation, "A comprehensive approach to broadening participation in STEM: North Star Alliance," (PI R. Jones, Co-PIs P.J. Strykowski, R. Wright, A. Ponce de Leon) 7/01/07 – 6/30/12. $2,454,845

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3M Foundation, "A retention initiative," (P.I. P.J. Strykowski, Co-PIs: S. Kubitschek, A. Hornickel) 7/01/09 – 12/31/10. $300,000

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Exhibit G

United States Patent Application

REISSUE DECLARATION OF INVENTORSHIP

As a below named inventor I hereby declare as follows.

1. My residence, post office address and citizenship are as stated below next to my name.

2. I believe I am the original, first and sole inventor of: (a) the subject matter which is described and claimed in U.S. Patent No. 7,670,495 (the '495 patent) which was issued on March 2, 2010; (b) the subject matter claimed in the broadening reissue patent application Serial No. 13/247,241 which was filed January 31, 2008 and which issued as U.S. Patent No. RE45,415 on March 17, 2015; and (c) the subject matter claimed in the present broadening reissue patent application Serial No. 14/601,340 filed January 21, 2015. Reissue patent application Serial No. 14/601,340 is a continuation of reissue patent application Serial No. 13/247,241 and thus is a continuation reissue application of the '495 patent. The '495 patent is related to U.S. Patent No. 6,689,262 which issued on February 10, 2004 (the '262 patent) and U.S. Patent No 7,396,441 which issued on July 8, 2008 (the '441 patent).

3. I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by the amendment that is being filed with this declaration. A copy of the amended claims is attached hereto as Exhibit A.

4. I acknowledge the duty to disclose information which is material to the patentability of this reissue application in accordance with 37 C.F.R. § 1.56 (attached hereto). I state that the present application is a broadening reissue application of U.S. Patent No. 7,670,495 and a continuation reissue application of U.S. Patent No. RE45,415. Because of the continuation relationship with U.S. Patent No. RE45,415, this present application has an original filing date within two years of the issuance of the '495 patent.

ERRORS CORRECTED

5. I state pursuant to 37 C.F.R. § 1.175(a) that I, the Applicant, believe the original patent to be partly inoperative or invalid by reason of the patentee claiming less than the patentee had a right to claim in the patent. I believe that the errors to be relied upon as the basis for reissue are to be found in the text of the claims of Patent No. 7,670,495 in that they do not encompass the full scope of my invention and unnecessarily limit that scope. The errors that are being addressed occur in the apparatus claims of the '495 patent, specifically claims 2-7, 11 and 12, each of which is directed to an emitter for electrolytic generation of microbubbles of oxygen ("the '495 emitter claims").

6. In paragraphs 7 and 8 below I discuss examples of how the '495 emitter claims are too broad in some respects, and that it was an error not to include emitter claims that include varying combinations of the features disclosed in the emitter embodiment corresponding to FIGS. 7A and 7B of the '495 patent. In paragraph 9 below I discuss examples of how the '495 emitter claims are too narrow in some respects, and that it was an error not to include emitter claims without certain limitations of the '495 emitter claims.

7. The '495 emitter claim 2, for example, is too broad in that it does not recite certain features of the disclosed emitter embodiment corresponding to FIGS. 7A and 7B which I was entitled to claim but did not claim. These features are shown in the embodiment of FIGS 7A and 7B and include, for example: the electrodes are positioned in the outer perimeter of the oxygenation chamber; this positioning of the electrodes provides an unobstructed passageway for water to flow; in that unobstructed passageway, water may flow from the water inlet to the water outlet without passing through a space between the electrodes of opposite polarity; and a portion of at least one of the first and second electrodes is in contact with a wall of the tubular housing.

8. It was an error in the '495 patent not to include apparatus claims that recite the features discussed in paragraph 7 that relate to a specific arrangement of the electrodes. To correct that error, varying combinations of those exemplary features are presented in the emitter claims of the present application, using claim language of varying scope shown below. The emitter claims presented by the present application are narrower than the emitter claim 2 of the '495 patent at least in these respects.

Claim 13 now recites:

> each electrode of the emitter is positioned so that substantially all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing and
>
> so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches... .

Claim 27 now recites:

> the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber,
>
> wherein the position and size of each electrode within the chamber defines a cross-section of the chamber that has a water flow area within the oxygenation chamber through which water may flow without passing between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches, ...
>
> wherein at least a portion of the outside electrode positioned in the chamber is closer to the inward-facing surface of the oxygenation chamber than said distance separating the inside electrode from the outside electrode... .

Claim 37 now recites:

> a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing, ...
>
> wherein each electrode is positioned within the oxygenation chamber so that a cross section of the oxygenation chamber includes a water flow area that allows water to avoid passing between electrodes separated by 0.005 inches to 0.140 inches... .

Claim 50 now recites:

> wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a midpoint of the tubular housing and
>
> so that at least some water may flow through an unobstructed passageway from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches.

Claim 62 now recites:

> the electrodes being positioned away from the center axis and maintaining a longitudinal, unobstructed passageway parallel to and including the center axis ...
>
> the electrodes being positioned so that water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;
>
> wherein the outside electrode defines a cross-sectional area between the outside electrode and the outer wall of the chamber that is substantially less than said cross-sectional area of the unobstructed passageway.

9. The '495 emitter claim 2 is too narrow, for example, in that it requires a spacer separating the electrodes and requires that water be "supersaturated." Therefore, I identify claims 2-7, 11 and 12 of U.S. Patent No. 7,760,495 as claims that the application seeks to broaden in the present claims at least with respect to the removal of the spacer and supersaturated limitations. It was an error in the '495 patent, not to include apparatus claims to the features discussed in paragraph 7 that relate to a specific arrangement of the electrodes and without all of the limitations of claim 2 of the '495 patent such as the "spacer" limitation and the "supersaturated" limitation.

10. The examples of errors provided herein are not intended to be exhaustive or exclusive, but are presented for stating at least one error being relied upon as the basis for reissue pursuant to 37

C.F.R. 1.175. These and additional errors are addressed and corrected by the independent and dependent claims presented by the amendment filed herewith.

THE REJECTION BASED ON DEFECTIVE REISSUE OATH

11. In an office action dated October 27, 2015, my previously filed oath was found to be defective because the pending claims were found to be correcting errors that patentee is barred from correcting. I understand the office action to rely on a number of factual findings, including:

> A. That for claims to emitters for electrolytic generation of bubbles of oxygen, adding a limitation that the emitter is "positioned within a conduit" alone would render a claim patentably distinct from an emitter claim without that limitation.
>
> B. That patentee argued during the prosecution of the earlier '441 patent that amending an emitter claim to say that the emitter is "positioned within a conduit" rendered the claim patentably distinct from a claim that did not recite that limitation.
>
> C. That patentee was barred or restricted from pursuing such emitter claims (i.e., in which the emitter or electrodes are positioned "within a conduit") in the '495 patent prosecution.
>
> D. The office action made a passing reference (without explanation or a formal rejection) to the prohibition on recapturing previously surrendered subject matter.

As I discuss below, none of these findings is true.

A. Adding that the emitter or the electrodes be positioned "within a conduit" would not render an emitter claim patentably distinct from one that did not recite this limitation.

12. The October 27, 2015 office action stated:

> The '495 divisional patent does not claim the same invention as the '441 patent, i.e., there are no claims in the '495 divisional application directed to a flow through oxygenator comprising an oxygen emitter positioned within a conduit as claimed in the '411 patent. Accordingly, the '495 patent claims do not provide a basis for claims directed to a system comprising an oxygen emitter positioned within a conduit as recited in the newly submitted claims 13-69.

The office action then reasoned that "applicants failure to further pursue the elected invention of the '441 patent in a continuing application of the '441 patent or a divisional of the '495 patent is not correctable by reissue of the '495 patent." All claims were, therefore, rejected as being based on a defective reissue declaration that failed to state an error correctable by reissue.

13. What stands out to me in the Patent Office's October 27, 2015 rejection is the statement that the '495 patent "does not claim the same invention as the '441 patent." This statement is not accurate. It is also particularly unfair because the stated finding is the exact opposite of the finding made by the Patent Office during prosecution of the '495 patent. As explained below, all the apparatus

claims of the '495 patent were rejected for double patenting based on the claims of the '441 patent that included the limitation regarding the electrodes being positioned within a conduit.

14. The '262, '441, and '495 patents have overlapping specifications directed to the field of emitters for electrolytic generation of small bubbles of oxygen such as microbubbles or nanobubbles. In each of the '262, '441, and '495 patents, I filed and consistently pursued claims directed **emitters for electrolytic generation of bubbles of oxygen**. The table below shows example emitter claims as originally filed and as issued in each of the '262, '441, and '495 patents.

The '262 patent	The '441 patent	The '495 patent
(as originally filed, emphasis added) 1. **An emitter for electrolytic generation of microbubbles of oxygen** comprising an anode separated at a critical distance from a cathode and a power source all in electrical communication with each other.	(as originally filed emphasis added) 1. A flow-through oxygenator comprising **an emitter for electrolytic generation of microbubbles of oxygen** comprising an anode separated at a critical distance from a cathode and a power source all in electrical communication with each other, wherein the emitter is placed within or adjacent to a conduit for flowing water.	(as originally filed emphasis added) 2. **An emitter for electrolytic generation of microbubbles of oxygen** in an aqueous medium comprising: an anode separated at a critical distance from a cathode, a nonconductive spacer maintaining the separation of the anode and cathode, the nonconductive spacer having a spacer thickness between 0.005 to 0.050 inches such that the critical distance is less than 0.060 inches and a power source all in electrical communication with each other, wherein the critical distance results in the formation of oxygen bubbles having a bubble diameter less than 0.0006 inches, said oxygen bubbles being incapable of breading the surface tension of the aqueous medium such that said aqueous medium is supersaturated with oxygen.
(as issued, emphasis added) 1. **An emitter for electrolytic generation of microbubbles of oxygen** comprising an anode separated at a critical distance from a cathode and a power source all in electrical communication with each other.	(as issued, emphasis added) 1. A flow through oxygenator comprising: a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen; **an oxygen emitter for electrolytic generation of microbubbles of oxygen** from an aqueous medium, the oxygen emitter including three matched sets of anodes and cathodes wherein the matched sets	(as issued, emphasis added) 2. **An emitter for electrolytic generation of microbubbles of oxygen** in an aqueous medium comprising: an anode separated at a critical distance from a cathode, a nonconductive spacer maintaining the separation of the anode and cathode, the nonconductive spacer having a

	of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen and each matched set resides at a 120° angle to the adjacent matched sets; and a power source in electrical communication with the oxygen emitter.	spacer thickness between 0.005 to 0.050 inches such that the critical distance is less than 0.060 inches and a power source all in electrical communication with each other, wherein the critical distance results in the formation of oxygen bubbles having a bubble diameter less than 0.0006 inches, said oxygen bubbles being incapable of breaking the surface tension of the aqueous medium such that said aqueous medium is supersaturated with oxygen.

15. To generate the oxygen bubbles in water through electrolysis, the disclosed emitters include pairs of strategically-spaced electrodes and, of course, some water container to bring the electrodes into contact with the water. The water containers are variously described as being, for example, a vessel, container, enclosure, tube, pipe, hose, tank, bucket, or conduit.

16. Since one skilled in this art would understand that generating oxygen bubbles through electrolysis would require some water container to bring the electrodes into contact with water, it is not reasonable to conclude that the emitter becomes patentably distinct by merely reciting that the electrodes are "positioned within" some type of container. The Patent Office made the same determination during prosecution of the '495 patent.

17. As can be seen in the chart above, claim 1 of the '441 patent as issued recites that the "oxygen emitter is positioned within the conduit." Claim 2 of the '495 patent (also shown above) does not recite that the emitter is positioned within a conduit. Despite this difference, the examiner in the '495 prosecution rejected claim 2 (and other claims) for double patenting based on claim 1 of the '441 patent. I am not a patent lawyer, but my understanding is that in order to make this rejection, the examiner was saying that claim 2 of the '495 patent was so similar to claim 1 of the '441 patent that there was no patentable difference between them. In response to the rejection, we had to forfeit part of the lifetime of the '495 patent by filing a terminal disclaimer with respect to the '441 patent so that the '495 patent would not survive any longer than the '441 patent.

B. Patentee never argued that amending an emitter claim to require that the emitter or electrodes be positioned "within a conduit" rendered the claim patentably distinct from a claim without that limitation.

18. The October 27, 2015 office action also suggested that an argument had been made during prosecution of the '441 patent that placing the electrodes "within a conduit" was a patentably distinct limitation. No such argument was made. Nor would it be reasonable to make such an argument as discussed in paragraphs 15 and 16 above. Here is what actually happened. In an office action dated May 25, 2007, claim 1 of application no. 10/732,326 was rejected for double patenting based on claims in the '262 patent. In response, in an amendment dated August 17, 2007, multiple amendments were

made to the claim, and the applicant argued that the double patenting rejection no longer applied. The following chart shows the claim both before and after the amendment.

Claim discussed in '441 prosecution **prior to** amendment	Claim discussed in '441 prosecution **after** amendment (with and without markings to show changes)
1. A flow through oxygenator consisting of an emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other, and a power source all in electrical communication with each other, wherein the emitter is placed within or adjacent to a conduit for flowing water.	1. A flow through oxygenator ~~consisting of~~ comprising: a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen; an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen ~~comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other,~~ and a power source ~~all~~ in electrical communication with ~~each other wherein~~ the oxygen emitter ~~is placed within or adjacent to a conduit for flowing water~~. Clean version (without markings) 1. A flow through oxygenator comprising: a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen; an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen; and a power source in electrical communication with the oxygen emitter.

19. The remarks section filed with the amendment included the generic statement:

> "Applicant respectfully asserts that the need for a Terminal Disclaimer to overcome a non-statutory obviousness-type double patenting rejection has been overcome through the present amendment to independent claim 1... As claims 1 [and others] are patentably distinct from claims 1-6 of U.S. Patent No. 6,689,262, Applicant respectfully requests said rejection be withdrawn."

20. From the marked changes it is clear that multiple changes were made to the claim. The amendments to the claim included: changing the preamble from "consisting of" to "comprising"; removing any reference to a critical distance between electrodes; adding a limitation that there be a plurality of anodes and a plurality of cathodes; adding a limitation that the electrodes now be arranged in a plurality of "matched sets"; adding features of a fluid conduit; and adding completely new structure, "stabilizing hardware", that was not previously recited. The limitation that the electrodes be "positioned within the conduit lumen" was never called out as being the basis for making the claims patentably distinct. In fact, no one limitation was specifically identified as the basis for making the claim patentably distinct, and there is no more reason to pin the distinction on the "within a conduit" limitation than there is to pin the distinction on the new "stabilizing hardware" limitation, for example, or the "plurality of matched sets" limitation. In fact, the language that the electrodes be "placed within or adjacent to a conduit" had already been in the claim prior to the amendment which suggests that the "positioned within the conduit" limitation was not the basis for arguing the claim was now patentably distinct.

21. From the examiner's following office action, it is clear that the examiner disagreed that even all of these amendments combined made the claims patentably distinct. The examiner maintained the double patenting rejection. Only after several more later amendments that did not relate to the electrodes being positioned "within a conduit" did the examiner finally withdraw the double patenting rejection. Therefore, the prosecution history of the '441 patent does not support any finding that either the applicant or the examiner ever argued or asserted that "positioned within a conduit" limitation made claims patentably distinct from claims that did not recite that limitation.

C. There was no bar or restriction requirement applied during prosecution of the '495 patent, but instead, it was found that patentee was claiming effectively the same invention that was granted in the '441 patent.

22. In the '495 application, I filed and pursued various independent claims, both apparatus and method claims, that were not limited to any single category from any prior restriction requirement in the '441 patent. I included claims directed to emitters for electrolytic generation of bubbles of oxygen. I was never under the impression that certain categories or groups of claims were off limits or barred or restricted when filing the claims of the '495 application. No restriction requirement was ever made in the '495 prosecution, and none of the previous restriction requirements made in the '441 case were ever repeated, made, or applied during prosecution of the '495 patent.

23. Instead, what was communicated to me by the actions taken by the Patent Office was that, according to the Patent Office, by filing claim 2 of the '495 patent I was attempting to claim an invention that was so similar to the claims that I had been granted in the '441 patent that the '495 claims were rejected for double patenting. In response to that finding, I forfeited part of the lifetime of the '495 patent by a terminal disclaimer. Now to my surprise the Patent Office wants to make the opposite

finding to argue that I am barred in a reissue of the '495 patent from pursing emitter claims that recite the emitter or electrodes be positioned within a conduit or similar language. That seems particularly wrong and unfair.

D. Patentee is not seeking to recapture subject matter previously surrendered.

24. The October 27, 2015 office action also makes a passing reference to "recapture" stating, "Nor can the present continuation reissue application recapture subject matter that was surrendered during the prosecution of the parent '441 and '262 patents." I have only a layman's understanding of this legal principle, but I cannot see how it could apply here. I discuss in paragraphs 7 and 8 how the emitter claims presented in this reissue application are narrower in significant respects than emitter claim 2 of the '495 patent, and the combination of narrowing limitations to each of the presently pending independent claims result in a claim scope that is not the same as any claim previously presented, amended, or issued during the prosecutions of the '262, '441, and '495 patents. Stated simply, at no time were the presently pending claims or any claims with the limitations discussed above in paragraphs 7 and 8 presented to the Patent Office or surrendered during any of the earlier prosecutions.

25. If such combinations of limitations to an emitter claim were never presented, I do not understand how it can be said that any decision was made to forfeit my right to pursue such claims. The '495 patent claims themselves, which do not include all the limitations of the '441 patent claims, also show that no surrender of subject matter had been made because the '495 patent included emitter claims that did not recite many of the limitations recited in the emitter claims of the '441 patent.

NO DECEPTIVE INTENT

26. I state that all errors present in the original patent and in the present reissue application up to the time of filing of this Reissue Declaration, and errors which are addressed and corrected by any amendment concurrently filed with this Reissue Declaration, which correction of errors I have reviewed, arose without any deceptive intention on the part of the Applicant.

27. I understand that pursuant to 37 C.F.R. §3.71, the assignee, Oxygenator Water Technologies, Inc., has granted the power of attorney, for prosecuting this reissue patent application and for transacting all related business, to attorneys and agents of the firm of Carlson, Caspers, Vandenburgh, Lindquist & Schuman, **Customer Number 38846.** I confirm and agree with this appointment.

28. Please direct all correspondence and all communications to **Carlson, Caspers, Vandenburgh, Lindquist & Schuman,** at the address provided by the following customer number.

Customer Number: 38846

[Intentionally Left Blank]

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of James Andrew Senkiw
Citizenship: U.S.A
Residence: Minneapolis, MN
Post Office Address: 4750 Aldrich Ave N, Minneapolis MN 55430-3529

Signature: ______________________ Date: 11 JAN 2016
James Andrew Senkiw

§ 1.56 Duty to disclose information material to patentability.

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is canceled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1) Each inventor named in the application:

(2) Each attorney or agent who prepares or prosecutes the application; and

(3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.

Exhibit A to Oath of James Senkiw

Amended claims to be filed with Oath:

13. An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;

at least two electrodes comprising a first electrode and a second electrode, at least portions of the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches within the tubular housing;

each electrode of the emitter is positioned so that substantially all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing and so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

14. The emitter of claim 13 wherein the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis; wherein said portions of the electrodes extend in a direction that is parallel to the longitudinal axis; and wherein at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes.

15. The emitter of claim 13 wherein the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis; wherein said portions of electrodes extend in a direction parallel to the longitudinal axis; and wherein each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing.

16. The emitter of claim 13 wherein at least one of the electrodes is a stainless steel mesh or screen.

17. The emitter of claim 13 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of that portion of one of the electrodes positioned within the tubular housing.

18. The emitter of claim 17 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing.

19. The emitter of claim 17 wherein the first and second electrodes comprise an outside electrode and an inside electrode, wherein said portions of the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing,

the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is,

wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is substantially less than a cross-sectional area of the unobstructed passageway.

20. The emitter of claim 13 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to and including the center axis, the passageway running for at least the length of that portion of one of the electrodes positioned within the housing;

wherein the first and second electrodes comprise an outside electrode and an inside electrode;

wherein said portions of the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing;

the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is;

wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is substantially less than a cross-sectional area of the unobstructed passageway; and

wherein the tubular housing of the emitter is round.

21. The emitter of claim 19 wherein said inward-facing surface is a concave surface.

22. The emitter of claim 13 further including first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing.

23. The emitter of claim 13 wherein the oxygen produced comprises microbubbles.

24. The emitter of claim 13 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

25. The emitter of claim 13 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

26. The emitter of claim 13 wherein the oxygen produced comprises nanobubbles.

27. An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing defining an oxygenation chamber and having a water inlet, a water outlet, a longitudinal water flow axis from the inlet to the outlet, and an inward-facing surface that runs parallel to the water flow axis and defines at least in part the oxygenation chamber;

at least two electrodes comprising an outside electrode and an inside electrode, at least portions of the outside and inside electrodes being positioned in the oxygenation chamber, said portions extending in a direction that is parallel to the longitudinal axis, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber,

wherein the position and size of each electrode within the chamber defines a cross-section of the chamber that has a water flow area within the oxygenation chamber through which water may flow without passing between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches, wherein the water flow area is greater than an area at the cross-section equal to the total area between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches,

wherein at least a portion of the outside electrode positioned in the chamber is closer to the inward-facing surface of the oxygenation chamber than said distance separating the inside electrode from the outside electrode; and

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the chamber of the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

28. The emitter of claim 27 wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a longitudinal center axis of the oxygenation chamber.

29. The emitter of claim 27 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of that portion of one of the electrodes positioned within the chamber.

30. The emitter of claim 29 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber.

31. The emitter of claim 30 wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is substantially less than a cross-sectional area of said unobstructed passageway.

32. The emitter of claim 27 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing.

33. The emitter of claim 27 wherein the oxygen produced comprises nanobubbles.

34. The emitter of claim 27 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

35. The emitter of claim 27 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

36. The emitter of claim 35 wherein the oxygen produced comprises nanobubbles.

37. An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing defining an oxygenation chamber and having a water inlet, and a water outlet;

at least two electrodes comprising a first electrode and a second electrode, at least portions of the first and second electrodes being positioned in the oxygenation chamber, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches, a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber, said portion being a portion that opposes the other of the first and second electrodes, wherein each electrode is positioned within the oxygenation chamber so that a cross section of the oxygenation chamber includes a water flow area that allows water to avoid passing between electrodes separated by 0.005 inches to 0.140 inches;

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

38. The emitter of claim 37 wherein the tubular housing has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal center axis; and wherein each

electrode of the emitter is positioned so that substantially all points midway between all opposing electrodes inside the chamber are closer to said inwardly-facing surface than to the longitudinal center axis.

39. The emitter of claim 37 wherein the chamber has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal axis, wherein said portions of the electrodes extend in a direction that is parallel to the longitudinal axis, and wherein at least one of the first and second electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes.

40. The emitter of claim 39 wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to the longitudinal center axis of the oxygenation chamber.

41. The emitter of claim 37 wherein the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing.

42. The emitter of claim 37 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of that portion of one of the electrodes positioned within the chamber.

43. The emitter of claim 42 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the chamber.

44. The emitter of claim 42 wherein the chamber has an inward-facing surface that runs parallel to the longitudinal axis; wherein the first and second electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is; and wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is substantially less than a cross-sectional area of the unobstructed passageway.

45. The emitter of claim 37 further including first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing.

46. The emitter of claim 37 wherein the oxygen comprises microbubbles.

47. The emitter of claim 37 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

48. The emitter of claim 37 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

49. The emitter of claim 37wherein the oxygen produced comprises nanobubbles.

50. An emitter for electrolytic generation of bubbles of oxygen in an aqueous medium comprising:

a tubular housing defining an oxygenation chamber, and having an inward-facing surface that defines at least in part the oxygenation chamber, a water inlet, and a water outlet;

at least two electrodes comprising an outside electrode and an inside electrode, at least portions of the outside and inside electrodes being positioned in the oxygenation chamber, said portions extending in a direction that runs parallel to the inward-facing surface, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the inward-facing surface of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber;

wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a midpoint of the tubular housing and so that at least some water may flow through an unobstructed passageway from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches.

51. The emitter of claim 50 wherein at least one of the inside and outside electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes, and wherein the tubular housing defines a longitudinal center axis that lies in the oxygenation chamber and wherein the unobstructed passageway includes the longitudinal center axis.

52. The emitter of claim 50 wherein at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber.

53. The emitter of claim 52 wherein the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing.

54. The emitter of claim 50 wherein the unobstructed passageway is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber.

55. The emitter of claim 54 wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is substantially less than a cross-sectional area of said unobstructed passageway.

56. The emitter of claim 55 wherein said inward-facing surface is a concave surface.

57. The emitter of claim 50 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing.

58. The emitter of claim 50 wherein the emitter is operable when connected to a power source to create microbubbles of oxygen in water flowing through the oxygenation chamber.

59. The emitter of claim 50 coupled to a power source wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

60. The emitter of claim 50 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

61. The emitter of claim 50 wherein the electrolysis cell is operable when connected to a power source to create nanobubbles of oxygen in water flowing through the oxygenation chamber.

62. An emitter for electrolytic generation of bubbles of oxygen in an aqueous medium comprising:

a tubular housing defining an oxygenation chamber, said housing having an outer wall that runs parallel to a longitudinal center axis of the housing, said housing having a water inlet and a water outlet,

at least two electrodes comprising an outside electrode and an inside electrode, at least portions of the outside and inside electrodes being positioned in the oxygenation chamber, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches;

the electrodes being positioned away from the center axis and maintaining a longitudinal, unobstructed passageway parallel to and including the center axis that runs for at least the length of that portion of one of the electrodes positioned within the chamber, the unobstructed passageway having a substantially uniform cross-sectional area along that length, the electrodes being positioned so that water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;

wherein the outside electrode defines a cross-sectional area between the outside electrode and the outer wall of the chamber that is substantially less than said cross-sectional area of the unobstructed passageway.

63. The emitter of claim 62 wherein at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber.

64. The emitter of claim 63 wherein the electrode in contact with a wall of the tubular housing is in contact with the outer wall which is a curved wall of the tubular housing.

65. The emitter of claim 62 wherein the unobstructed passageway is multiple times wider than the distance separating the opposing outside and inside electrodes within the chamber.

66. The emitter of claim 62 wherein said outer wall includes an inwardly-facing concave surface.

67. The emitter of claim 62 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing.

68. The emitter of claim 62 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

69. The emitter of claim 68 wherein the emitter is operable when connected to a power source to create nanobubbles of oxygen in water flowing through the oxygenation chamber.

Exhibit H

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/023,431	01/31/2008	James Andrew Senkiw	4056.02US03	7381

24113 7590 03/27/2009
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EXAMINER	
ALLEN, CAMERON J	
ART UNIT	**PAPER NUMBER**
1797	

MAIL DATE	DELIVERY MODE
03/27/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Office Action Summary	Application No. 12/023,431	Applicant(s) SENKIW, JAMES ANDREW	
	Examiner CAMERON J. ALLEN	Art Unit 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 January 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 January 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/21/2008, 4/4/2008*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-12 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-14 of U.S. Patent No. 6,689,262 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant application discloses use in a conduit, but the patent discloses use in a vessel. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the device in a conduit, since one of ordinary skill in the art would recognize it would yield the added and expected result of oxygenation.

Claims 2-12 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-17 of U.S. Patent No. 7,396,441 B2.

Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant application discloses one set of anodes and cathodes and the patent discloses the use of multiple anode and cathode configuration. It would have been obvious to one of ordinary skill in the art at the time of the invention to use multiple anode and cathode configuration, since; it would yield the added benefit and expected result of increased treatment.

Claims 1-12 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-7 of copending Application No. 10/732,326. Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant application discloses the critical distance is less than 0.060. The related application discloses 0.0005-0.140 and 0.045 to 0.060. One of ordinary skill in the art at the time of the invention would recognize that the ranges overlap, and therefore disclose the same distances.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CAMERON J. ALLEN whose telephone number is (571)270-3164. The examiner can normally be reached on M-Th 9-7pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

CJA

/Walter D. Griffin/
Supervisory Patent Examiner, Art Unit 1797

Exhibit I

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/732,326	12/10/2003	James Andrew Senkiw	AQI.002US1	7020

24113 7590 11/01/2007
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80 SOUTH 8TH STREET
MINNEAPOLIS, MN 55402-2100

EXAMINER	
ZHENG, LOIS L	

ART UNIT	PAPER NUMBER
1793	

MAIL DATE	DELIVERY MODE
11/01/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Office Action Summary	**Application No.** 10/732,326	**Applicant(s)** SENKIW, JAMES ANDREW
	Examiner Lois Zheng	**Art Unit** 1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 August 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) *5-8 and 10-12* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,9,13 and 15-26* is/are rejected.

7)☒ Claim(s) *14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of Claims

1. Claims 1-4 and 9 are amended in view of applicant's amendment filed 17 August 2007. New claims 13-26 are added in view of applicant's amendment. Claims 5-8 and 10-12 remain withdrawn from consideration. Therefore, claims 1-4, 9 and 13-26 are currently under examination.

Status of Previous Rejections/Objections

2. The rejection of claims 1-3 under 35 U.S.C. 102(e) as being anticipated by Zappi et al. US 6,328,875 B1(Zappi) is withdrawn in view of applicant's claim amendment filed 17 August 2007.

The rejection of claim 4 under 35 U.S.C. 103(a) as being unpatentable over Zappi is withdrawn in view of applicant's claim amendment filed 17 August 2007.

The rejection of claim 9 under 35 U.S.C. 103(a) as being unpatentable over Zappi in view of Cairns et al. US 4,587,001(Cairns) is withdrawn in view of applicant's claim amendment filed 17 August 2007.

3. The rejection of claims 1-4 under 35 U.S.C. 103(a) as being unpatentable over Divisek et al. US 4,225,401(Divisek) is withdrawn in view of applicant's claim amendment filed 17 August 2007.

The rejection of claim 9 under 35 U.S.C. 103(a) as being unpatentable over Divisek in view of Cairns et al. US 4,587,001(Cairns) is withdrawn in view of applicant's claim amendment filed 17 August 2007.

Drawings

4. The drawings are objected to because:

Fig. 1A, 1B, 2A, 2B are shown in the drawings. However, the specification only discusses Fig. 1 and Fig. 2 as a whole.

Fig. 6 shows two additional data points for "control" data set on August 10 and 17 above the "Test" data set. These data points are not discussed in the specification. In addition, the date increments on the x-axis are not proportionally and accurately represented.

Figs. 7(A) and 7(B) as discussed on lines 24 and 29 on page 13 of the specification are not properly labeled in Fig. 7.

On page 15, lines 15-20 of the instant specification teaches that Fig. 8 shows dissolved oxygen went from 0.5mg/l to 10.8 mg/l in nine minutes. However, Fig. 8 does not show dissolved oxygen levels over time. Instead, it shows temperature variation over time.

The claimed feature of a side arm flow portion, wherein the oxygen emitter reside, is not shown in any of the figures.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Priority

5. This application is a CIP of previously filed US patent application 10/372,017, now Patent No. 6,689,262. However, the parent patent does not disclose the claimed stabilizing hardware, the claimed water hose and the claimed hydroponic circulating system as recited in independent claims 1 and 25-26. Therefore, the instant application does NOT benefit from the effective filing date of the parent patent. The effective filing date of the current application is 10 December 2003.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-3, 13, 15 and 17-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Takesako et al. US 2002/0074237 A1(Takesako).

Takesako teaches a water electrolyzer comprising a fluid conduit having a fluid inlet and a fluid outlet connected with a conduit lumen(Fig. 1(a)-(b), #1, 21, 22). Takesako also teaches an electrolysis cell positioned within the conduit lumen and parallel to a flow axis of the conduit lumen(Fig. 1(b), paragraph [0021]). The electrolysis cell as taught by Takesako comprises a plurality of matched sets of anodes and cathodes and secured to electrode connecting rods by conductive bolts and spacers(Figs. 2-3, #2, 4, 25-27 and 31-33, paragraph [0056]). In addition, the electrodes are expanded metal mesh(paragraphs [0012, 0062] and the distance between the electrodes does not exceed 3.0mm(paragraph [0017]). Takesako further teaches that the electrolysis cell in the conduit lumen is connected to a power source (Fig. 1(b)).

Regarding claims 1-3, 17-18 and 21, the water electrolyzer as taught by Takesako reads on the claimed flow through oxygenator. The electrolysis cell within the conduit lumen as taught by Takesako reads on the claimed oxygen emitter. The electrode connecting rods, the conductive bolts and the conductive spacers that secure the plurality of matched sets of electrodes as taught by Takesako reads on the claimed stabilizing hardware.

Regarding claim 13, based on the shape of the electrode connecting rods and the way the electrodes are structured and secured, the examiner takes a position that the power source in the apparatus of Takesako is inherently connected to the electrode connecting rods, which is a part of the claimed stabilizing hardware, to provide electricity to the electrodes.

Regarding claim 15, Takesako further teaches that the polarity of the electrodes are reversed periodically(paragraphs [0011,0024, 0063-0065]). Therefore, the perforated electrodes proximate the conduit wall in the apparatus of Takesako function as anodes and the non-perforated electrodes proximate a conduit center in the apparatus of Takesako function as cathodes during periods of operation, which meets the limitation of the instant claim 15.

Regarding claim 19, Takesako further teaches a controller connected to a flow detecting circuit for controlling the voltage and the polarity applied to the water electrolysis cell(paragraphs [0063-0065]). Therefore, the controller as taught by Takesako is inherently capable of operating the power source in the claimed manner.

Regarding claims 20 and 22, since Takesako teaches a flow through water electrolyzer that is structurally the same as the claimed flow through oxygenator, the examiner takes a position that the apparatus of Takesako is capable of generating oxygen sufficient to form a supersaturated aqueous medium as claimed.

8. Claims 1-2, 13, 17 and 20-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Hough et al. US 6,171,469 B1(Hough).

Hough teaches a water electrolyzer for increasing oxygen content of water(abstract, title), wherein the water electrolyzer comprises a flow conduit having an inlet and an outlet connected to the conduit lumen(Fig. 1 #11-12). Hough also teaches a plurality of matched sets of anodes and cathodes mounted to stabilizing hardware and positioned within the conduit lumen(Fig. 2C). The electrodes are connected to a power source(Fig. 1 #14, col. 3 lines 6-11). The electrodes in the water electrolyzer of Hough are metal(col. 3 lines 1-5) and are positioned parallel to the flow axis of the conduit(Fig. 2C).

Regarding claims, 1-2, 17 and 21, the water electrolyzer of Hough meets the structural limitations of the instant claims.

Regarding claim 13, based on the connection between the electrode plates and the stabilizing hardware, the examiner takes a position that the power source in the apparatus of Hough is inherently connected to the electrode connecting nuts and bolts and contacting wires(i.e. stabilizing hardware) to provide electricity to the electrodes.

Regarding claims 20 and 22, since Hough teaches a flow through water electrolyzer that is structurally the same as the claimed flow through oxygenator, the examiner takes a position that the apparatus of Hough is capable of generating oxygen sufficient to form a supersaturated aqueous medium as claimed.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 4, 16 and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takesako.

The teachings of Takesako are discussed in paragraph 7 above.

Regarding claim 4, the inter-electrode distance of not exceeding 3mm as taught by Takesako encompasses the claimed gap of 0.045-0.060 inches(i.e. 1.143-1.524

mm). Therefore, a prima facie case of obviousness exists. See MPEP 2144.05. The selection of claimed gap between electrodes from the disclosed gap of Takesako would have been obvious to one skilled in the art since Takesako teaches the same utilities in its disclosed inter-electrode distance.

Regarding claim 16, even though Takesako does not explicitly teach the claimed oxygen emitter positioned within a side arm flow portion of the conduit lumen, one of ordinary skill in the art would have found it obvious to have positioned the water electrolysis cell in any part of the conduit lumen, including the claimed side arm flow portion, with expected success since water flows through any part of the conduit lumen and the location of the electrolysis cell is an obvious variation absence any evidence that a specific location is superior.

Regarding claims 23-26, even though Takesako does not explicitly teach using the water electrolysis cell in the claimed watering hose or the claimed hydroponic circulating system, one of ordinary skill in the art would have found it obvious to have adapted the water electrolysis cell as taught by Takesako in any suitable applications wherein electrolyzed water is desirable, including the claimed watering hose and the claimed hydroponic circulating system.

11. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takesako, in view of Cairns et al. US 4,587,001(Cairns).

The teachings of Takesako are discussed in paragraphs 7 and 10 above.

However, Takesako does not explicitly teach the claimed anode being platinum and iridium oxide on a support.

Cairns teaches an cathode for use in an electrolytic cell(abstract). Cairns further teaches an titanium anode having a electro-catalytically active coating material comprising one or more oxides of platinum group metals such as platinum and iridium(col. 5 lines 15-25).

Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated the anode of Cairns into the water electrolysis cell of Takesako as the anode since Cairns teaches that platinum group metal oxides is a good electro-catalytically active material for an anode of an electrolytic cell and the application of such coating on an anode is well known in the art(col. 5 lines 15-16 and 32-33).

12. Claims 3-4, 16, 18-19 and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hough, and further in view of Takesako.

The teachings of Hough are discussed in paragraph 8 above. However, Hough does not explicitly teach the claimed inter-electrode distance, the claimed metal mesh electrode and the claimed controller.

The teachings of Takesako are discussed in paragraphs 7 and 10 above.

Regarding claims 3-4, it would have been obvious to one of ordinary skill in the art to have incorporated the inter-electrode distance of not exceeding 3mm as taught by Takesako into the water electrolyzer of Hough in order to receive an increased current without using a very high voltage as taught by Takesako. In addition, the inter-electrode as taught by Hough in view of Takesako encompasses the claimed gap of 0.045-0.060 inches(i.e. 1.143-1.524 mm). Therefore, a prima facie case of obviousness exists. See MPEP 2144.05. The selection of claimed gap between electrodes from the disclosed gap of Hough in view of Takesako would have been obvious to one skilled in the art since Hough in view of Takesako teach the same utilities in their disclosed inter-electrode distance.

Regarding claim 16, even though Hough in view of Takesako do not explicitly teach the claimed oxygen emitter positioned within a side arm flow portion of the conduit lumen, one of ordinary skill in the art would have found it obvious to have positioned the water electrolysis cell in any part of the conduit lumen, including the claimed side arm flow portion, with expected success since water flows through any part of the conduit lumen and the location of the electrolysis cell is an obvious variation absence any evidence that a specific location is superior.

Regarding claim 18, Takesako further teaches that perforated electrode plates facilitate the flow of water into the flow passages between the electrode plates (paragraph 0062). Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated the perforated electrode plates as taught by Takesako into the water electrolyzer of Hough in order to facilitate the flow of water into the flow passages as taught by Takesako.

Regarding claim 19, Takesako further teaches the use of a control circuit and a flow detecting circuit to control the voltage from the power source applied to the electrolyzer(paragraphs[0063-0065]). Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated the control circuit and the flow detecting circuit as taught by Takesako into the water electrolyzer of Hough in order to control the voltage of the electrolyzer as taught by Takesako.

Regarding claims 23-26, even though Hough in view of Takesako do not explicitly teach using the water electrolysis cell in the claimed watering hose or the claimed hydroponic circulating system, one of ordinary skill in the art would have found it obvious to have adapted the water electrolyzer as taught by Hough in view of Takesako in any suitable applications wherein electrolyzed water is desirable, including the claimed watering hose and the claimed hydroponic circulating system.

13. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hough, in view of Cairns.

The teachings of Hough are discussed in paragraph 8 above.

However, Hough does not explicitly teach the claimed anode being platinum and iridium oxide on a support.

The teachings of Cairns are discussed in paragraph 11 above.

Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated the anode of Cairns into the water electrolyzer of Hough as the anode since Cairns teaches that platinum group metal oxides is a good electro-catalytically active material for an anode of an electrolytic cell and the application of such coating on an anode is well known in the art(col. 5 lines 15-16 and 32-33).

Double Patenting

14. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., In re Berg, 140

F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

15. Claims 1-4, 9, 13, 15 and 18-22 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6, 9 and 13-14 of U.S. Patent No. 6,689,262 B2(US'262) in view of Takesako.

Claims of U.S. Patent No. 6,689,262 B2 teach an oxygen emitter that is structurally similar to the emitter of the claimed flow-through oxygenator.

However, claims of US'262 does not explicitly teach that the anodes and the cathodes are mounted to stabilizing hardware.

The teachings of Takesako are discussed in paragraph 7 above. Therefore, it would have been obvious to one of ordinary skill in the art to have adapted the electrode connecting rods, the conductive bolts and spacers(i.e. stabilizing hardware) as taught by Takesako into the oxygen emitter of US'262 in order to securely position the oxygen emitter within a flow conduit as taught by Takesako.

Allowable Subject Matter

16. Claim 14 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

17. The following is a statement of reasons for the indication of allowable subject matter: The prior art of record does not teach or fairly suggest, either alone or in combination, the claimed flow through oxygenator comprising three matched sets of anodes and cathodes attached to stabilizing hardware in adjacent relation such that each matched set resides at a 120° angle to the adjacent matched sets.

Response to Arguments

18. Applicant's arguments filed 17 August 2007 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Nishiki et al. US 5,015,354 teaches a bi-polar water electrolyzer comprising a water electrolysis cell positioned within a flow conduit and secured by stabilizing hardware, wherein the electrodes are parallel to the flow axis.

20. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lois Zheng whose telephone number is (571) 272-1248. The examiner can normally be reached on 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LLZ

Exhibit J

AUG 17 2007

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of: Attorney Docket No.: 4056.02US01

James Andrew Senkiw Confirmation No.: 7020

Application No.: 10/732,326 Examiner: Zheng, Lois L.

Filed: December 10, 2003 Group Art Unit: 1742

For: FLOW-THROUGH OXYGENATOR

AMENDMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

INTRODUCTORY COMMENTS

In response to the Office Action mailed May 24, 2007, amendment to the above-identified patent application is requested.

The present amendment comprises the following sections:

A. Amendments to the Claims

B. Remarks

Please grant any extension of time necessary for entry; charge any fee due to Deposit Account No. 16-0631.

CERTIFICATE OF MAILING

I hereby certify that this document is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on

8/17/07
Date of Deposit

J. Paul Haun

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AUG 17 2007

Application No. 10/732,326

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A flow through oxygentaor ~~consisting of~~ comprising:

a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen;

an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen ~~comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other,~~; and

a power source ~~all~~ in electrical communication with ~~each other, wherein~~ the oxygen emitter ~~is placed within or adjacent to a conduit for flowing water~~.

2. (Currently Amended) The flow through oxygenator ~~emitter~~ of claim 1, wherein ~~the~~ each anode is a metal or a metallic oxide or a combination of a metal and a metallic oxide and ~~the~~ each cathode is a metal or metallic oxide or a combination of a metal and a metallic oxide.

3. (Currently Amended) The flow through oxygenator ~~critical distance~~ of claim 1, wherein the anode and cathode within each matched set are separated by a spacer such to maintain a gap of ~~which is~~ 0.005 to 0.140 inches between the anode and cathode.

4. (Currently Amended) The flow through oxygenator ~~critical distance~~ of claim ~~1~~ 3, wherein the gap ~~which~~ is 0.045 to 0.060 inches.

PAGE 3/15 * RCVD AT 8/17/2007 2:45:28 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-2/4 * DNIS:2738300 * CSID:6123499266 * DURATION (mm-ss):03-56

5. (Withdrawn) The product of claim 1 wherein the water is supersaturated with oxygen and of an approximately neutral pH.

6. (Withdrawn) A method for enhancing growth and yield of plants comprising the administration of supersaturated water on said plants.

7. (Withdrawn) The method of claim 6 wherein the supersaturated water is delivered to the plants in hydroponic culture or through drip irrigation.

8. (Withdrawn) A method for treating waste water comprising passing the waste water through a conduit comprising the emitter of claim 1.

9. (Currently Amended) The <u>flow through oxygenator</u> ~~emitter~~ of claim 1 wherein ~~the~~ <u>each</u> anode is platinum and iridium oxide on a support and ~~the~~ <u>each</u> cathode is a metal or metallic oxide or a combination of a metal and a metallic oxide.

10. (Withdrawn) A method to increase the oxygen content of flowing water comprising passing flowing water through a conduit comprising the flow-through oxygenator of claim 1.

11. (Withdrawn) The method of claim 11 wherein the flowing water has a temperature of 1 to 40 degrees Celsius.

12. (Withdrawn) The method of claim 11 wherein the flowing water becomes supersaturated with oxygen.

13. (New) The flow through oxygenator of claim 1, wherein the power source is electrically connected to the stabilizing hardware for powering the plurality of matched sets of anodes and cathodes.

14. (New) The flow through oxygenator of claim 1, wherein the plurality of matched sets comprises three matched sets of anodes and cathodes attached to the stabilizing hardware in adjacent relation such that each matched set resides at a 120° angle to the adjacent matched sets.

15. (New) The flow through oxygenator of claim 1, wherein the plurality of matched sets of anodes and cathodes are attached to the stabilizing hardware with the anodes proximate a conduit wall and the cathodes proximate a conduit center.

16. (New) The flow through oxygenator of claim 1, wherein the conduit lumen comprises a main flow portion and a side arm flow portion and wherein the oxygen emitter is positioned within the side arm flow portion using the stabilizing hardware.

17. (New) The flow through oxygenator of claim 1, wherein the plurality of matched sets of anodes and cathodes define plates positioned parallel to a flow axis of the conduit lumen.

18. (New) The flow through oxygenator of claim 1, wherein each cathode comprises a mesh screen.

19. (New) The flow through oxygenator of claim 1, further comprising:

a controller selectively operating the power source, such that the power source supplies power to the plurality of matched sets of anodes and cathodes when the aqueous

Application No. 10/732,326

medium is flowing through the conduit lumen and withholds power when the aqueous medium is not flowing through the conduit lumen.

20. (New) The flow through oxygenator of claim 1, wherein the oxygen emitter is sized to generate oxygen sufficient to form a supersaturated aqueous medium.

21. (New) The flow through oxygenator of claim 1, wherein the aqueous medium is water.

22. (New) The flow through oxygenator of claim 21, wherein the oxygen emitter is sized to generate oxygen sufficient to form superoxygenated water.

23. (New) The flow through oxygenator of claim 1, wherein the fluid conduit is a watering hose.

24. (New) The flow through oxygenator of claim 1, wherein the fluid conduit is a hydroponic circulating system.

25. (New) A flow through oxygenator comprising:
a watering hose having a hose lumen; and
an oxygen emitter operably mounted within the hose lumen.

26. (New) A flow through oxygenator comprising:
a hydroponic circulating system having a circulating lumen; and
an oxygen emitter operably mounted within the circulating lumen.

Application No. 10/732,326

REMARKS

Claims 1-4 and 9-12 are pending. By this Amendment, claims 1-4 and 9 are amended, new claims 13-26 are added and claims 10-12 are withdrawn. Claims 5-8 have been previously withdrawn. Support for the amendments can be found in the application, figures and claims as originally filed and more specifically at Page 4, Lines 18-28 and Page 13, Line 22 – Page 15, Line 12 as well as Figure 7. No new matter is introduced by way of the present amendments.

Status of Claims

By way of the present amendment, claims 1-4, 9 and new claims 13-26 are presently pending with claims 5-8 and 10-12 being presently or previously withdrawn.

Election/Restrictions

Applicant respectfully acknowledges the constructive election of claims 1-4 and 9.

Terminal Disclaimer

Claims 1-4 and 9 were previously rejected on the ground of nonstatutory obviousness-type double patenting. Applicant respectfully asserts that the need for a Terminal Disclaimer to overcome a nonstatutory obviousness-type double patenting rejection has been overcome through the present amendment to independent claim 1 and the addition of new independent claims 25 and 26. As claims 1, 25 and 26 are patently distinct from claims 1-6 of U.S. Patent No. 6,689,262, Applicant respectfully requests said rejections be withdrawn.

Claim Rejections – 35 USC §102

In the Office Action mailed May 24, 2007, claims 1-3 were rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,328,875 to Zappi et al. In response, Applicant presents amended claim 1 to further clarify the presently claimed invention. With the present response, Applicant has amended independent claim 1 to clarify the presently claimed flow through oxygenator as comprising an oxygen emitter positioned within a conduit lumen of a fluid conduit.

Zappi et al. discloses an electrolytic apparatus and related methods of use for the electropurification of contaminated aqueous media. Zappi et al. discloses the use of an electrolytic cell in an "open configuration" allowing for the controlled leakage of aqueous electrolyte solution and gaseous by-products (See Col. 4, Lines 9-43, Col. 5, Line 23 – Col. 6, Line 10, Col. 6, Lines 24-50 and Figures 1, 2 and 3). While Zappi et al. discusses the use of a conduit means (Col. 3, Lines 52-54) or pipe (Col. 14, Lines 23-37) for feeding aqueous electrolyte solution to the electrodes in the electrolyzer zone (Col. 3, Lines 52-54), Zappi et al. is absent any disclosure relative to the positioning of an oxygen emitter directly within the conduit lumen of a fluid conduit as presently claimed. Further evidence of Zappi et al.'s lack of disclosure relative to the positioning of an oxygen emitter within a conduit lumen of a fluid conduit are the repeated references to an ability to increase residency/retention time of the aqueous solution. As Zappi et al. fails to disclose each and every element of presently amended independent claim 1, Applicant respectfully requests said rejection be withdrawn.

Claim Rejections – 35 USC §103

In the Office Action mailed May 24, 2007, claim 4 was rejected under 35 U.S.C. 103(a) as being unpatentable over Zappi . As discussed above, Zappi et al. fails to disclose an oxygen emitter positioned within a conduit lumen of a fluid conduit as presently claimed in independent claim 1. As such, Zappi et al. fails to establish a *prima facie* case of obviousness with respect to independent claim 1. Applicant respectfully requests said rejection be withdrawn.

In the Office Action mailed May 24, 2007, claim 9 was rejected under 35 U.S.C. 103(a) as being unpatentable over Zappi in view of U.S. Patent No. 4,587,001 to Cairns et al. As discussed above, Zappi et al. fails to disclose the positioning of an oxygen emitter within the conduit lumen of a fluid conduit. Cairns et al. is directed solely to a cathode having a metallic substrate and is absent any teaching, suggestion or motivation relative to the positioning of an oxygen emitter within the conduit lumen of a fluid conduit. As such, neither Zappi et al. nor Cairns et al., considered individually or combination, establish a *prima facie* case of obviousness with respect to presently amended independent claim 1. Applicant respectfully requests said rejection be withdrawn.

In the Office Action mailed May 24, 2007, claims 1-4 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,225,401 to Divisek et al. As admitted in the Office Action mailed May 24, 2007, Divisek does not teach an electrolyzer placed directly within a conduit as presently claimed in amended independent claim 1. Contrary to the assertions within the office action, there is simply no support that would lead one of skill in the art, utilizing either the explicit disclosure of Divisek or simple "common sense" to position the electrolyzer of Divisek adjacent to a fluid conduit let alone within the fluid conduit as presently claimed. The teachings of Divisek in which anode and cathode chambers are separated by a specified separator and preferred operation of the invention is conducted at temperatures of 300°C to 600°C could not possibly teach, suggest or motivate one of skill in the art to consider positioning the electrolyzer either adjacent to or directly within a fluid conduit as presently claimed within independent claim 1. As such, Divisek et al. fails to establish a case of *prima facie* obviousness with respect to presently amended independent claim 1. Applicant respectfully requests said rejection be withdrawn.

In the Office Action mailed May 24, 2007, claim 9 was rejected under 35 U.S.C. 103(a) as being unpatentable over Divisek et al. in view of Cairns et al. As discussed previously, neither Divisek et al. nor Cairns et al., considered individually or in combination, teach or suggest the positioning of an oxygen emitter directly within a conduit lumen of a fluid conduit. As such, the proposed combination of Divisek et al. and Cairns et al. fails to establish a *prima facie* case of obviousness with respect to presently amended independent claim 1. Applicant respectfully requests said rejection be withdrawn.

New Claims

Newly added independent claims 25 and 26 each contain the structural limitation of an oxygen emitter being operably mounted within a conduit lumen of a conduit. As discussed previously with respect to the present rejections to independent claim 1, none of the presently cited art considered individually or in combination teaches the positioning of an oxygen emitter directly within a conduit lumen of a fluid conduit. As such, Applicant respectfully asserts that newly added independent claims 25 and 26 are in condition for allowance.

In view of the foregoing, it is submitted that this application is in condition for allowance. Favorable consideration and prompt allowance of the application are respectfully requested.

The Examiner is invited to telephone the undersigned if the Examiner believes it would be useful to advance prosecution.

Respectfully submitted,

J. Paul Haun
Registration No. 53,003

Customer No. 24113
Patterson, Thuente, Skaar & Christensen, P.A.
4800 IDS Center
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Exhibit K

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/732,326	12/10/2003	James Andrew Senkiw	AQI.002US1	7020

7590 05/24/2007

Kathleen R. Terry
#314
1666 Coffman Street
Falcon Heights, MN 55108

EXAMINER	
ZHENG, LOIS L	

ART UNIT	PAPER NUMBER
1742	

MAIL DATE	DELIVERY MODE
05/24/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Office Action Summary	**Application No.** 10/732,326	**Applicant(s)** SENKIW, JAMES ANDREW
	Examiner Lois Zheng	**Art Unit** 1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 March 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4 and 6-12* is/are pending in the application.

4a) Of the above claim(s) *6-8 and 10-12* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4 and 9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 27 March 2007 has been entered.

Status of Claims

2. Claim 1 is amended in view of the claim amendment filed 27 March 2007. New claims 10-12 are added in view of the claim amendment. Claims 6-8 remain withdrawn from consideration. Therefore, claims 1-4 and 9-12 are currently under examination.

Note, previously withdrawn claim 5 is missing in the claims filed 27 March 2007.

Election/Restrictions

3. Newly submitted claims 10-12 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:

New claims 10-12 and claims 1-3 and 9 are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another and materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus as recited in claims 1-3 and 9 can be used to practice another and materially different process such as a process to produce hydrogen and oxygen.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 10-12 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Specification

4. The amendment to the specification filed on 27 March 2007 is entered.

Terminal Disclaimer

5. The terminal disclaimer filed 28 February 2007 is improper because:

The application/patent being disclaimed has been improperly identified since the number used to identify the application number 10/372,017 being disclaimed is incorrect. The correct number is US Patent No. 6,689,262 B2.

Status of Previous Rejections

6. The rejection of claims 1-4 and 9 under 35 U.S.C. 112, second paragraph, is withdrawn in view of applicant's claim amendments filed 27 March 2007.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the

applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1-3 are rejected under 35 U.S.C. 102(e) as being anticipated by Zappi et al. US 6,328,875 B1(Zappi).

Zappi teaches an electrolytic apparatus for electropurification of water(abstract), wherein the apparatus comprises a water feed, at least one cathode and at least one anode with inter-electrode gap between 0-2mm(Fig. 1 #12,18 and 20, col. 10, lines 13-15, col. 12 lines 45-49).

Regarding claims 1 and 3, Zappi teaches the generation of oxygen gas(Fig. 1). Therefore, the claimed electrolytic generation of microbubbles of oxygen inherently takes place when the electrolytic apparatus of Zappi is in operation. The inter-electrode distance of 0-2mm reads on the claimed critical distance from anode to cathode. Since the apparatus of Zappi is used to process water, the examiner concludes that the anode and the cathode in the apparatus of Zappi are both within an aqueous medium as claimed based on the broadest reasonable interpretation. In addition, Fig. 1 of Zappi further teaches that purified water drips from the electrode, which implies that the anode and the cathode as taught by Zappi are in aqueous communication with each other as claimed. The claimed power source is inherently present in the electrolytic apparatus of Zappi in order for it to be operational. Furthermore, the electrolytic apparatus as taught by Zappi is place adjacent to a conduit for flowing water(Fig. 1#22).

Regarding claim 2, Zappi further teaches that the anode and the cathode are a metal or metal oxide as claimed.

Therefore, Zappi electrolytic apparatus anticipates the claimed flow-through oxygenator and the claimed emitter.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zappi.

The teachings of Zappi are discussed in paragraph 8 above.

Regarding claim 4, the distance of 0-2mm between the electrodes as taught by Zappi encompasses the claimed critical distance of 0.045 to 0.060 inches.

Therefore, a prima facie case of obviousness exists. See MPEP 2144.05. The selection of claimed critical distance from the disclosed range of Zappi would have been obvious to one skilled in the art since Zappi teaches the same utilities in its' disclosed critical distance range.

11. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zappi in view of Cairns et al. US 4,587,001(Cairns).

The teachings of Zappi are discussed in paragraph 8 above.

However, Zappi does not explicitly teach the claimed anode being platinum and iridium oxide on a support.

Cairns teaches an cathode for use in an electrolytic cell(abstract). Cairns further teaches an titanium anode having a electro-catalytically active coating material comprising one or more oxides of platinum group metals such as platinum and iridium(col. 5 lines 15-25).

Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated the anode of Cairns into the electrolyzer of Zappi as the anode since Cairns teaches that platinum group metal oxides is a good electro-catalytically active material for an anode of an electrolytic cell and the application of such coating on an anode is well known in the art(col. 5 lines 15-16 and 32-33).

12. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Divisek et al. US 4,225,401(Divisek).

Divisek teaches a water electrolyzer for generating hydrogen and oxygen(abstract). The water electrolyzer comprises and anode separated at a distance from a cathode(Fig. 1), wherein both the anode and the cathode are within an aqueous medium as claimed. Divisek further teaches that the distance between the electrodes is about 1-3 mm(col. 3 lines 54-61).

Regarding instant claims 1 and 3, since the water electrolyzer of Divisek produces oxygen, the claimed oxygen microbubbles is inherently electrolytically generated when Divisek's water electrolyzer is in operation. In addition, Divisek teaches the claimed anode and cathode separated about 1-3 mm apart from each other, which reads on the claimed critical distance as recited in instant claim 3. The claimed power source is also inherently present in the water electrolyzer of Divisek. Furthermore, Divisek further teaches transfer of electrolyte from cathode chamber to anode chamber takes place in order to equalize the mass balance(col. 3 lines 47-50).

Therefore, the anode and the cathode are in aqueous communication with each other in the apparatus of Divisek.

Even though Divisek does not explicitly teach that its electrolyzer is place within or adjacent to a conduit for flowing water, one of ordinary skill in the art would have found the position of Divisek's electrolyzer at least adjacent to a water conduit obvious since water is added/fed to Devisek's electrolyzer for electrolysis to take place.

Therefore, the claimed flow-through oxygenator and the claimed emitter do not structurally distinguish from the water electrolyzer of Divisek.

Regarding claim 2, Divisek further teaches that the anode and the cathode are made of nickel(col. 4 lines 37-39), which meets the limitation of claimed metal anode and metal cathode.

Regarding claim 4, the distance of 1-3mm between the electrodes as taught by Divisek encompasses the claimed critical distance of 0.045 to 0.060 inches.

Therefore, a prima facie case of obviousness exists. See MPEP 2144.05. The selection of claimed critical distance from the disclosed range of Divisek would have been obvious to one skilled in the art since Divisek teaches the same utilities in its' disclosed critical distance range.

13. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Divisek in view of Cairns et al. US 4,587,001(Cairns).

The teachings of Divisek are discussed in paragraph 12 above.

However, Divisek does not explicitly teach the claimed anode being platinum and iridium oxide on a support.

Cairns teaches an cathode for use in an electrolytic cell(abstract). Cairns further teaches an titanium anode having a electro-catalytically active coating material comprising one or more oxides of platinum group metals such as platinum and iridium(col. 5 lines 15-25).

Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated the anode of Cairns into the electrolyzer of Divisek as the anode since Cairns teaches that platinum group metal oxides is a good electro-catalytically active material for an anode of an electrolytic cell and the application of such coating on an anode is well known in the art(col. 5 lines 15-16 and 32-33).

Double Patenting

14. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., In re Berg, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

15. Claims 1-4 and 9 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 6,689,262 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because the emitter of U.S. Patent No. 6,689,262 B2 is structurally the same as the emitter of the claimed flow-through oxygenator. Even though U.S. Patent No. 6,689,262 B2 does not explicitly teach the claimed flow through oxygenator, one of ordinary skill in the art would have found it obvious to use the instant emitter in an oxygenator as claimed since the emitter produces oxygen.

Response to Arguments

16. Applicant's arguments filed 27 March have been fully considered but they are not persuasive.

In the remarks, applicant argues that Divisek teaches the use of a separator for separating the anode and the cathode into anode and cathode chambers. This separator is not present in the instant invention.

The examiner does not applicant's argument persuasive since the instant claim 1 uses open-ended transitional phase "comprising", which allows the presence of additional structural components in the claimed emitter, such as the separator as taught by Divisek.

Applicant further argues that Divisek does not teach that the water electrolyzer is placed within a conduit for flowing water.

The examiner does not find applicant's argument persuasive. As stated in paragraph 12 above, even though Divisek does not explicitly teach that its electrolyzer is place within or adjacent to a conduit for flowing water, one of ordinary skill in the art would have found the position of Divisek's electrolyzer at least adjacent to a water conduit obvious since water is added/fed to Devisek's electrolyzer for electrolysis to take place.

Applicant further argues that cathode is not located in an aqueous medium since the operating temperature as taught by Divisek is in the range of 300-600C. Therefore, any water would be in vapor form not in liquid form. The examiner does not find applicant's argument persuasive since the phase of water electrolyte depends upon the electrolysis operating temperature, therefore, is directed to a process limitation. As stated in MPEP 2114 [R-1], it is well settled that the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus as long as the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). In this case, since the apparatus as taught by Divisek is substantially the same structurally as the claimed apparatus, the examiner concludes that the rejection is proper.

Applicant's arguments with respect to claims 2, 4 and 9 are not found convincing since they are depended upon the non-convincing arguments of claim 1 above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lois Zheng whose telephone number is (571) 272-1248. The examiner can normally be reached on 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LLZ

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SUPERVISORY PATENT EXAMINER
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Exhibit L

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/732,326	12/10/2003	James Andrew Senkiw	AQL002US	7020

46350 7590 11/29/2005

KATHLEEN R. TERRY
2417 COMO AVENUE
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EXAMINER	
ZHENG, LOIS L	
ART UNIT	**PAPER NUMBER**
1742	

DATE MAILED: 11/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)
	10/732,326	SENKIW, JAMES ANDREW
	Examiner	Art Unit
	Lois Zheng	1742

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 December 2003*.
2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.
4a) Of the above claim(s) *5-8* is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *1-4* is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☐ All b)☐ Some * c)☐ None of:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *19 July 2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1-4, drawn to a flow-through oxygenator, classified in class 204, subclass 242.

   II. Claim 5, drawn to an oxygen supersaturated water product, classified in class 205, subclass 633.

   III. Claims 6-7, drawn to a method for enhancing growth of plants, classified in class 47, subclass 58.1 SC.

   IV. Claim 8, drawn to a method for treating waste water, classified in class 205, subclass 742.

2. Inventions I and II are related as apparatus and product made. The inventions in this relationship are distinct if either or both of the following can be shown: (1) that the apparatus as claimed is not an obvious apparatus for making the product and the apparatus can be used for making a different product or (2) that the product as claimed can be made by another and materially different apparatus (MPEP § 806.05(g)). In this case the oxygen supersaturated water can be made by another and materially different apparatus such as an non-electrochemical fluid aeration device.

3. Inventions III and I are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions have different function. Invention I is drawn to

an oxygenator apparatus while Invention III is drawn to a process for enhancing growth of plants.

4. Inventions IV and I are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus of Invention I can be used to practice another and materially difference process, such as a process to produce oxygen.

5. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

6. During a telephone conversation with Kathleen R. Terry on 15 November 2005 a provisional election was made without traverse to prosecute the invention of group I, claims 1-4. Affirmation of this election must be made by applicant in replying to this Office action. Claims 58 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1 and 3 are rejected under 35 U.S.C. 102(b) as being anticipated by Divisek et al. US 4,225,401(Divisek).

Divisek teaches a water electrolyzer for generating hydrogen and oxygen(abstract). The water electrolyzer comprises and anode separated at a distance from a cathode(Fig. 1). Divisek further teaches that the distance between the electrodes is about 1-3 mm(col. 3 lines 54-61).

Regarding instant claims 1 and 3, since the water electrolyzer of Divisek produces oxygen, the claimed oxygen microbubbles is inherently electrolytically generated when Divisek's water electrolyzer is in operation. In addition, Divisek teaches the claimed anode and cathode separated about 1-3 mm apart from each other, which reads on the claimed critical distance as recited in instant claim 3. The claimed power source is also inherently present in the water electrolyzer of Divisek. Fig. 1 of Divisek further shows that the water electrolyzer is placed within a conduit for flowing water Therefore, the water electrolyzer of Divisek meets the structural limitation of the instant claims 1 and 3. The examiner concludes that the electrolyzer of Divisek reads on the claimed flow-through oxygenator and the claimed emitter based on the broadest reasonable interpretation.

Therefore, Divisek anticipates instant claims 1 and 3.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Divisek.

The teachings of Divisek are discussed in paragraph 8 above.

Regarding instant claim 4, the distance of 1-3mm between the electrodes as taught by Divisek encompasses the claimed critical distance of 0.045 to 0.060 inches.

Therefore, a prima facie case of obviousness exists. See MPEP 2144.05. The selection of claimed critical distance from the disclosed range of Divisek would have been obvious to one skilled in the art since Divisek teaches the same utilities in its' disclosed critical distance range.

11. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Divisek in view of Cairns et al. US 4,587,001(Cairns).

The teachings of Divisek are discussed in paragraph 8 above. Divisek further teaches that the anode and the cathode are made of nickel(col. 4 lines 37-39).

However, Divisek does not explicitly teach the claimed anode being platinum and iridium oxide on a support.

Cairns teaches an cathode for use in an electrolytic cell(abstract). Cairns further teaches an titanium anode having a electro-catalytically active coating material comprising one or more oxides of platinum group metals such as platinum and iridium(col. 5 lines 15-25).

Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated the anode of Cairns into the electrolyzer of Divisek as the anode since Cairns teaches that platinum group metal oxides is a good electro-catalytically active material for an anode of an electrolytic cell and the application of such coating on an anode is well known in the art(col. 5 lines 15-16 and 32-33).

Double Patenting

12. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., In re Berg, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

13. Claims 1-4 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 6,689,262 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because the emitter of U.S. Patent No. 6,689,262 B2 is structurally the same as the emitter of the claimed flow-through oxygenator. Even though U.S. Patent No. 6,689,262 B2 does not explicitly teach the claimed flow through oxygenator, one of ordinary skill in the art would have found it obvious to use the instant emitter in an oxygenator as claimed since the emitter produces oxygen.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lois Zheng whose telephone number is (571) 272-1248. The examiner can normally be reached on 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/601,340	01/21/2015	James Andrew Senkiw	3406.005US2	1069

38846 7590 02/13/2018
Carlson, Caspers, Vandenburgh, Lindquist &
Schuman
225 South 6th Street
Suite 4200
Minneapolis, MN 55402

EXAMINER	
JOHNSON, JERRY D	

ART UNIT	PAPER NUMBER
3991	

MAIL DATE	DELIVERY MODE
02/13/2018	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Application Number: 14/601,340
Filing Date: January 21, 2015
Appellant(s): SENKIW, JAMES ANDREW

____
Philip P. Caspers
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed November 21, 2017.

(1) Grounds of Rejection to be Reviewed on Appeal

Every ground of rejection set forth in the Office action dated June 5, 2017 from which the appeal is taken is being maintained by the examiner except for the grounds of rejection (if any) listed under the subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

The following ground(s) of rejection are applicable to the appealed claims.

Scope of Claims

The present reissue application seeks to broaden the apparatus claims of the '495 patent (patented claim 2-7, 11 and 12 directed to an emitter for electrolytic generation of microbubbles of oxygen in an aqueous medium) through newly added claims 13-69. Claim 13 is representative:

> 13. (New) <u>An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:</u>
>
> <u>a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;</u>
>
> <u>at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches up to 0.140 inches within the tubular housing;</u>
>
> <u>each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing and so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;</u>
>
> <u>a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or</u>

equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to delivery electric current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

The ‘495 patent specification contains the following definitions:

“O_2 emitter” means a cell comprised of at least one anode and at least one cathode separated by the critical distance. (Column 4, lines 7-8)

“Critical distance” means the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles. (Column 4, lines 1-3)

Column 3, lines 11-13 of the ‘495 patent teach “[i]n order to form microbubbles and nanobubbles, the anode and cathode are separated by a critical distance. The critical distance ranges from 0.005 inches to 0.140 inches.”

An “O_2 emitter” is “[a]n emitter for electrolytic generation of bubbles of oxygen” as recited in claims 13-69. Accordingly, the emitter of claims 13-69 comprises at least one anode and at least one cathode separated by the critical distance of from 0.005 to 0.140 inches.

Newly presented claims 13-69 recite “**a tubular housing** having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet” (claim 13); “**a tubular housing** defining an oxygenation chamber and having a water inlet, a water outlet, a longitudinal water flow axis from the inlet to the outlet” (claim 27); “**a tubular housing** defining an oxygenation chamber and having a water inlet, and a water outlet" (claim 37); "**a tubular housing** defining an oxygenation chamber, and having an inward-facing surface that defines at least in part the oxygenation chamber, a water inlet, and a water outlet” (claim 50) and; “**a**

tubular housing defining an oxygenation chamber, said housing having an outer wall that runs parallel to a longitudinal center axis of the housing, said housing having a water inlet and water outlet" (claim 62). (Emphasis added)

The term "tubular housing" does not appear in the '495 patent specification. Nor does the term "fluid conduit", which is recited in claim 1 of the '441 patent, appear in the '441 patent specification. Rather, the '441 and '495 specifications (which are essentially the same) teach that the emitter may be made to fit inside "a tube or hose" (column 9, lines 5-11 of each specification). Accordingly, the terms "tubular housing" and "fluid conduit" are considered to be descriptive of, and supported by, the terms "tube or hose".

Consequently, the "tubular housing" having an inlet and an outlet as recited in claims 13-69 is also a "fluid conduit" as recited in claims 1-15 of the 441 patent, i.e., "a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen" ('441 patent, claim 1). Newly presented claims 13-69, like claims 1-15 of the '441 patent, are therefore directed to an emitter for electrolytic generation of microbubbles of oxygen wherein the emitter is positioned within a conduit having an inlet and an outlet.

Reissue Declaration

The reissue oath/declaration filed with this application is defective (see 37 CFR 1.175 and MPEP § 1414) because of the following:

The claims of the present reissue application are directed to a different invention that is patentably distinct from the claims of the 7,670,495 patent (hereafter "the '495 patent"). More specifically, the reissue declaration states "[t]he '495 emitter claim 2, for example, is too broad in that it does not recite certain features of the disclosed emitter embodiment corresponding to FIGS. 7A and 7B which I was entitled to claim but did not claim. These features are shown in the embodiment of FIGS 7A and 7B and include, for example: the electrodes are positioned in the outer perimeter of the oxygenation chamber; this positioning of the electrodes provides an unobstructed passageway for water to flow; in that unobstructed passageway, water may flow from the water inlet to the water outlet without passing through a space between the electrodes of opposite polarity; and a portion of at least one of the first and second electrodes is in contact with a wall of the tubular housing." (Paragraph 7).

Claim 2 of the '495 patent recites:

2. An emitter for electrolytic generation of microbubbles of oxygen in an aqueous medium comprising:
an anode separated at a critical distance from a cathode,
a nonconductive spacer maintaining the separation of the anode and cathode,
the nonconductive spacer having a spacer thickness between 0.005 to 0.050 inches such that the critical distance is less than 0.060 inches and a power source all in electrical communication with each other,
wherein the critical distance results in the formation of oxygen bubbles having a bubble diameter less than 0.0006 inches, said oxygen bubble being incapable of breaking the surface tension of the aqueous medium such that said aqueous medium is supersaturated with oxygen.

The 12/023,431 application (hereafter "the '431 application"), which became the '495 patent, was a divisional of the 10/732,326 application (hereafter "the '326 application") which became the 7,396,441 patent (hereafter "the '441 patent"). The '431 application was originally filed with a single claim to a method for treating waste water. Claims directed to an emitter (claims 2-7, 11 and 12), a method for oxygenating a non-native habitat (claim 8), a method for lowering the biologic oxygen demand of polluted water (claim 9), and a supersaturated aqueous product (claim 10) were added by preliminary amendment. The '495 patent issued from the '431 application without any further amendments. As a result, the '495 patent **does not** contain claims to an emitter positioned within a "tubular housing" or "conduit" (as shown in Fig. 7) and recited in instant claims 13-69.

In contrast, during prosecution of the '326 application, applicant specifically cited to Fig. 7 as support for the '441 patent claims. Moreover, as discussed below, applicant argued during prosecution of the '441 patent that claims to an emitter positioned within a conduit were patentably distinct from claims to the emitter alone. Consequently, the present continuation reissue application cannot be used to broaden the claims of the '495 patent to include the patentably distinct invention of the '441 divisional patent (which issued July 8, 2008). Nor can the present continuation reissue application recapture subject matter that was surrendered during prosecution of the '441 patent.

The '441 Patent

The '326 application, which became the '441 patent, was filed on December 10, 2003 with claims 1-8. In an Office Action dated November 29, 2005, the examiner restricted the claims as follows:

I. Claims 1-4, drawn to a flow-through oxygenator.

II. Claim 5, drawn to an oxygen supersaturated water product.

III. Claims 6-7, drawn to a method for enhancing the growth of plants.

IV. Claim 8, drawn to a method for treating waste water.

Applicant elected claims 1-4 to a flow-through oxygenator. Claim 1 recited:

> 1. A flow-through oxygenator comprising an emitter for electrolytic generation of microbubbles of oxygen comprising an anode separated at a critical distance from

> a cathode and a power source all in electrical communication with each other, **wherein the emitter is placed within or adjacent to a conduit for flow water**. (Emphasis added)

In a non-final Office Action dated May 24, 2007, claims 1-3 were rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,328,875 to Zappi. The examiner stated “the electrolytic apparatus as taught by Zappi is place [sic] adjacent to a conduit for flowing water” (page 4 of the Office Action mailed May 24, 2007). Claim 1-4 were also rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,225,401 to Divisek et al. (page 6 of the Office Action mailed May 24, 2007). The examiner stated “[e]ven though Divisek does not explicitly teach that its electrolyzer is place [sic] within or adjacent to a conduit for flowing water, one of ordinary skill in the art would have found the position of Divisek's electrolyzer at least adjacent to a water conduit obvious since water is added/fed to Devisek’s [sic] electrolyzer for electrolysis to take place" (page 7 of the Office Action mailed May 24, 2007).

The examiner further rejected claim 1-4 and 9 of the ‘326 application on the grounds of non-statutory obviousness-type double patenting:

> [c]laims 1-4 and 9 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 6,689,262 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because the emitter of U.S. Patent No. 6,689,262 B2 is structurally the same as the emitter of the claimed flow-through oxygenator. Even though U.S. Patent No. 6,689,262 B2 does not explicitly teach the claimed flow through oxygenator, one of ordinary skill in the art would have found it obvious to use the instant emitter in an oxygenator as claimed since the emitter produces oxygen. (page 9 of the Office Action mailed May 24, 2007).

Claim 1 of U.S. Patent No. 6,689,262 reads as follows:

> 1. An emitter for electrolytic generation of microbubbles of oxygen comprising an anode separated at a critical distance from a cathode and a power source all in electrical communication with each other.

In a response filed August 17, 2007, applicant amended the claims to recite (bold emphasis added):

> 1. (Currently Amended) A flow through oxygenator ~~consisting of~~ comprising:
> **a fluid conduit** having a fluid inlet and a fluid outlet with a conduit lumen;
> an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that **the oxygen emitter is positioned within the conduit lumen** ~~comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other,~~; and
> a power source ~~all~~ in electrical communication with ~~each other, wherein~~ the oxygen emitter ~~is placed within or adjacent to a conduit for flowing water~~.

Applicant also added new claims 25 and 26 (emphasis added):

> 25. (New) A flow through oxygenator comprising:
> a watering hose having a hose lumen; and
> **an oxygen emitter operably mounted within the hose lumen**.
>
> 26. (New) A flow through oxygenator comprising:
> a hydroponic circulating system having a circulating lumen; and
> **an oxygen emitter operably mounted within the circulating lumen**.

As to the amendment, applicant argued “Applicant has amended independent claim 1 to clarify the presently claimed flow through oxygenator as comprising an oxygen emitter positioned within a conduit lumen of a fluid conduit”; “Zappi et al. is absent any disclosure relative to the positioning of an oxygen emitter directly within the conduit lumen of a fluid conduit as presently claimed” and; “Divisek does not teach an electrolyzer placed directly within a conduit as presently claimed in amended independent claim 1” (Remarks, pages 7 and 8).

As to new claims 25 and 26, applicant argued “[a]s discussed previously with respect to the present rejections to independent claim 1, none of the presently cited art considered individually or in combination teaches the positioning of an oxygen emitter directly within a conduit lumen of a fluid conduit" (Remarks, page 9)

Applicant further argued

> [c]laims 1-4 and 9 were previously rejected on the ground of nonstatutory obviousness type double patenting. Applicant respectfully asserts that the need for a Terminal Disclaimed to overcome a nonstatutory obviousness-type double patenting rejection has been overcome through the present amendment to independent claim 1 and the addition of new independent claims 25 and 26. As claims 1, 25 and 26 are patentably distinct from claims 1-6 of U.S. Patent No. 6,689,262, Applicant respectfully requests said rejections be withdrawn. (Remarks, page 6)

The examiner responded to applicant's arguments and amendment in an Office Action mailed November 1, 2007, the examiner stating "[t]he rejection of claims 1-3 under 35 U.S.C. 102(e) as being anticipated by Zappi et al. US 6,328,875 B1 (Zappi) is withdrawn in view of applicant's claim amendment filed 17 August 2007." The examiner also withdrew the rejection of claims 1-4 over Divisek et al. stating "[t]he rejection of claims 1-4 under 35 U.S.C. 103(a) as being unpatentable over Divisek et al. US 4,225,401 (Divisek) is withdrawn in view of applicant's claim amendment filed 17 August 2007." The examiner additionally withdrew the rejection of claims 1-4 and 9 on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 6,689,262 B2.

Thus, applicant not only distinguished the claims of the '441 patent application from the cited prior art based on the amendment requiring the emitter be directly within a conduit, but also argued that such an amendment made the claims patentably distinct from claims to an emitter not within a conduit. Accordingly, newly added reissue claims 13-69 are directed to a patentably distinct invention from the issued '495 patent claims.

Inasmuch as claims to an emitter within a tubular housing (as recited in claims 13-69) are patentably distinct from claims to an emitter alone (as issued in the apparatus claims of the '495 patent), it would be appropriate to restrict claims 13-69 from the instant reissue application as being directed to an invention non-elected by original presentation. However, in view of compact prosecution and the fact that applicant cannot pursue claims 13-69, which are directed to, and broader than the patentably distinct '441 patent claims (which issued more than 2 years ago), in a divisional reissue application, the specialist has not done so. Such a restriction requirement would force applicant to file a divisional application to claims which are barred by 35 U.S.C. 251. *In re Graff*, 111 F.3d 874, 877, 42 USPQ2d 1471, 1473-74 (Fed. Cir. 1997) (Broadened claims in a continuing reissue application were properly rejected under 35 U.S.C. 251 because the proposal for broadened claims was not made (in the parent reissue application) within two years from the grant of the original patent and the public was not notified that broadened claims were being sought until after the two-year period elapsed.)

Claims 13-69 are rejected as being based upon a defective reissue declaration under 35 U.S.C. 251 as set forth above. See 37 CFR 1.175.

The nature of the defect(s) in the declaration is set forth in the discussion above in this Office action.

Recapture

Claims 13-69 are rejected under 35 U.S.C. 251 as being an improper recapture of broadened claimed subject matter surrendered in the application for the patent upon which the present reissue is based. See *Greenliant Systems, Inc. et al v. Xicor LLC*, 692 F.3d 1261, 103

USPQ2d 1951 (Fed. Cir. 2012); *In re Shahram Mostafazadeh and Joseph O. Smith*, 643 F.3d 1353, 98 USPQ2d 1639 (Fed. Cir. 2011); *North American Container, Inc. v. Plastipak Packaging, Inc.*, 415 F.3d 1335, 75 USPQ2d 1545 (Fed. Cir. 2005); *Pannu v. Storz Instruments Inc.*, 258 F.3d 1366, 59 USPQ2d 1597 (Fed. Cir. 2001); *Hester Industries, Inc. v. Stein, Inc.*, 142 F.3d 1472, 46 USPQ2d 1641 (Fed. Cir. 1998); *In re Clement*, 131 F.3d 1464, 45 USPQ2d 1161 (Fed. Cir. 1997); *Ball Corp. v. United States*, 729 F.2d 1429, 1436, 221 USPQ 289, 295 (Fed. Cir. 1984). A broadening aspect is present in the reissue which was not present in the application for patent. The record of the application for the patent shows that the broadening aspect (in the reissue) relates to claimed subject matter that applicant previously surrendered during the prosecution of the application. Accordingly, the narrow scope of the claims in the patent was not an error within the meaning of 35 U.S.C. 251, and the broader scope of claim subject matter surrendered in the application for the patent cannot be recaptured by the filing of the present reissue application.

During prosecution of the '326 application, which became the '441 patent, claims 1-3 were rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,328,875 to Zappi. The examiner stated "the electrolytic apparatus as taught by Zappi is place [sic] adjacent to a conduit for flowing water" (page 4 of the Office Action mailed May 24, 2007). Claim 1-4 were also rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,225,401 to Divisek et al. (page 6 of the Office Action mailed May 24, 2007). The examiner stated "[e]ven though Divisek does not explicitly teach that its electrolyzer is place [sic] within or adjacent to a conduit for flowing water, one of ordinary skill in the art would have found the position of Divisek's electrolyzer at least adjacent to a water conduit obvious since water is added/fed to Devisek's

[sic] electrolyzer for electrolysis to take place" (page 7 of the Office Action mailed May 24, 2007).

In a response filed August 17, 2007, applicant amended the claims to recite:

> 1. (Currently Amended) A flow through oxygenator ~~consisting of~~ comprising:
> a fluid conduit having a fluid inlet and a fluid outlet with a conduit lumen;
>
> an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen ~~comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other,~~; and
>
> a power source ~~all~~ in electrical communication with ~~each other, wherein~~ the oxygen emitter ~~is placed within or adjacent to a conduit for flowing water~~.

As to the amendment, applicant argued "Applicant has amended independent claim 1 to clarify the presently claimed flow through oxygenator as comprising an oxygen emitter positioned within a conduit lumen of a fluid conduit". "Zappi et al. is absent any disclosure relative to the positioning of an oxygen emitter directly within the conduit lumen of a fluid conduit as presently claimed" and; "Divisek does not teach an electrolyzer placed directly within a conduit as presently claimed in amended independent claim 1" (Remarks, pages 7 and 8). Applicant also added new claims 13-26. New claim 14 reads:

> 14. (New) The flow through oxygenator of claim 1, wherein the plurality of matched sets comprises three matched sets of anodes and cathodes attached to the stabilizing hardware in adjacent relation such that each matched set resides at a 120° angle to the adjacent matched sets.

Applicant cited page 4, lines 18-28; page 13, line 22 to page 15, line 12 and Figure 7 as support for the amendment (Remarks, page 6). Page 13, lines 24-26 of the '326 application state:

> [i]n Figure 7 (A), the oxygenation chamber is comprised of three anodes 1 and cathodes 2, of appropriate size to fit inside a tube or hose and separated by the critical distance are placed within a tube or hose 3 at 120° angles to each other.

As to new independent claims 25 and 26, applicant argued "[a]s discussed previously with respect to the present rejections to independent claim 1, none of the presently cited art considered individually or in combination teaches the positioning of an oxygen emitter directly within a conduit lumen of a fluid conduit'" (Remarks, page 9)

The examiner responded to applicant's arguments and amendment in an Office Action mailed November 1, 2007, the examiner stating "[t]he rejection of claims 1-3 under 35 U.S.C. 102(e) as being anticipated by Zappi et al. US 6,328,875 B1 (Zappi) is withdrawn in view of applicant's claim amendment filed 17 August 2007." The examiner also withdrew the rejection of claims 1-4 over Divisek et al. stating "[t]he rejection of claims 1-4 under 35 U.S.C. 103(a) as being unpatentable over Divisek et al. US 4,225,401 (Divisek) is withdrawn in view of applicant's claim amendment filed 17 August 2007."

The examiner entered new grounds of rejection over U.S. Patent Publication 2002/0074237 to Takesako et al (Takesako) and U.S. Patent 6,171,469 to Hough et al. (Hough). As to Takesako, the examiner rejected claims 1-3, 13, 15 and 17-22 under 35 U.S.C. 102(b) as being anticipated, stating:

> Takesako teaches a water electrolyzer comprising a fluid conduit having a fluid inlet and a fluid outlet connected with a conduit lumen (Fig. 1(a)-(b), #1, 21, 22). Takesako also teaches an electrolysis cell positioned within the conduit lumen and parallel to a flow axis of the conduit lumen (Fig. 1(b), paragraph [0021]). The electrolysis cell as taught by Takesako comprises a plurality of matched sets of anodes and cathodes and secured to electrode connecting rods by conductive bolts and spacers (Figs. 2-3, #2, 4, 25-27 and 31-33, paragraph [0056]). In addition, the electrodes are expanded metal mesh (paragraphs [0012, 0062] and the distance between the electrodes does not exceed 3.0 mm (paragraph [0017]. Takesako

> further teaches that the electrolysis cell in the conduit lumen is connected to a power source (Fig. 1(b)). (Office Action, page 4 and 5).

As to Hough, the examiner rejected claims 1-3, 13, 17 and 20-22 under 35 U.S.C. 102(b) as being anticipated, stating:

> Hough teaches a water electrolyzer for increasing oxygen content of water (abstract, title), wherein the water electrolyzer comprises a flow conduit having an inlet and an outlet connected to the conduit lumen (Fig. 1 #11-12). Hough also teaches a plurality of matched sets of anodes and cathodes mounted to stabilizing hardware and positioned within the conduit lumen (Fig. 2C). The electrodes are connected to a power source (Fig. 1 #14, col. 3 lines 6-11). The electrodes in the water electrolyzer of Hough are metal (col. 3 lines 1-5) and are positioned parallel to the flow axis of the conduit (Fig. 2C) (Office Action, pages 6 and 7).

The examiner also objected to claim 14 as being dependent upon a rejected base claim but allowable if rewritten in independent form. The examiner stated "[t]he prior art of record does not teach or fairly suggest, either alone or in combination, the claimed flow through oxygenator comprising three matched sets of anodes and cathodes attached to stabilizing hardware in adjacent relation such that each matched set resides at a 120° angle to the adjacent matched sets." (Office Action, page 13)

In a response filed March 3, 2008, applicant amended the claims to recite:

> 1. (Currently Amended) A flow through oxygenator comprising:
> a fluid conduit having a fluid inlet and a fluid outlet with a conduit lumen;
>
> an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including ~~a plurality of~~ <u>three</u> matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen <u>and each matched set resides at a 120° angle to the adjacent matched sets;</u> and
>
> a power source in electrical communication with the oxygen emitter.
>
> 25. (Currently Amended) A flow through oxygenator comprising:
> a watering hose having a hose lumen; and

an oxygen emitter operably mounted with the hose lumen, the oxygen emitter including three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets.

26. (Currently Amended) A flow through oxygenator comprising:
a hydroponic circulating system having a circulating lumen; and
an oxygen emitter operably mounted within the circulating lumen, the oxygen emitter including three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets.

Applicant thus limited all the claims to include the limitation shown in Figure 7A, i.e., "three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets."

Applicant argued "[b]y way of the present amendment to independent claim 1, Applicant has incorporated the previously indicated allowable subject matter of former dependent claim 14. As such, Applicant requests said rejections be withdrawn." (Remarks, page 11)

The narrow scope of the claims in the '411 patent which recite "the oxygen emitter is positioned within the conduit lumen" (claims 1-15); "an oxygen emitter operably mounted within the hose lumen" (claim 16); and "an oxygen emitter operably mounted within the circulating lumen" (claim 17), along with "three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets" was done to overcome prior art rejections and was not an error within the meaning of 35 U.S.C. 251. The broader scope of claim subject matter surrendered in the application for the '411 patent cannot be recaptured by the filing of the present reissue application.

35 U.S.C. § 112, 1st paragraph

The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 13-69 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

There is no support for claiming "each electrode of the emitter is positioned so that substantially all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing"; "at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes"; "each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing"; "the electrodes are positioned away from a longitudinal center axis of the tubular housing"; "the passageway running longitudinally for at least the length of that portion of one of the electrodes positioned within the tubular housing"; "the unobstructed passageway includes the center axis

and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing"; "the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is substantially less than a cross-sectional area of the unobstructed passageway"; "the passageway running for at least the length of that portion of one of the electrodes positioned within the housing"; "the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is substantially less than a cross-sectional area of the unobstructed passageway"; "a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing"; "the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing" and; "the unobstructed passageway having a substantially uniform cross-sectional area along that length."

To the extent that applicant's Reissue Declaration references Figures 7A and 7B as support for the above claim limitations, e.g., "it was an error not to include emitter claims that include varying combinations of the features disclosed in the emitter embodiment corresponding to FIGS. 7A and 7B of the '495 patent" (Page 1 of the Declaration filed January 26, 2016), Figures 7A and 7B are **not** taught as being to scale. Drawings in patents, and applications for patent, do not define the precise proportions of the elements and may not be relied on to show particular sizes when the specification is completely silent on the issue. *Hockerson-Halberstadt Inc. v. Avia Group Intl Inc.*, 222 F.3d 951, 956 (Fed. Cir. 2000); *see also In re Wright* 569 F.2d 1124, 1127 (CCPA 1977) ("Absent any written description in the specification of quantitative values, arguments based on measurement of a drawing are of little value"). Accordingly, Figures 7A and 7B do not provide support for limitations which are not otherwise disclosed in the '495 patent specification. Nor do Figures 7A and 7B disclose features that are now being claimed. For example, Figures 7A and 7B do not disclose wherein “the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing”; "first and second conductors coupled to the first and second electrodes”; or “first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing”.

35 U.S.C. § 112, 4th paragraph

The following is a quotation of 35 U.S.C. 112(d):

> (d) REFERENCE IN DEPENDENT FORMS.—Subject to subsection (e), a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

The following is a quotation of pre-AIA 35 U.S.C. 112, fourth paragraph:

> Subject to the following paragraph [i.e., the fifth paragraph of pre-AIA 35 U.S.C. 112], a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

Claims 23, 26, 36, 46, 49, 58, 61 and 69 are rejected under 35 U.S.C. 112(d) or pre-AIA 35 U.S.C. 112, 4th paragraph, as being of improper dependent form for failing to further limit the subject matter of the claim upon which it depends, or for failing to include all the limitations of the claim upon which it depends.

The ‘495 patent teaches that a “critical distance” separating the anode and cathode ranging from 0.005 inches to 0.140 inches is the distance at which evolved oxygen forms microbubbles and nanobubbles. As each of the claims from which claims 23, 26, 36, 46 and 49 depend are already limited to the critical distance, the recitation in claims 23, 26, 36, 46 and 49 to forming microbubbles or nanobubbles is not a further limitation to these claims. In like manner, the recitation in dependent claims 58, 61 and 69 that the emitter is "operable" to create microbubbles or nanobubbles is not a further limitation to the claims.

Applicant may cancel the claim(s), amend the claim(s) to place the claim(s) in proper dependent form, rewrite the claim(s) in independent form, or present a sufficient showing that the dependent claim(s) complies with the statutory requirements.

(2) Response to Argument

Appellant's arguments have been fully considered but they are not persuasive.

Appellant argues the two year rule has not been violated by Appellant's present reissue claims (Brief, page 14); the current rejection is in conflict with the *Orita* rule; "[t]he examiner's oath rejection attempts to create a new restriction in the '441 patent prosecution (one that draws a distinction between claims that include the 'within a conduit' limitation and claims without that limitation), and then imports that restriction into the '495 patent prosecution" (Brief, page 15) and, that applicant argued within a conduit in the prior '441 patent prosecution to distinguish prior art or to distinguish the '262 patent claims is irrelevant (Brief, page 16).

Applicant's arguments made during prosecution are never "irrelevant". A patent owner (reissue applicant) is bound by the argument that applicant relied upon to overcome an art rejection in the original application for the patent to be reissued, regardless of whether the Office adopted the argument in allowing the claims. *Greenliant Systems, Inc. v. Xicor LLC*, 692 F.3d 1261, 1271, 103 USPQ2d 1951, 1958 (Fed. Cir. 2012). As pointed out by the court, "[i]t does not matter whether the examiner or the Board adopted a certain argument for allowance; the sole question is whether the argument was made." The "original application" includes the patent family's entire prosecution history. *MBO Laboratories, Inc. v. Becton, Dickinson & Co*., 602 F.3d 1306, 94 USPQ2d 1598 (Fed. Cir. 2010). Accordingly, patent owner is bound by the arguments made in the prior '441 patent prosecution.

In arguing that the present reissue claims do not violate the two year rule, appellant ignores the claims of the earlier '441 patent—which cannot be broadened—which are part of the instant patent family. The '441 patent issued more than 2 years before the filing date of the '340 reissue application and contains the following independent claims:

1. A flow through oxygenator comprising:
a fluid conduit having a fluid inlet and a fluid outlet fluidly connected with a conduit lumen;
an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including three matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that the oxygen emitter is positioned within the conduit lumen and each matched set resides at a 120° angle to the adjacent matched sets; and
a power source in electrical communication with the oxygen emitter.

16. A flow through oxygenator comprising:
a watering hose having a hose lumen; and
an oxygen emitter operably mounted with the hose lumen, the oxygen emitter including three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets.

17. A flow through oxygenator comprising:
a hydroponic circulating system having a circulating lumen; and
an oxygen emitter operably mounted within the circulating lumen, the oxygen emitter including three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets.

The instant reissue claims could not have been presented in a reissue application for the ‘441 patent because the ‘441 patent claims issued more than 2 years ago and the reissue claims are broader than the claims of the ‘441 patent. For example, claim 13 of the ‘340 reissue application recites (underlining omitted; bold emphasis added):

> 13. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:
>
> **a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet**;
>
> at least two electrodes comprising a first electrode and a second electrode, **the first and second electrodes being positioned in the tubular housing**, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches within the tubular housing;
>
> **each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing** and so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;
>
> a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 1.8 amps;
>
> the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

Claim 13 is broader than every claim of the ‘441 patent in not including the limitation that the oxygen emitter includes three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets. A claim of a reissue application enlarges the scope of the claims of the patent if it is broader in at least one respect, even though it may be narrower in other respect. See, e.g., 37 CFR 1.175(b).

The claims of the ‘340 reissue application are directed to an emitter positioned within a tubular housing, which is not the same invention as the ‘495 patent claims. For example, claim 2 of the ‘495 patent recites:

> 2. An emitter for electrolytic generation of microbubbles of oxygen in an aqueous medium comprising: an anode separated at a critical distance from a cathode, a nonconductive spacer maintaining the separation of the anode and cathode, the nonconductive spacer having a spacer thickness between 0.005 to 0.050 inches such that the critical distance is less than 0.060 inches and a power source all in electrical communication with each other, wherein the critical distance results in the formation of oxygen bubbles having a bubble diameter less than 0.0006 inches, said oxygen bubbles being incapable of breaking the surface tension of the aqueous medium such that said aqueous medium is supersaturated with oxygen.

Patented claim 2 displays little resemblance to claim 13 of the ‘340 reissue application. For example, claim 13, rewritten as patented claim 2 with markings to show the changes, would appear as follows:

13. An emitter for electrolytic generation of [microbubbles] <u>bubbles</u> of oxygen in [an aqueous medium] <u>water, the emitter</u> comprising:

<u>a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;</u>

<u>at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches within the tubular housing</u>

<u>each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;</u>

[an anode separated at a critical distance from a cathode, a nonconductive spacer maintaining the separation of the anode and cathode, the nonconductive spacer having a spacer thickness between 0.005 to 0.050 inches such that the critical distance is less than 0.060 inches and] <u>a power source</u> [all] in electrical communication with [each other,] <u>the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;</u>

the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis

[wherein the critical distance results in the formation of oxygen bubbles having a bubble diameter less than 0.0006 inches, said oxygen bubbles being incapable of breaking the surface tension of the aqueous medium such that said aqueous medium is supersaturated with oxygen].

Claim 2, rewritten without the language that has been deleted or added in claim 13, would read as follows:

2. An emitter for electrolytic generation of of oxygen in comprising:

in electrical communication with

.

Clearly claim 13 is directed to a different invention (i.e., emitter within a tubular housing) than was claimed in the ‘495 patent (i.e., an emitter having a nonconductive spacer having a spacer thickness between 0.005 to 0.50 inch such that the distance between the anode and cathode is less than 0.060 inches). Again, as stated above, applicant argued during prosecution of the ‘326 application that claims to an emitter within a tubular housing (e.g., conduit, hose, or lumen) were patentably distinct from claims to an emitter not within a tubular housing.

That the instant reissue claims are actually directed to the claims of the ‘441 patent is also evidenced by the reissue declaration filed with the application on January 21, 2015. The declaration states (emphasis added): “I believe that the errors to be relied upon as the basis for reissue are to be found in the text of the claims of the patent in that they do not encompass the full scope of Applicant's invention and unnecessarily limit that scope. For example, Applicant was entitled to claim but did not claim such aspects of the disclosed invention as the construction of **the emitter as a flow through device with one or more sets of electrodes therein and an arrangement of the sets of electrodes that would provide a relative relationship of those sets at angles other than 120°**."

It is the '441 patent, not the '495 patent, which claims an emitter as a flow through device with electrodes therein arranged at 120° angles to each other.

As to appellant's argument that the current rejection is in conflict with the *Orita* rule, appellant's argument is misplaced. A rejection based on "the *Orita* rule" would necessitate that the claims be rejected under 35 U.S.C. 251 for lack of defect in the original patent and lack of error in obtaining the original patent (MPEP 1412.01 I.; March 2014). A rejection for lack of defect and lack of error in obtaining the original patent has not been made during prosecution of the '340 application.

Appellant argues

> the claims of the '495 patent demonstrate that claims with this limitation ("within a conduit) could have been included in the '495 patent, because such claims were included. In the '495 patent prosecution, Applicant, in fact, filed and obtained a claim that expressly required the emitter to be positioned "within a conduit." Here is that claim.
>
> > 1. A method for treating waste water comprising;
> > providing a flow-through oxygenator comprising an emitter for electrolytic generation of microbubbles of oxygen comprising an anode separated at a critical distance from a cathode and a power source all in electrical communication with each other,
> > placing the emitter within a conduit; and
> > passing the waste water through the conduit.

(Brief, page 16)

Appellant's argument is unpersuasive for the reasons as stated at the personal interview held 16 May 2017 (see Applicant-Initiated Interview Summary dated 22 May 2017), i.e., claim 1 of the '495 patent is directed to a different statutory class (method) than claims of the '340 application (apparatus). Claim 1 of the '495 patent therefore does not provide support for claims to an apparatus with that limitation.

Appellant argues

> [i]f there is no violation of the two year rule, the *Orita* doctrine, or the recapture doctrine, it is irrelevant whether the claims of the present reissue application are directed to an invention that is patentably distinct from the claims of the '495 patent (Brief, page 16).

The instant claims **do** violate the two year rule and the recapture doctrine ("the Orita doctrine" is not applicable).

The '441 patent issued more than two years ago. Once the two year period for broadening the claims of the '441 patent had expired and there was no application pending which claimed priority from the '441 patent, the public has a right to rely on the fact that patent owner cannot obtain through reissue broader claims wherein patent owner could sue a party for infringement that previously could not have been sued for infringement of the '441 patent claims.

Claims of the '340 application, like the '441 patent, are directed to an emitter positioned within a conduit, but omits, in its entirety, the surrender-generating limitation of three matched sets of anodes and cathodes arranged at angles of 120° to each other from the '441 patent claims. Thus, contrary to the public right, the pending reissue claims could be used to sue a party for infringement that previously could not have been sued for infringement of the '441 patent claims. Bottom-line, patent owner cannot use the '495 patent as a vehicle to circumvent the prohibition against impermissible broadening and recapture and thereby deprive the public of their right to rely on the scope of the '441 patent claims as issued.

Appellant argues

> [n]otably, even the examiner in the '441 patent prosecution issued a double patenting rejection for '441 patent claims (having the "within conduit" limitation) based on the parent '262 patent claims (**not** having the "within the conduit" limitation). What that means is that the restriction the examiner seeks to import (i.e., that draws a distinction between emitter claims including the "within the conduit" limitation and emitter claims without that limitation) cannot even be found in the parent '441 patent prosecution. (Brief, page 23)

Appellant's argument is not well taken.

While the history of nonstatutory obviousness-type double patenting rejections in the '441 patent prosecution is less than straight forward, there is a clear distinction during prosecution between claims having the "within the conduit" limitation vs those without.

For example, claim 1, as originally filed in the '326 application (which became the '441 patent), read as follows (emphasis added):

> Claim 1. A flow-through oxygenator comprising an emitter for electrolytic generation of microbubbles of oxygen comprising an anode separated at a critical distance from a cathode and a power source all in electrical communication with each other, **wherein the emitter is placed within or adjacent to a conduit for flowing water**.

Claim 1 thus covered two different embodiments: 1) where the emitter was located **adjacent to a conduit** for flowing water, and 2) where the emitter was located **within a conduit** for flowing water.

In a non-final Office Action dated November 29, 2005, the examiner rejected claims 1-4 on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of the '262 patent. Applicant's response filed March 17, 2006 stated that a terminal disclaimed was submitted to obviate the rejection. However, on February 5, 2007, the examiner again rejected claims 1-4 as well as claim 9 on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of the '262 patent; the examiner stating that a terminal disclaimer had not been filed. Applicant filed a response to the final rejection on February 28, 2007 which included a terminal disclaimer disclaiming over the 10/372,017 application (which had previously issued as the '262 patent). Applicant subsequently filed a request for continued examination on March 27, 2007. In the non-final Office Action dated May 27, 2007, the examiner stated that the terminal disclaimer filed February 28, 2007 was improper "since the number used to identify the application number being disclaimed is incorrect. The correct number is US Patent 6,789,262." The examiner again rejected claims 1-4 and 9 on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of the '262 patent. However, notwithstanding the examiner's comment, the February 28, 2007 terminal disclaimer was approved on June 1, 2007.

Applicant filed a response to the non-final Office Action on August 17, 2007. The response included the following amendment to claim 1 (bold emphasis added):

> 1. (Currently Amended) A flow through oxygenator ~~consisting of~~ comprising:
> **a fluid conduit** having a fluid inlet and a fluid outlet with a conduit lumen;
> an oxygen emitter for electrolytic generation of microbubbles of oxygen from an aqueous medium, the oxygen emitter including a plurality of matched sets of anodes and cathodes wherein the matched sets of anodes and cathodes are mounted to stabilizing hardware such that **the oxygen emitter is positioned within the conduit lumen** ~~comprising an anode separated at a critical distance from a cathode both within an aqueous medium and in aqueous communication with each other,~~; and
> a power source ~~all~~ in electrical communication with ~~each other, wherein~~ the oxygen emitter ~~is placed within or adjacent to a conduit for flowing water~~.

By the amendment to claim 1, claim 1 and claims dependent thereof were limited to embodiments where the emitter was located **within a conduit** for flowing water (i.e., claims 1-4 and 9 no longer included the embodiment wherein the emitter was located adjacent a conduit).

Applicant also added new claims 25 and 26 (emphasis added):

> 25. (New) A flow through oxygenator comprising:
> a watering hose having a hose lumen; and
> **an oxygen emitter operably mounted within the hose lumen**.
>
> 26. (New) A flow through oxygenator comprising:
> a hydroponic circulating system having a circulating lumen; and
> **an oxygen emitter operably mounted within the circulating lumen**.

Despite having already filed a terminal disclaimer—which had also been accepted—applicant argued (emphasis added):

> [c]laims 1-4 and 9 were previously rejected on the ground of nonstatutory obviousness type double patenting. **Applicant respectfully asserts that the need for a Terminal Disclaimed to overcome a nonstatutory obviousness-type double patenting rejection has been overcome through the present amendment to independent claim 1 and the addition of new independent claims 25 and 26. As claims 1, 25 and 26 are patentably distinct from claims 1-6 of U.S. Patent No. 6,689,262.** Applicant respectfully requests said rejections be withdrawn. (Remarks, page 6)

Thus the examiner's nonstatutory obviousness-type double patenting rejection over claims 1-6 of the ‘262 patent was made during the time when applicant’s claims 1-4 and 9 included embodiments where the emitter was located **adjacent to a conduit** for flowing water **and** embodiments where the emitter was located **within a conduit** for flowing water. And it was after limiting the claims to embodiments where the emitter was located **within a conduit** for flowing water that applicant argued that the ‘326 application claims were patentably distinct from the ‘262 patent and that a terminal disclaimer was no longer needed.

On pages 25 and 26 of the Brief, footnote 5, appellant presents a sanitized and highly misleading discussion of the '441 patent prosecution. Of particular note, is the incomplete quote of applicant's argument made traversing the obviousness-type double patenting rejection and the need for a terminal disclaimer. The following is the complete quote with bold highlighting designating what appellant omitted:

> Applicant respectfully asserts that the need for a Terminal Disclaimer to overcome a non-statutory obviousness-type double patenting rejection has been overcome through the present amendment to independent claims 1 **and the addition of new independent claims 25 and 26.** As claims 1**, 25 and 26** are patentably distinct from claims 1-6 of U.S. Patent No. 6,689,262, Applicant respectfully request said rejection be withdrawn.

Appellant's arguments in footnote 5 are refuted by the language of newly added independent claims 25 and 26 (emphasis added):

> 25. (New) A flow through oxygenator comprising:
> a watering hose having a hose lumen; and
> **an oxygen emitter operably mounted within the hose lumen**.
>
> 26. (New) A flow through oxygenator comprising:
> a hydroponic circulating system having a circulating lumen; and
> **an oxygen emitter operably mounted within the circulating lumen**.

(Response and amendment filed August 17, 2007 in '326 application).

Clearly, claims 25 and 26 do not contain the limitations appellant asserts in footnote 5 may have been the basis for asserting the claims were patentably distinct from the '262 patent claims.

As to the §112, 1st paragraph rejections, appellant argues

> [g]eometry dictates that electrodes positioned along the lines of an equilateral triangle centered on a round tube with its corners located outside the tube, will necessarily be located closer to the outer wall than to the center point of the tube. It is mathematically impossible for electrodes in this configuration to be closer to the center of the tube than the wall of the tube. It doesn't matter how large or

> small you make the housing or the electrodes: if the electrodes are arranged as chords of a circle along the sides of an equilateral triangle having its points outside the circle as is clearly shown in FIG. 7A and also described at 9:7-11, the electrodes can never be closer to the center point of the tube than to the circular wall of the tube. This is pure math and does not rely on any drawing being to scale. It is dictated by the shapes described and shown in FIG. 7A (concentric circle and equilateral triangle.) (Brief, page 32).

Appellant's argument is not persuasive.

Initially, nowhere does the '495 patent describe Figure 7A as depicting "an equilateral triangle centered on a round tube with its corners located outside the tube". Rather, Figure 7A shows a single embodiment of the invention wherein "three anodes **1** and cathodes **2**, of appropriate size to fit inside a tube or hose and separated by the critical distance are placed within a tube or hose **3** at 120° angles to each other" (column 9, lines 7-11). Figure 7A, along with the description at column 9, lines 5-18 of the '495 patent, thus teach a single embodiment of the invention wherein three sets of anodes and cathodes (i.e., six electrodes) are arranged at 120° angles to each other within a tube or hose.

Appellant's claims do **not** require at least three sets of anodes and cathodes as disclosed and arranged in Figure 7A and described in column 9, lines 5-18, i.e., "at 120° angles to each other." For example, claim 13 recites "at least two electrodes". A single pair of electrodes cannot form an equilateral triangle as shown in Figure 7A and described in column 9 of the '495 patent. Nor do the additionally recited claim limitations (e.g., phrases 1-3, 6-8 and 11; Brief pp. 30, 36-37, 41) inherently require three pairs of electrodes arranged in an equilateral triangle and it is disingenuous for appellant to point to the characteristics of an equilateral triangle as inherently supporting claims which do not require the electrodes to be arranged in an equilateral triangle. Furthermore, it is clear that the upper left electrode depicted as a solid line in Figure 7A is shorter than the other two solid lines shown. Therefore, the triangle of Figure 7A is not centered within the tube.

Appellant's argument that the embodiment shown in FIG. 7A is described as one embodiment of a flow-through emitter and that the specification indicates that other embodiments do not need three anodes and cathodes or a 120° angle relationship (Brief, pages 34-35) is not persuasive.

The preliminary amendment filed January 21, 2015 cites to Figures 7A and 7B and the disclosure at column 9, lines 7-11 as support for the instant claim language. None of the other embodiments are disclosed as having, for example, "a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet", and "first and second electrodes being positioned in the tubular housing" (claim 13). Figure 7A and the disclosure at column 9, lines 7-11 is limited to a single embodiment wherein each of three pairs of electrodes are arranged within a tubular housing at 120° angle to the adjacent set of electrodes. Accordingly, there is no written support for claims to an arrangement of electrodes within a tubular housing which does not include this limitation.

As to phrases 4, 5, 9, 10, 11 and 12 (Brief, pages 30-42), there is no description of these limitations anywhere within the '495 patent specification and Figures 7A and 7B do not clearly show the features claimed. Furthermore, as to appellant's argument "[a]lthough there is an obvious error in Figure 7B, where reference numeral 6 should be reference numeral 4, it is clear that the inventor had possession of the concept of 'first and second conductors coupled to the first and second electrodes'" (Brief, page 43), it is not at all clear that reference number 6 should really be reference number 4. The specification teaches that reference number 4 in Figures 7A and 7B refers to “stabilizing hardware" (column 9, lines 12 and 15). Reference numeral 6 is taught as showing “the active area”. The depiction of reference numeral 6 in Figure 7B shows no resemblance to the "stabilizing hardware" of reference numeral 4 in Figure 7A.

Appellant argues

> none of the language cited in the '340 FOA dtd 6/5/2017 is present in any of claims 16, 21, 23-28, 30-36, 38-40, 43, 46-52, 54-61, or 63-69. Accordingly, Applicant respectfully requests withdrawal of the rejection of these claims under pre-AIA U.S.C. 112, first paragraph, written description. (Brief, page 43)

Each of claims 16, 21, 23-28, 30-36, 38-40, 43, 46-52, 54-61, or 63-69 depends from a claim containing either the unsupported or equivalent language. For example, claims 16 and 23-26 depend from claim 13. Claim 13 contains the unsupported limitation “each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing”. Claims 28 and 30-36 depend from claim 27. Claims 27 contains the unsupported limitation “the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that is parallel to the longitudinal axis”; “the water flow area is greater than an area at the cross-section equal to the total area between electrodes of opposite polarity"; and "at least a portion of the outside electrode positioned in the chamber is closer to the inward-facing surface of the oxygenation chamber than said distance separating the inside electrode from the outside electrode”. Claims 38-40, 43 and 46-49 depend from claim 37. Claim 37 contains the unsupported limitation “a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing". Claims 51, 52 and 54-61 depend from claim 50. Claim 50 contains the unsupported limitation “each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a midpoint of the tubular housing". Claims 63-69 depend from claim 62. Claim 62 contains the unsupported limitation "The electrodes being positioned away from the center axis and maintaining a longitudinal, unobstructed passageway parallel to and including the center axis that runs for at least the length of one of the electrodes positioned in the chamber, the unobstructed passageway having a uniform cross-sectional area along that length."

Appellant argues

> [b]y providing ranges, the specification allows the critical distance to be a distance that is within those ranges, but does not state that all distances within those ranges are always a critical distance. The actual critical distance may be different for different applications. That is, just because a distance is within a stated range does not necessarily mean that the distance is a "critical distance". The distance is a critical distance if evolved oxygen forms microbubbles and nanobubbles. Accordingly, a distance with a stated range may not form microbubbles or nanobubbles in a given application. (Brief, page 45).

Appellant’s argument lacks merit.

The ‘495 patent specification defines “critical distance” as the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles (column 4, lines 1-3). The ‘495 patent specification teaches that this distance is 0.005 to 0.140 inches: “[i]n order to form microbubbles and nanobubbles, the anode and cathode are separated by a critical distance. The critical distance ranges from 0.005 to 0.140 inches” (column 3, lines 11-13). Accordingly, the term “critical distance” defines a range of from 0.005 to 0.140 inches. As each of the claims from which claims 23, 26, 36, 46 and 49 depend are already limited to the critical distance, the recitation in claims 23, 26, 36, 46 and 49 to forming microbubbles or nanobubbles is not a further limitation to these claims. In like manner, the recitation in dependent claims 58, 61 and 69 that the emitter is "operable" to create microbubbles or nanobubbles is not a further limitation to the claims.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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Central Reexamination Unit 3991

Conferees:

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/Stephen J. Stein/
Supervisory Patent Reexamination Specialist
Central Reexamination Unit 3991

Requirement to pay appeal forwarding fee. In order to avoid dismissal of the instant appeal in any application or ex parte reexamination proceeding, 37 CFR 41.45 requires payment of an appeal forwarding fee within the time permitted by 37 CFR 41.45(a), unless appellant had timely paid the fee for filing a brief required by 37 CFR 41.20(b) in effect on March 18, 2013.

Index of Claims	Application/Control No. 14601340	Applicant(s)/Patent Under Reexamination SENKIW, JAMES ANDREW
	Examiner JERRY D JOHNSON	Art Unit 3991

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	05/06/2015	10/21/2015	09/19/2016	05/30/2017	02/06/2018				
	1	-	-	-	-	-				
	2	-	-	-	-	-				
	3	-	-	-	-	-				
	4	-	-	-	-	-				
	5	-	-	-	-	-				
	6	-	-	-	-	-				
	7	-	-	-	-	-				
	8	-	-	-	-	-				
	9	-	-	-	-	-				
	10	-	-	-	-	-				
	11	-	-	-	-	-				
	12	-	-	-	-	-				
	13	✓	✓	✓	✓	A				
	14	✓	✓	✓	✓	A				
	15	✓	✓	✓	✓	A				
	16	✓	✓	✓	✓	A				
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	23	✓	✓	✓	✓	A				
	24	✓	✓	✓	✓	A				
	25	✓	✓	✓	✓	A				
	26	✓	✓	✓	✓	A				
	27	✓	✓	✓	✓	A				
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	34	✓	✓	✓	✓	A				
	35	✓	✓	✓	✓	A				
	36	✓	✓	✓	✓	A				

Index of Claims	Application/Control No. 14601340	Applicant(s)/Patent Under Reexamination SENKIW, JAMES ANDREW
	Examiner JERRY D JOHNSON	Art Unit 3991

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	05/06/2015	10/21/2015	09/19/2016	05/30/2017	02/06/2018				
	37	✓	✓	✓	✓	A				
	38	✓	✓	✓	✓	A				
	39	✓	✓	✓	✓	A				
	40	✓	✓	✓	✓	A				
	41	✓	✓	✓	✓	A				
	42	✓	✓	✓	✓	A				
	43	✓	✓	✓	✓	A				
	44	✓	✓	✓	✓	A				
	45	✓	✓	✓	✓	A				
	46	✓	✓	✓	✓	A				
	47	✓	✓	✓	✓	A				
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	68	✓	✓	✓	✓	A				
	69	✓	✓	✓	✓	A				

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/601,340	01/21/2015	James Andrew Senkiw	3406.005US2	1069

38846 7590 02/23/2018
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ART UNIT	PAPER NUMBER
3991	

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02/23/2018	PAPER

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The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
14/601,340	21 January, 2015	SENKIW, JAMES ANDREW	3406.005US2

	EXAMINER	
Carlson, Caspers, Vandenburgh, Lindquist & Schuman 225 South 6th Street Suite 4200 Minneapolis, MN 55402	JERRY D. JOHNSON	
	ART UNIT	PAPER
	3991	20180216

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Commissioner for Patents

The IDS filed 4/27/15 has been considered.

/Jean C. Witz/ Supervisory Patent Reexamination Specialist CRU 3991	/Jerry D. Johnson/ Patent Reexamination Specialist Central Reexamination Unit 3991

PTO-90C (Rev.04-03)

Substitute for form 1449A/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** (Use as many sheets as necessary)	*Complete if Known*	
	Application Number	14/601,340
	Filing Date	January 21, 2015
	First Named Inventor	James Andrew Senkiw
	Group Art Unit	1797
	Examiner Name	Unknown
Sheet 1 of 4	Attorney Docket No: 3406.005US2	

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EXAMINER /JERRY D JOHNSON/ DATE CONSIDERED 02/16/2018

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Substitute for form 1449A/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** (Use as many sheets as necessary)	*Complete if Known*	
	Application Number	14/601,340
	Filing Date	January 21, 2015
	First Named Inventor	James Andrew Senkiw
	Group Art Unit	1797
	Examiner Name	Unknown
Sheet 2 of 4	Attorney Docket No: 3406.005US2	

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Sheet 3 of 4	Attorney Docket No: 3406.005US2	

FOREIGN PATENT DOCUMENTS

Examiner Initial *	Foreign Document Number	Publication Date	Name of Patentee or Applicant of cited Document	T 1
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Examiner Initial *	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T 1
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EXAMINER	/JERRY D JOHNSON/	DATE CONSIDERED	02/16/2018

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	Group Art Unit	1797
	Examiner Name	Unknown
Sheet 4 of 4	Attorney Docket No: 3406.005US2	

OTHER DOCUMENTS – NON PATENT LITERATURE DOCUMENTS		
Examiner Initial *	**Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.**	**T 1**
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

Appellant	Oxygenator Water Technologies, Inc.	**Reply Brief**
Serial No.	14/601,340	
Filing Date	01/21/2015	
Group Art Unit	3991	
Examiner	Johnson, Jerry D.	
Attorney Docket No.	3406.005US2	
Title: FLOW-THROUGH OXYGENATOR		

In response to the Examiner's Answer mailed on February 13, 2018, please consider the following:

Remarks, beginning on page 2 of this paper.

REMARKS

The Examiner's Answer maintained all rejections from the Final Office Action. There are four categories of rejections: (1) Reissue Oath, (2) Recapture, (3) §112, 1st paragraph, and (4) §112, 4th paragraph. With this Reply Brief, Appellant addresses each of the arguments and rejections in the Examiner's Answer.

Important Facts to Remember

This is a reissue of the '495 patent, entitled "FLOW-THROUGH OXYGENATOR." In the original '495 patent, a broad spectrum of claims were pursued and eventually issued, including:

a) '495 claim 1: a claim that expressly recites "**a flow-through** oxygenator comprising **an emitter**", "placing the emitter **within a conduit**", and "passing waste water **through the conduit"**; and

b) '495 claim 9: a claim depending from apparatus claim 2 that, with respect to the emitter of claim 2, recites **"a vessel containing the emitter"** and **"passing"** water **"through"** that vessel containing the emitter.

In light of these original claims of the '495 patent, it cannot be said that Applicant constructively elected by original presentation, only claims that do not include a "within a conduit" limitation.

Further, the '495 examiner did not make any restriction requirement, nor did he repeat or refer to any restriction requirement, nor did he suggest in any way that claims that refer to an emitter being "within a conduit" could not be prosecuted in the '495 patent. The opposite happened. The '495 patent claims not only included claims with this limitation (see above) but also were issued a double patenting rejection based on the claims in the '441 parent patent (which included oxygen emitter claims wherein the emitter is positioned "within a conduit"). Notably, even the examiner in the '441 patent prosecution issued a double patenting rejection for the '441 patent claims (having the "within a conduit" limitation) based on the parent '262 patent claims (**not** having the "within the conduit" limitation). See Appeal Brief at pp. 18-

19, n. 2. To overcome these double patenting rejections, Applicant filed terminal disclaimers in both prosecutions.

These are the facts, and they are dispositive of the Oath rejection on appeal.[1]

The net effect of the current rejection is that the current examiner is saying that he would have handled the '495 patent prosecution differently, i.e., he would not have issued a double patenting rejection based on the claims in the '441 parent patent (which included oxygen emitter claims wherein the emitter is positioned "within a conduit"). Instead, the present reissue examiner would have made a distinction between claims that required the emitter to be positioned "within a conduct" and claims that did not. But reissue examiners cannot base their rejections on restriction requirements that never occurred, even if they would have made such restriction requirements had they been handling the original prosecution.

In a broadening reissue of original patent, the reissue examiner is not allowed insert new prosecution facts to comport with how he would have handled prosecution of the original patent. Instead, the prosecution facts are set, and the broadening reissues are guided by clear rules: (1) the two year rule, (2) the *Orita* doctrine, and (3) recapture. Under those rules, applicant is clearly entitled to pursue the pending claim set. Applicant filed within two years, and there is no bar to the current claim under *Orita* doctrine or recapture.

<u>Reissue Oath & The '441 Patent</u>

1. The Two Year Rule

There can be no dispute that the present reissue application satisfies the 2-year rule for filing a broadening reissue. A broadening reissue application was filed within 2 years of the issuance of the '495 patent. The present application claims priority back to that broadening reissue.

That the Examiner's Answer continues to insist that the 2-year rule has been violated (see Answer at p. 20, line 6 – p.23 and p. 25, line – p. 26, line 2) shows that the examiner is mistakenly treating this as a reissue of the '441 patent, not the '495 patent.

[1] Additional reasons are provided below and in the Applicant's Appeal Brief, but understanding even only these facts should dispose of the oath rejection.

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Tennant Company v. OWT
IPR2021-00625

The examiner is ignoring the fact that prosecution did not end with the '441 patent. A continuing application was filed (which issued as the '495 patent) that included claims much broader than the '441 patent and that did not include the "triangle" limitation. The Applicant cannot be said to have surrendered all claims that do not include the "triangle" limitation.

The examiner's attempt to invoke the public's right to rely on the scope of the '441 patent claims once two years elapses from its issuance, does not support the examiner's rejection. The public was on notice that a continuing application had been filed and that in that application, the Applicant pursued and had been granted claims of broader scope than the '441 patent. The public has no right to rely on the scope of the '441 patent claims, when continuing applications are pursued <u>and granted</u> with broader claims (i.e. that don't include the "triangle" limitation). In addition, the public is on notice that the claims of that continuing patent can be further broadened for up to two years from its issuance. Examiner seems to assume that a broadening reissue on a child patent is always barred, if the parent or grandparent or great-grandparent patent is more than 2 years old. This is not the law.

2. Oath Rejection has no Legal Basis

The Examiner's Answer maintains the rejection to the reissue oath, asserting that the oath is defective because "The claims of the present reissue application are directed to a different invention that is patentably distinct from the claims of the 7,670,495 patent". Applicant disputes that including the phrase "within a conduit" in the pending claims makes them patentably distinct from the original claims of the '495 patent. More fundamentally, however, neither the Answer nor the Final Office Action cite any legal principle stating that claims to an invention patentably distinct from the claims of its original patent cannot be pursued in a reissue application.

In fact, it is well established legal principle that such claims *can* be pursued. MPEP §1412.01 expressly allows such a "new invention" to be pursued, and indicates that the new claims need only be for the same general invention as measured against <u>the specification's disclosure</u>, not the prior claims. Appellant's notified the Examiner of this principle in the Appeal Brief at page 27, lines 1-32. The Examiner's Answer did not state anything in response.

Because claims that are patentably distinct *can be pursued* in a reissue application, and because no argument or legal principle has been provided to the contrary, Appellant respectfully requests reversal of the rejections to claims 13-69 as being based upon a defective reissue declaration under 35 U.S.C. 251.

3. Rejection ignores that the '495 Patent Claims included "within a conduit"

Appellants pointed out that, even under the examiner's flawed legal theory, claims including a "within a conduit" limitation *could* have been included in the '495 patent, because claim 1 of the '495 patent *did* include this language.[2] The Examiner's Answer states that the inclusion of "within a conduit" in claim 1 does not support claims to an apparatus with that language, because claim 1 is a different statutory class (method vs. apparatus).

Claim 1 cannot be ignored just because it falls within a different statutory class. The claims should be considered for what they recite and teach. In this instance, the "within a conduit" limitation was a prominent aspect of method claim 1. The relevant limitation from method claim 1 recites "placing the emitter within a conduit". The "within a conduit" language is critical to this step of the method. In fact, the whole purpose of this step is to recite that the emitter is placed "within a conduit". Ignoring or removing the "within a conduit" language from this step renders the step meaningless. Thus, claim 1 clearly evidences Applicant's intent to include claims relating to an emitter "within a conduit" in the '495 patent.

In addition, the original examiner of the '495 patent did not distinguish between method and apparatus claims when applying double-patenting rejections. For example, the original examiner made a double-patenting rejection of '495 patent claim 1 (a method claim) based on claim 1 of the '262 patent (an apparatus claim), stating, "Claims 1-12 are rejected on the grounds of nanstatutory obviousness-type double patenting as being unpatentable over claims 1-14 of U.S. Patent No. 6,689,262 B2. Although the conflicting claims are not identical, they are not

[2] As pointed out above, claim 9 of the '495 patent also included a similar limitation to "a vessel containing the emitter" and "passing" water "through" that vessel containing the emitter. Also, as pointed out at page 1 of this reply brief, the '495 examiner issued a double patenting rejection based on the claims in the '441 parent patent (which included oxygen emitter claims wherein the emitter is positioned "within a conduit"). Further, even the examiner in the '441 patent prosecution issued a double patenting rejection for the '441 patent claims (having the "within a conduit" limitation) based on the parent '262 patent claims (not having the "within the conduit" limitation). See Appeal Brief at pp. 18-19, n. 2.

patentably distinct from each other because <u>the instant application discloses use in a conduit</u>, but the ['262] patent discloses use in a vessel." 3/27/2009 Notice of Allowance in App. File No. 12/023,431 at p. 2. Similarly, in the same action, the original examiner rejected the apparatus claims in the '495 patent (e.g., claims 2-7) based on the method claims in the '262 patent (e.g., claims 7, 10-12). Therefore, the original examiner not only recognized that the original claims of '495 patent were directed to including an emitter within a conduit, but also made no distinction between method claims and apparatus claims when making the double-patenting rejections.

<u>Recapture</u>

The Recapture Rejection Ignores Step One of the Three-Step Test

The Examiner's Answer maintains the recapture rejection. The Examiner is treating this as a reissue of the '441 patent, and analyzes the claims as though the '495 patent application had never been filed and as if Appellant were simply broadening the '441 patent. But those are not the facts. This is a reissue of the '495 patent (the original patent), and the prosecution facts of the '495 patent establish that applicant can pursue the presently pending claims in a reissue on the '495 patent. In a broadening reissue of an original patent, the reissue examiner is not allowed insert new prosecution facts to comport with how he would have handled prosecution of the original patent. Nor is the reissue examiner allowed to choose or desigate a new original patent for which reissue is sought.

Under a proper recapture analysis, which determines what aspects of the pending claims are broadening by comparison to the '495 patent claims, no improper recapture has occurred. Because the Examiner's Answer does not properly address the three steps (e.g., it skips the first step), the Answer analysis fails to recognize or address that the absence of the "triangle limitation" from the presently sought reissue claims is not a broadening aspect at all. The "triangle limitation" is not being removed from the '495 patent claims, because it was never present in the '495 patents claims to start with. Thus, the rejection's recapture analysis is fundamentally flawed.

Certainly, under the second step of the recapture analysis, parent cases can be examined to determine whether any broadening change proposed by the new claims relates to language that had been added in any prior prosecution in such a way as to surrender that subject matter. But here, the language the Answer is relying on (the "triangle limitation") is not a broadening change, because the language *was never in the '495 patent claims* at all.

Appellants presented this argument in detail in the Appeal Brief at pp. 50-53. The Examiner's Answer did not counter Appellant's argument on the three step test. Because the current claims do not violate the three step test for recapture, and because no argument has been presented to the contrary, Appellant respectfully requests reversal of the rejections to claims 13-69 as being an improper recapture of broadened claimed subject matter.

35 U.S.C. §112, 1st Paragraph

The Examiner's Answer maintains the written description rejections with nearly identical reasoning as provided in the Final Office Action. The only difference in the rejection portion of the Examiner's Answer is the addition of a cite to *Hockerson-Halberstadt Inc. v. Avia Group Intl Inc.* along with an assertion that precise proportions of the drawings may not be relied upon to show size when the specification is silent on the issue. Appellant agrees. Appellant is not relying on the precise proportions of the drawing. Appellant repeatedly states and shows (in its Appeal Brief and in supporting declaration evidence) that its positions do *not* rely on the scale of the drawings. Instead, they rely on mathematics and the corresponding text describing the drawings.

Appellant also specifically highlights the declaration from Dr. Strykowski addressing many aspects of language in the §112, 1st paragraph rejections, discussed in the Appeal Brief, but ignored by the Examiner's Answer. Dr. Strykowski explains that one of skill in the art would have understood the inventor to be in possession of each claimed feature at the time the application was filed. Dr. Strykowski further explains why these conclusions do not rely on the scale of the figures, but instead are driven by mathematics and geometry. The Examiner's Answer appears to ignore this evidence. Appellant respectfully requests that full weight be provided to the declaration from Dr. Strykowski when considering the §112, 1st paragraph rejections.

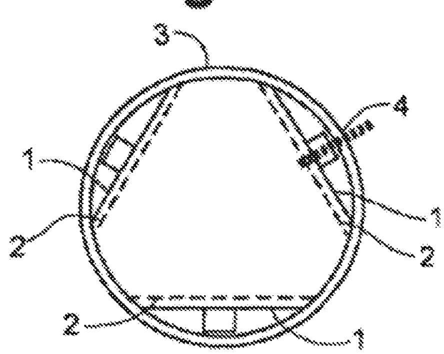
Response to Argument – page 30, lines 9-25

In this passage the Examiner's Answer states "nowhere does the '495 patent describe Figure 7A as depicting "an equilateral triangle centered on a round tube with its corners located outside the tube". The Examiner's Answer then goes on to discuss some of the language used to describe Figure 7A and concludes that Figure 7A shows a single embodiment having three pairs of electrodes arranged in an equilateral triangle. The Examiner's Answer then states "it is disingenuous for appellant to point to the characteristics of an equilateral triangle as inherently supporting claims which do not require the electrode to be arranged in an equilateral triangle". The Examiner's Answer also adds "[f]urthermore, it is clear that the upper left electrode depicted as a solid line in Figure 7A is shorter than the other two solid lines shown. Therefore, the triangle of Figure 7A is not centered within the tube."

Appellant respectfully asserts that there is nothing disingenuous at all about Appellant's position. Appellant is merely describing characteristics of the disclosed equilateral triangle and claiming those characteristics. The fact that Appellant's claims are not limited to an equilateral triangle is not dispositive. The correct inquiry for written description is not which features of an embodiment have been claimed. The correct inquiry is whether one skilled in the art can reasonably conclude that the inventor had *possession* of the claimed invention based on the specification. Applicant respectfully asserts that one skilled in the art would reasonably conclude that the inventor had possession of the rejected claim language based on the specification.

For example, the Examiner's Answer asserts that the application does not disclose the triangle of Figure 7A centered within the tube, because one of the solid-line electrodes (1) in Figure 7A is apparently shorter than the other two. Figure 7A is reproduced below for reference.

Fig. 7A



Interestingly, the Examiner's Answer is apparently relying on the minutest measurement and scale and precise proportions from the drawings in order to make this assertion. Relying on the scale and precise proportions is not proper, and *is the very thing it is accusing the Appellant of doing*. In any case, Appellant disagrees and believes that one skilled in the art would reasonably conclude from Figure 7A and its description that the triangle *is* centered within the tube. Not only does the triangle look centered within FIG. 7A, but the description discloses that the electrodes can all be the same size. For example, Table III in column 9 of the '495 patent discloses that the active electrode area of an example 2-plate tube is 20 square inches and the active electrode area of a 3-plate tube is 30 square inches. This indicates that each plate in this example has a common electrode area of 10 square inches. That is, it indicates that each plate is the same size. Being of the same size, at the same 120 degree angle, and pulled against the inside surface of the tube as shown in the figure, necessarily results in the electrode triangle being centered relative to the tube.

Whether the electrodes are the exact same size or are centered within the tube, however, is not the ultimate inquiry. The question to answer is whether the disclosure indicates possession of *the claim language*. In this instance, the claim language does not recite that a triangle be centered or that the electrodes be the same size. The relevant rejected language only relates to positioning the electrodes inside the housing so that the electrodes are arranged toward the outside, away from the centerpoint of the housing. Thus, even if one were to conclude that the electrodes of Figure 7A are not exactly the same size and the triangle is not perfectly centered within the tube, the electrodes are certainly arranged toward the outside, away from the centerpoint. The specific language of each relevant claim is recited below:

Phrase 1. "each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing"

Phrase 2. "the electrodes are positioned away from a longitudinal center axis of the tubular housing"

Phrase 3. "each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing"

The Examiner's Answer did not point to any other error in Appellant's arguments in the Appeal brief or in Dr. Strykowiski's declaration with respect to phrases 1, 2, and 3. Accordingly, since the purported issues raised by the Examiner's Answer do not refute that the inventor had possession of the relevant claim language, Appellant respectfully requests reversal of the rejection regarding phrases 1, 2, and 3 recited in the Appeal Brief.

Response to Argument – page 31, lines 7-15

In this passage the Examiner's Answer asserts that there is no written support for claim 13 because it claims an arrangement of electrodes with a tubular housing but does not recite the "triangle limitation". Applicants respectfully addressed this assertion in the Appeal Brief at page 33, line 12 – page 35, line 4. In summary, one of skill in the art would reasonably conclude that the electrodes need not be arranged at a 120° angle with respect to one another based on the specification language indicating that other flow-through embodiments do not need three anodes and cathodes or a 120° angle relationship, and based on the disclosure of a specific example of such another embodiment ("the 'T' model). Accordingly, Appellant respectfully requests reversal of this rejection to claim 13.

Response to Argument – page 31, lines 16-18

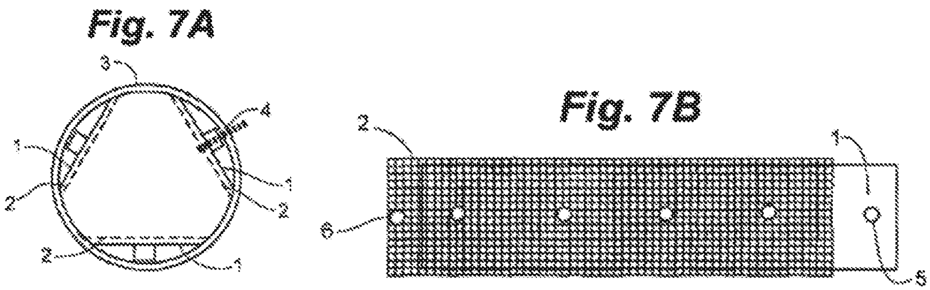
In this passage the Examiner's Answer asserts that:

> As to phrases 4, 5, 9, 10, 11, and 12 (Brief, pages 30-42), there is no description of these limitations anywhere within the '495 patent specification and Figures 7A and 7B do not clearly show the features claimed.

The Answer, however, does not provide any reasoning to support this assertion and does not challenge any of Appellant's arguments showing possession of such language. Accordingly, Appellant respectfully requests reversal of the rejections to phrases 4, 5, 9, 10, 11, and 12 based on the reasons provided in the Appeal Brief at pages 30-42.

Response to Argument – page 31, line 18 – page 32, line 3

In this passage the Examiner's Answer disagrees with Appellant's assertion that there is an obvious error in Figure 7B in that reference numeral 6 should be reference numeral 4. The only reasoning the Answer provides to support its position is that "the depiction of reference number 6 in Figure 7B shows no resemblance to the "stabilizing hardware" of reference number 4 in Figure 7A. Figures 7A and 7B are reproduced below.



Appellant asserts that one skilled in the art would clearly recognize the round circles in Figure 7B as akin to the "stabilizing hardware" of Figure 4, as the drawing in Figure 7B is a view looking down the length of the stabilizing hardware 4 of Figure 7A. Further evidence is provided by the text. The description of Figure 7B identified "stabilizing hardware 4" and "stabilizing hardware 5". Since, a) there is no reference numeral 4 in Figure 7B, but the text clearly indicates there are two stabilizing hardware reference numerals in Figure 7B, b) "stabilizing hardware 5" is a round circle identical to, and in line with, the circle of reference numeral 6, and c) both the circle identified by reference numeral 5 and the circle identified by reference numeral 6 match the depiction of the stabilizing hardware 4 of Figure 7A.

In any case, the ultimate inquiry here is whether the disclosure indicates possession of the below phrases which relate to conductors of the emitter.

Phrase 12. "first and second conductors coupled to the first and second electrodes"

Phrase 13. "first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing"

Appellant respectfully asserts that one of skill in the art would conclude that the disclosure does indicate possession of the conductor concepts for the reasons provided in the Appeal Brief at page 42, line 7 – page 43, line 8. Accordingly, Appellant respectfully requests reversal of the rejections to phrases 12 and 13 under §112, 1st paragraph.

Response to Argument – page 32, line 4 – page 33, line 7

In this passage the Examiner's Answer responds to Appellant's notification that none of the language rejected under §112, 1st paragraph was present in claims 16, 21, 23-28, 30-36, 38-40, 43, 46-52, 54-61, or 63-69. This passage of the Examiner's Answer responded by indicating that claims 16, 21, 23-26, 38-40, 43, 46-49, and 63-69 depend from independent claims rejected under §112, 1st paragraph. Based on this, Appellant respectfully requests withdrawal of the rejections to claims 16, 21, 23-26, 38-40, 43, 46-49, and 63-69 for the reasons provided herein and in the Appeal Brief with respect to their independent claims 13, 37, and 62.

The remaining claims 27, 28, 30-36, 50-52, and 54-61 are, or depend from, independent claim 27 or independent claim 50. Neither of these independent claims contain any of the language that was listed in the §112, 1st paragraph rejection of the Final Office Action or the §112, 1st paragraph rejection of the Examiner's Answer.

The Response to Argument passage of the Examiner's Answer attempts to remedy this by listing one or more new phrases from each of claim 27 and 50 as well as claim 62. Since these new phrases were not previously rejected, Appellant asserts that listing and relying on these new phrases to reject claims 27, 50, and 62 is a "New Ground of Rejection". The Examiner's Answer does not include this under a separate heading of "New Grounds for Rejection" as is required, and does not indicate that the required approval of the director or designee was obtained. Instead, the Examiner's Answer attempts to sneak these New Grounds in, to remedy the lack of rejection for claims 27 and 50 in the Final Office Action.

In any case, the Examiner's Answer lists the phrases and then baldly alleges that the phrases are "unsupported". No reasoning is provided to explain why or how the newly listed phrases are unsupported. Hiding new rejections that are inserted for the first time in the Examiner's Answer and then providing no reasoning behind the rejections is insufficient.

Appellant, in section IV of the Appeal Brief, has already identified where support for the claim language can be found in the specification. Appellant included a chart identifying by column number, line, figure, and reference no, where support for *every* portion of *every* claim is. For example, the first new phrase listed in the Examiner's Answer is "the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that is parallel to the longitudinal axis" from claim 27. The chart on page 6 of the Appeal Brief lists col. 3, lines 25-30, column 9, lines 7-18, and FIGS. 7A and 7B as locations which support this phrase. This feature can be easily understood from FIG. 7B which is a "longitudinal section" showing the longitudinal length of the electrodes. The Examiner's Answer does not address any of this when it simply states the phrase is "unsupported". The portion of the chart from section IV of the Appeal Brief indicating support for the other portions of claims 27, along with claims 50 and 62 is copied below for reference. The Examiner's Answer does not address any of these in its conclusion that the new phrases are unsupported.

Claim 27	
at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that is parallel to the longitudinal axis	3:25-30 FIG. 7A – No. 1, 2 FIG. 7B – No. 1, 2 9:7-18
the position and size of each electrode within the chamber defines a cross-section of the chamber that has a water flow area within the oxygenation chamber through which water may flow without passing between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches, wherein the water flow area is greater than an area at the cross-section equal to the total area between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches	FIG. 7A 9:5-33 3:23-30 3:11-14
a portion of the outside electrode positioned in the chamber is closer to the inward-facing surface of the oxygenation chamber than said distance separating the inside electrode from the outside electrode	FIG. 7A 3:25-28

Claim 50	
each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a midpoint of the tubular housing and so that at least some water may flow through an unobstructed passageway from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches	FIGS. 7A-7B 9:7-11 3:23-30 3:11-14

Claim 62	
the electrodes being positioned away from the center axis and maintaining a longitudinal, unobstructed passageway parallel to and including the center axis that runs for at least the length of one of the electrodes positioned within the chamber, the unobstructed passageway having a uniform cross-sectional area along that length	FIG. 7A FIG. 7B 9:7-18

For these reasons, Appellant requests reversal of the rejection to claims 27, 50, and their dependents 28, 30-36, 51, 52, and 54-61 under §112, 1st paragraph.

35 U.S.C. §112, 4th Paragraph

The Examiner's Answer maintains the improper dependent rejections with identical reasoning in the rejection section as provided in the Final Office Action.

In the Response to Arguments section of the Examiner's Answer at page 33, line 8 – page 34, line 4, the Examiner's Answer asserts that the term 'critical distance', "defines a range of from 0.005 to 0.140 inches." The Examiner's Answer bases this assertion on the language in the specification that states "[t]he critical distance ranges from 0.005 inches to 0.140." '495 patent at col. 3, lines 12-13. The examiner has not responded to the points made in Appellant's Appeal Brief. As stated in our Appeal Brief, this merely provides a range within which the critical distance may fall for any given application. That is, the critical distance can be somewhere within that range. The range itself is not defined as the critical distance. In fact, the critical distance is expressly defined in the specification and is not equated to that numerical range, but rather is defined based on the formation of nanobubbles and microbubbles. See column 4:1-3.

As further evidence, the specification also states: "[t]he preferred critical distance is from 0.045 to 0.060 inches." '495 patent at col. 3, lines 13-14. Thus, the specification provides another, alternative, range in which the critical distance can lie. The critical distance cannot be defined as the range from 0.005 to 0.140 inches, if the specification also states that the critical distance can range from 0.045 to 0.060 inches. Thus, defining the critical distance as the range from 0.005 to 0.140 inches is contrary to that taught by the specification.

For these reasons and the reasons provided in the Appeal Brief, Appellant requests reversal of the rejection to claims 23, 26, 36, 46, 58, 61, and 69 under §112, 4th Paragraph.

Conclusion

Appellant respectfully requests reversal of the rejections of the claims under appeal.

Respectfully submitted,
CARLSON, CASPERS, VANDENBURGH, LINQUIST & SCHUMAN, P.A.
Suite 4200
225 S. Sixth Street
Minneapolis, MN 55402
(612) 436-9617

Date: February 26, 2018

By: /Philip Caspers/
Philip P. Caspers
Reg. No. 33,227

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

CONTINUATION REISSUE APPLICATION

Appellant	Oxygenator Water Technologies, Inc.	**REQUEST FOR ORAL HEARING**
Serial No.	14/601,340	
Filing Date	January 21, 2015	
Continuation Reissue of U.S. Patent No.	7,670,495	
Issued:	March 2, 2010	
Examiner Name	Jerry D. Johnson	
Group Art Unit	3991	
Attorney Docket No.	3406.005US2	
Customer Number:	38846	
Confirmation No.	1069	
Title:	FLOW-THROUGH OXYGENATOR	

Mail Stop Appeal
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

With this paper, Appellant hereby requests an oral hearing in the appeal of the above referenced application. The fee of $650 for a small entity request of oral hearing is also submitted herewith. Appellant authorizes the USPTO to charge any additional fee necessary for this Appeal to proceed or for set-up of an oral hearing to Deposit Account No. 502880.

Please contact the undersigned at the phone number below if anything further is needed to set-up an oral hearing.

Respectfully submitted,

CARLSON, CASPERS, VANDENBURGH,
LINDQUIST & SCHUMAN, P.A.
225 South Sixth Street, Suite 4200
Minneapolis, MN 55402
(612) 436-9609

Date February 26, 2018

By /Aaron W. Pederson/
Aaron W. Pederson
Reg. No. 58,607

Electronic Patent Application Fee Transmittal

Application Number:	14601340
Filing Date:	21-Jan-2015
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Filer:	Aaron Wesley Pederson
Attorney Docket Number:	3406.005US2

Filed as Small Entity

Filing Fees for **Utility under 35 USC 111(a)**

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
REQUEST FOR ORAL HEARING	2403	1	650	650
APPEAL FORWARDING FEE	2413	1	1120	1120

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
	Total in USD ($)			1770

Electronic Acknowledgement Receipt	
EFS ID:	31890597
Application Number:	14601340
International Application Number:	
Confirmation Number:	1069
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Customer Number:	38846
Filer:	Aaron Wesley Pederson
Filer Authorized By:	
Attorney Docket Number:	3406.005US2
Receipt Date:	26-FEB-2018
Filing Date:	21-JAN-2015
Time Stamp:	16:55:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1770
RAM confirmation Number	022718INTEFSW00004356502880
Deposit Account	502880
Authorized User	Aaron Pederson

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reply Brief Filed	Reply_Brief-FINAL_SIGNED.pdf	625583 0fb54c906983a19429e31a5044a7e539e2b8a1c6	no	15
Warnings:					
Information:					
2	Request for Oral Hearing	App_No_14601340_Req_Oral_Hearing_SIGNED.pdf	94874 e9e6c70c278ede7fccd09fad4fa7c2b41156590e	no	1
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	31430 3da4c0c91abf44fabefeddeb157f2ea89e462406	no	2
Warnings:					
Information:					
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United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/601,340	01/21/2015	James Andrew Senkiw	3406.005US2	1069

38846 7590 03/01/2018
Carlson, Caspers, Vandenburgh, Lindquist &
Schuman
225 South 6th Street
Suite 4200
Minneapolis, MN 55402

EXAMINER	
JOHNSON, JERRY D	

ART UNIT	PAPER NUMBER
3991	

MAIL DATE	DELIVERY MODE
03/01/2018	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

United States Patent and Trademark Office

Under Secretary of Commerce for Intellectual Property and
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CARLSON, CASPERS, VANDENBURGH, LINDQUIST &
SCHUMAN
225 SOUTH 6TH STREET
SUITE 4200
MINNEAPOLIS, MN 55402

Appeal No: 2018-003835
Application: 14/601,340
Appellant: James Andrew Senkiw et al.

Patent Trial and Appeal Board Docketing Notice

Application 14/601,340 was received from the Technology Center at the Board on March 01, 2018 and has been assigned Appeal No: 2018-003835.

In all future communications regarding this appeal, please include both the application number and the appeal number.

The mailing address for the Board is:

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ALEXANDRIA, VIRGINIA 22313-1450

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By order of the Patent Trial and Appeal Board.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/601,340	01/21/2015	James Andrew Senkiw	3406.005US2	1069

38846 7590 04/24/2019
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EXAMINER	
JOHNSON, JERRY D	

ART UNIT	PAPER NUMBER
3991	

MAIL DATE	DELIVERY MODE
04/24/2019	PAPER

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CARLSON CASPERS
VANDENBURGH & LINDQUIST,
PA
225 SOUTH 6TH STREET
SUITE 4200
MINNEAPOLIS, MN 55402

Appeal No:	2018-003835
Appellant:	James Andrew Senkiw, et al.
Application No:	14/601,340
Hearing Room:	A
Hearing Docket:	A
Hearing Date:	Monday, June 03, 2019
Hearing Time:	10:00 AM
Location:	**Madison Building - East Wing** **600 Dulany Street, 9th Floor** **Alexandria, Virginia 22313-1450**

NOTICE OF HEARING - ALEXANDRIA, VIRGINIA
RESPONSE REQUIRED WITHIN 21 DAYS

Your attention is directed to 37 CFR § 41.47. The above identified appeal will be heard by the Patent Trial and Appeal Board on the date indicated. Hearings will commence at the time set, and as soon as the argument in one appeal is concluded, the succeeding appeal will be taken up. **The time allowed for argument is 20 minutes** unless additional time is requested and approved before the argument commences. **If the application involved in this appeal has been published, the hearing will be open to the public.**

CONFIRMATION OF ATTENDANCE OR WAIVER OF THE HEARING IS REQUIRED WITHIN **21 DAYS** OF THE MAILING DATE OF THIS NOTICE. Failure to respond may subject Appellant(s) to waiver of the oral hearing. If Appellant is no longer interested in having an oral hearing, Appellant must still file a waiver of oral hearing with the Board. This allows the panel to promptly act on the appeal without waiting for the oral hearing date.

Confirmation or waiver of the hearing should be indicated by completing the form below and returning it to the Board. This form may be filed with the Board by any one of the following three alternative methods:

1. Via the USPTO Electronic Filing System (EFS) at http://www.uspto.gov/patents/process/file/efs/
2. ***PREFERRED***: Facsimile transmitted to: The USPTO Central fax number (official copy): **(571) 273-8300** ***and*** the PTAB Hearing fax number (courtesy copy): **(571) 273-9797.**
3. By mail at the PTAB mailing address: Patent Trial and Appeal Board
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To aid the judges in determining whether any conflicts exist that may require a recusal, please list in the 'Comments' section the names of any additional person(s) who will be participating in the oral hearing. (Upon arrival at the **Madison East Building, 9th floor**, all persons presenting arguments must sign in at the Usher's desk.)

Comments/Special Requests:
____

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____ ____________________
Typed or Printed Name of Attorney/Agent/Appellant Registration No.

____ ____________________
Signature of Attorney/Agent/Appellant Date

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MINNEAPOLIS, MN 55402

Appeal No:	2018-003835
Appellant:	James Andrew Senkiw, et al.
Application No:	14/601,340
Hearing Room:	A
Hearing Docket:	A
Hearing Date:	Monday, June 03, 2019
Hearing Time:	10:00 AM
Location:	**Madison Building - East Wing** **600 Dulany Street, 9th Floor** **Alexandria, Virginia 22313-1450**

NOTICE OF HEARING - ALEXANDRIA, VIRGINIA
RESPONSE REQUIRED WITHIN 21 DAYS

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CONFIRMATION OF ATTENDANCE OR WAIVER OF THE HEARING IS REQUIRED WITHIN **21 DAYS** OF THE MAILING DATE OF THIS NOTICE. Failure to respond may subject Appellant(s) to waiver of the oral hearing. If Appellant is no longer interested in having an oral hearing, Appellant must still file a waiver of oral hearing with the Board. This allows the panel to promptly act on the appeal without waiting for the oral hearing date.

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3. By mail at the PTAB mailing address: Patent Trial and Appeal Board
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   P.O. BOX 1450
   Alexandria, Virginia 22313-1450

In all communications relating to this appeal, please identify the appeal by its number.

PAGE 1/2 * RCVD AT 5/15/2019 2:55:29 PM [Eastern Daylight Time] * SVR:W-PTOFAX-001/19 * DNIS:2738300 * CSID: * ANI:6124369600 * DURATION (mm-ss):00-56

OWT Ex. 2119
Tennant Company v. OWT
IPR2021-00625

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( ) I ELECT A VIDEO HEARING - ATTENDANCE CONFIRMED *(EFS-Web selection: Confirmation of Hearing by Appellant)*

( ) I ELECT TO WAIVE HEARING ATTENDANCE *(EFS-Web selection: Waiver of Hearing by Appellant)*

To aid the oral hearings staff in scheduling hearing rooms, please indicate the total number of participating and observing attendees if more than three are expected: 1

To aid the judges in determining whether any conflicts exist that may require a recusal, please list in the 'Comments' section the names of any additional person(s) who will be participating in the oral hearing. (Upon arrival at the **Madison East Building, 9th floor**, all persons presenting arguments must sign in at the Usher's desk.)

Comments/Special Requests:

Aaron Pederson
Typed or Printed Name of Attorney/Agent/Appellant

58,607
Registration No.

Aaron Pederson
Signature of Attorney/Agent/Appellant

May 15, 2019
Date

The 'Hearings' section of the PTAB webpage http://www.uspto.gov/patents-application-process/patent-trial-and-appeal-board/hearings provides additional information about oral hearings.

Please direct other inquiries to the PTAB Hearings Clerk at 571-272-9797.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 138517

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☒ The address associated with the above-mentioned Customer Number

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☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Oxygenator Water Technologies, Inc.

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	Mark A. Rolfes	Date (Optional)	06-05-2019
Name	Mark Rolfes		
Title	President - Oxygenator Water Technologies, Inc.		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

Electronic Acknowledgement Receipt

EFS ID:	36347698
Application Number:	14601340
International Application Number:	
Confirmation Number:	1069
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Customer Number:	38846
Filer:	Aaron Wesley Pederson
Filer Authorized By:	
Attorney Docket Number:	3406.005US2
Receipt Date:	19-JUN-2019
Filing Date:	21-JAN-2015
Time Stamp:	15:16:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	1252_0002RE_POA_Trans.pdf	173288 a280eaee9e75c50883d191214b78464fb35ef4f8	no	1

Warnings:

JA2561

OWT Ex. 2119
Tennant Company v. OWT
IPR2021-00625

Information:					
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Application Number	14/601,340
Filing Date	2015-01-21
First Named Inventor	James Andrew Senkiw
Title	FLOW-THROUGH OXYGENATOR
Art Unit	3991
Examiner Name	Jerry D JOHNSON
Attorney Docket Number	1252.0002RE

SIGNATURE of Applicant or Patent Practitioner

Signature	/Aaron W. Pederson/	Date (Optional)	2019-06-19
Name	Aaron Pederson	Registration Number	58607
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/601,340	01/21/2015	James Andrew Senkiw	3406.005US2

CONFIRMATION NO. 1069

POA ACCEPTANCE LETTER

OC000000109088469

138517
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Date Mailed: 06/21/2019

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/19/2019.

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/yteferra/

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/601,340	01/21/2015	James Andrew Senkiw	3406.005US2

CONFIRMATION NO. 1069

POWER OF ATTORNEY NOTICE

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Date Mailed: 06/21/2019

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/19/2019.

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/yteferra/

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/601,340	01/21/2015	James Andrew Senkiw	3406.005US2	1069

138517 7590 06/25/2019
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EXAMINER	
JOHNSON, JERRY D	

ART UNIT	PAPER NUMBER
3991	

NOTIFICATION DATE	DELIVERY MODE
06/25/2019	ELECTRONIC

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PTOL-90A (Rev. 04/07)

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JAMES ANDREW SENKIW

Appeal 2018-003835
Application 14/601,340
Patent 7,670,495 B2
Technology Center 3900

Before JEFFREY B. ROBERTSON, CYNTHIA L. MURPHY, and JANE E. INGLESE, *Administrative Patent Judges*.

ROBERTSON, *Administrative Patent Judge*.

DECISION ON APPEAL[1]

James Andrew Senkiw[2] (Appellant) seeks our review under 35 U.S.C. § 134 from the Examiner's final rejection of reissue claims 13–69 in reissue application 14/601,340, filed January 21, 2015. (Appeal Br. 4.) The reissue application seeks to reissue U.S. Patent 7,670,495 B2 ("the '495 patent"),

[1] This Decision includes citations to the following documents: Final Office Action dated June 5, 2017 ("Final Act."); Appeal Brief filed November 21, 2017 ("Appeal Br."); Examiner's Answer dated February 13, 2018 ("Ans."); and Reply Brief filed February 26, 2018 ("Reply Br.").

[2] Appellant identifies the Applicant, Oxygenator Water Technologies, Inc. as the real party in interest. (Appeal Br. 1.)

issued March 2, 2010, based on application 12/023,431 filed January 31, 2008. We have jurisdiction pursuant to 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

STATEMENT OF THE CASE

The present reissue application, application 14/601,340 (the '340 Application) was filed on January 21, 2015 as a continuing reissue application of reissue application 13/247,241 (the '241 Application), filed September 28, 2011, seeking to reissue U.S. Patent 7,670,495 B2 (the '495 Patent). The '241 Application issued as RE45, 415 E (the '415 Patent) on March 17, 2015. The '495 Patent, which issued on March 10, 2010 from application 12/023,431, claims priority to application 10/732,326, which issued as U.S. Patent 7,396,441 (the '441 Patent) on July 8, 2008. The '441 Patent claims to be a continuation-in-part of application 10/372,017 filed on February 21, 2003 and issued on February 10, 2004 as US 6,689,262 B2 (the '262 Patent).

We heard oral argument from Appellant's counsel on June 3, 2019, a transcript of which will be entered into the electronic record in due course.

THE INVENTION

Appellant states that the invention relates to electrolytic generation of microbubbles of oxygen for increasing the oxygen content of flowing water. (The '495 patent, 1:15–17.)

Claim 13 is representative and reproduced below from the Claims Appendix to the Appeal Brief:

> 13. An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:
>
> > a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;
> >
> > at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches within the tubular housing;
> >
> > each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing and so that at least some water may flow from the water inlet to the water outlet without
> >
> > passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;
> >
> > a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;
> >
> > the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

(Appeal Br. 54–55 (Claims Appendix).)

The ’340 Application contains four other independent claims, claims 27, 37, 50, and 62, which are also directed to an emitter, and also recite electrodes located within a tubular housing. As a result, we largely limit our discussion to claim 13, and discuss other claims to the extent necessary.

REJECTIONS

The Examiner rejected claims 13–69 as follows:

1. Claims 13–69 as being based upon a defective reissue declaration under 35 U.S.C. § 251;
2. Claims 13–69 under 35 U.S.C. § 251 as being an improper recapture of broadened subject matter surrendered in the application for the patent upon which the present reissue is based;
3. Claims 13–69 under 35 U.S.C. § 112(a) or 35 U.S.C. § 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement; and
4. Claims 23, 26, 36, 46, 49, 58, 61, and 69 under 35 U.S.C. § 112(d) or pre-AIA 35 U.S.C. § 112, 4th paragraph, as being of improper dependent form for failing to further limit the subject matter of the claim upon which it depends.

The Reissue Oath/Declaration Rejection

ISSUE

The Examiner determined that the reissue declaration was defective because the claims of the '340 Application are "directed to a different invention that is patentably distinct from the claims of the ['495 Patent]." (Ans. 4.) In this regard, the Examiner determined that the '495 Patent does not contain claims to an emitter positioned within a tubular housing or conduit, and that in the course of prosecution leading to the '441 Patent (the parent patent to the '495 Patent), Appellant argued that claims to an emitter positioned within a conduit were patentably distinct from the claims to the emitter alone. (Ans. 6.) The Examiner determined that the present continuation reissue cannot be used to broaden the claims of the '495 Patent to include a patentably distinct invention from the '441 Patent. (*Id.*)

Appellant argues that the Examiner is incorrectly treating the '340 Application as a reissue application of the '441 Patent instead of the '495 Patent. (Reply Br. 3.) Appellant contends that prosecution did not end with the '441 Patent, and the '495 Patent, a continuation of the '441 Patent, contains claims that are much broader than the '441 Patent, such that Appellant can seek broadened claims of the '495 Patent within two years of issuance. (Reply Br. 3–4.)

Accordingly, the issue with respect to this rejection is whether the Examiner erred in rejecting claims 13–69 under 35 U.S.C. § 251 as being based on a defective reissue declaration.

DISCUSSION

We are persuaded by Appellant's position that the Examiner errs in rejecting the claims as based upon a defective reissue declaration. (See Reply Br. 3–4.) That is, as acknowledged by the Examiner, the reissue declaration filed on January 21, 2015 in the instant reissue application (the '340 Application) indicated Appellant's intent to seek claims to an emitter as a flow through device having one or more set of electrodes therein at angles other than 120°. (Ans. 23–24; Reissue Declaration filed January 21, 2015, p. 1.) Notably, this reissue declaration was dated September 22, 2011, and originally filed with the '241 Application on September 28, 2011, the first reissue application filed on the '495 Patent. The '241 Application was filed within two years of the issuance of the '495 Patent. Here, we emphasize that the '340 Application is a continuing reissue application of the '241 Application.

The reissue declaration dated September 22, 2011 expressly stated that the reissue application (the '241 Application) was a broadening reissue application, and identified at least one error that "Applicant was entitled to claim but did not claim such aspects of the disclosed invention as the construction of the emitter as a flow through device with one or more sets of electrodes therein and an arrangement of the sets of electrodes that would provide a relative relationship of those sets at angles other than 120°." (Reissue Declaration filed January 21, 2015, p. 1.) The reissue declaration dated September 22, 2011 expressly stated also that "the claims of the parent patents [the '441 Patent and the '262 Patent] do not recite the same subject matter and features set forth in either the original claims of [the '495 Patent] or the subject matter Applicant was entitled to claim but did not claim."

The reissue declarations filed July 6, 2015 and January 26, 2016 in the '340 Application expressed a similar intent to claim features not recited in the '495 Patent or the '441 Patent. (Reissue Declaration filed July 6, 2015, 1–3; Reissue Declaration filed January 26, 2016, 1–9.) Thus, contrary to the Examiner's statements, the public had been put on notice through a continuing application (the '431 Application) resulting in the '495 Patent, a reissue application (the '241 Application) filed within the two year statutory period of issuance of the '495 Patent, and continuing reissue application (the

'340 Application) that Appellant intended to pursue broadened subject matter from the claims issuing in the '441 Patent. *In re Doll*, 419 F.2d 925, 927-28 (CCPA 1970) (holding that the public was sufficiently put on notice of patentee's intention to enlarge the claims by filing a broadening reissue application within two years of issuance of the patent despite additional broadening changes being made throughout the course of prosecution of the reissue application after the two-year period); *see also In re Graff*, 111 F.3d 874, 877 (Fed. Cir. 1997).

As a result, we reverse the Examiner's rejection of claims 13–69 as being based on a defective reissue declaration.

The Recapture Rejection

PRINCIPLES OF LAW

"The recapture rule bars a patentee from recapturing subject matter, through reissue, that the patentee intentionally surrendered during the original prosecution in order to overcome prior art and obtain a valid patent." *In re Youman*, 679 F.3d 1335, 1343 (Fed. Cir. 2012). The determination as to whether reissue claims violate the recapture rule involves a three-step analysis. *Id.*; *see also* Manual of Patent Examining Procedure (MPEP) § 1412.02 (9th ed., Rev. 7, Aug. 2017) (citing *In re Clement*, 131 F.3d 1464, 1468–70 (Fed. Cir. 1997) and *N. Am. Container, Inc. v. Plastipak Packaging, Inc.*, 415 F.3d 1335, 1349 (Fed. Cir. 2005)).

"Under the first step, we determine whether and in what aspect the reissue claims are broader than the patent claims.'" *In re Youman*, 679 F.3d at 1343 (internal quotations omitted). Under the second step, we "determine

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whether the broader aspects of the reissue claims relate to surrendered subject matter." *Id.* (internal quotations omitted). If the reissue claims are broader relative to the patented claims in a manner related to surrendered subject matter, then under the third step, we "determine whether the surrendered subject matter has crept into the reissue claim." *Id.* at 1344 (internal quotations omitted). Violation of the recapture rule under this third step may be avoided if "the [reissue] claims are materially narrowed in a way that avoids substantial or whole recapture of the surrendered subject matter." *Id.* at 1344–1345. The materially narrowing analysis is conducted on a limitation-by-limitation basis and the frame of reference is the original claim—the claim prior to the surrendering amendment or cancelation. *Id.* at 1345, 1346; *see also id.* at 1347 ("[I]f the patentee modifies the added limitation such that it is broader than the patented claim yet still materially narrows relative to the original claim, the recapture rule does not bar reissue."). To avoid violation of the recapture rule, "the narrowing must relate to the subject matter surrendered during the original prosecution." *In re Mostafazadeh*, 643 F.3d 1353, 1359 (Fed. Cir. 2011). "[A] limitation that is added during prosecution to overcome prior art cannot be entirely eliminated on reissue because doing so would constitute recapture of the surrendered subject matter." *Id.*

ISSUE

In conducting the reissue/recapture analysis, the Examiner discussed the differences between claim 2 of the '495 Patent and claim 13 of the '340 Application, and stated that "claim 2 displays little resemblance to claim 13 of the ’340 reissue application” and “claim 13 is directed to a different invention” than claim 2 of the ’495 Patent. (Ans. 22–23.) The Examiner observed that the ’441 Patent was subject to a restriction requirement and determined that because Appellant had argued in the course of prosecuting the ’441 Patent that amendments requiring the emitter to be “within a conduit” rendered such claims patentably distinct from claims to an emitter not within a conduit, that claims directed to an emitter within a conduit (or in the case of the claims on appeal “within a tubular housing”), should have been presented within two years of the issuance of the ’441 Patent. (Ans. 5–10.)

The Examiner determined also that in the course of prosecuting the ’441 Patent, Appellant limited the claims including emitters located within a conduit to those having “three matched sets of anodes and cathodes mounted to stabilizing hardware such that each matched set resides at a 120° angle to the adjacent matched sets” (the “triangle limitation”). (Ans. 15.) The Examiner determined that because the triangle limitation was added in order to overcome prior art including oxygen emitters located within a conduit, a broader scope of the claimed subject matter, i.e., emitters located within a conduit without the triangle limitation, cannot be recaptured by the filing of the ’340 Application. (Ans. 15.)

Appellant contends that the Examiner did not properly analyze the claims, because rather than comparing the claims in the ’340 Application to the claims of the ’495 Patent (the “original patent”), the Examiner compared the claims to the ’441 Patent, and thus ignores the first step of the three-step recapture test. (Appeal Br. 50–53; Reply Br. 6.) In this regard, Appellant contends that omission of the triangle limitation is not a broadening aspect at all because such language was never in the '495 Patent. (Reply Br. 6–7.)

The issue with respect to this rejection is whether the Examiner erred in rejecting claims 13–69 under 35 U.S.C. § 251 as being an improper recapture of broadened claimed subject matter surrendered in the application for the patent upon which the present reissue is based.

DISCUSSION

Claim 2 of the '495 Patent is reproduced below:

> 2. An emitter for electrolytic generation of microbubbles of oxygen in an aqueous medium comprising: an anode separated at a critical distance from a cathode, a nonconductive spacer maintaining the separation of the anode and cathode, the nonconductive spacer having a spacer thickness between 0.005 to 0.050 inches such that the critical distance is less than 0.060 inches and a power source all in electrical communication with each other, wherein the critical distance results in the formation of oxygen bubbles having a bubble diameter less than 0.0006 inches, said oxygen bubbles being incapable of breaking the surface tension of the aqueous medium such that said aqueous medium is supersaturated with oxygen.

The Examiner annotated claim 13 of the '495 Patent to show the differences (additions relative to claim 2 shown as underlined and omissions in brackets) (Ans. 22–23):

> 13. An emitter for electrolytic generation of [microbubbles] <u>bubbles</u> of oxygen in [an aqueous medium] <u>water, the emitter</u> comprising:
>
> <u>a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;</u>
>
> <u>at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the</u>

> second electrode by a distance of between 0.005 inches to 0.140 inches within the tubular housing
>
> each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;
>
> [an anode separated at a critical distance from a cathode, a nonconductive spacer maintaining the separation of the anode and cathode, the nonconductive spacer having a spacer thickness between 0.005 to 0.050 inches such that the critical distance is less than 0.060 inches and] a power source [all] in electrical communication with [each other,] the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;
>
> the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis
>
> [wherein the critical distance results in the formation of oxygen bubbles having a bubble diameter less than 0.0006 inches, said oxygen bubbles being incapable of breaking the surface tension of the aqueous medium such that said aqueous medium is supersaturated with oxygen].

Even if we assume the Examiner's annotated version of claim 13 is sufficient to show that claim 13 has been broadened relative to claim 2 issued in the '495 Patent, we are not persuaded that such a broadening implicates improper recapture of subject matter surrendered during the prosecution of the '441 Patent.

That is, as shown in the Examiner's annotated version of claim 13, the '495 Patent, in issued claim 2, recites an oxygen emitter without the requirement that the emitter be located "within a conduit" or the triangle limitation recited in claim 1 of the '441 Patent. As discussed above, the "within a conduit" limitation corresponds to the "within a tubular housing" limitation recited in representative independent claim 13 of the '340 Application. Thus, Appellant's arguments in the '441 Patent with respect to the patentability of claims drawn to an emitter within a conduit, when taking into account the prosecution history as a whole, do not present a recapture issue.[3]

In this regard, as evidenced by claim 2 of the '495 Patent, Appellant was able to pursue and obtain claims drawn to an emitter without the "within a conduit" or the "triangle" limitations in claim 1 of the '441 Patent. Also, as discussed above, in filing the '241 Application and the '340 Application as reissue applications of the '495 Patent, Appellant continued to pursue

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[3] With respect to the Examiner's position that Appellant's arguments made during prosecution of the '441 Patent in response to an obviousness double patenting rejection over the '262 Patent that the "within the conduit" limitation inserted into the claims rendered the claims patentably distinct from the '262 Patent, we observe that the Examiner in the '441 Patent prosecution did not accept such arguments, and still required a terminal disclaimer to be filed. ('326 Application, Response filed August 17, 2007, p. 6; Final Action November 1, 2007, p. 11–12; Terminal Disclaimer filed February 28, 2007; '441 Patent, 1st page, (*) Notice.) Moreover, we observe that the only rejection made in the course of prosecuting the '495 Patent was an obviousness-type double patenting rejection over the '262 Patent and the '441 Patent, where Appellant also filed Terminal Disclaimers. ('431 Application, Non-Final Action dated March 27, 2009, pp. 2–4; Terminal Disclaimer filed August 20, 2009; '495 Patent, 1st page, (*) Notice.)

emitter claims with the "within a conduit" limitation issued in claim 1 of the '441 Patent, but without the surrender generating "triangle" limitation. (*See* Preliminary Amendment filed in the '241 Application on September 28, 2011, claims 13–29.)

Regarding the restriction requirement in the '441 Patent, we emphasize that the '495 Patent, by virtue of the claims filed and issued therein is more properly considered to be a continuation of the '441 Patent, and not a true divisional of the '441 Patent. That is, in the course of prosecuting the '326 Application, which led to the '441 Patent, the restriction requirement made by the Examiner was between claims drawn to a flow-through oxygenator (Group I), claims drawn to an oxygen supersaturated water product (Group II), claims drawn to a method for enhancing the growth of plants (Group III), and claims drawn to a method for treating waste water (Group IV), where the flow-through oxygenator claims were elected for prosecution. ('326 Application, Non-Final Action dated November 29, 2005, 2–3.)

When the '431 Application leading to the '495 Patent was filed, it was initially filed with one claim drawn to a method for treating wastewater (Group IV). ('431 Application, Claims filed January 31, 2008.) However, claims 2–12, drawn to an emitter (*see* claim 2), a method for oxygenating a non-native habitat (*see* claim 8), a method for lowering the biologic oxygen demand of polluted water (*see* claim 9), and a supersaturated aqueous product (*see* claim 10) were added by preliminary amendment. ('431 Application, Preliminary Amendment filed December 16, 2008.) Thus, the claims in the '431 Application were not limited to one group of claims as set forth in the restriction requirement in the '326 Application, such that the '431 Application leading to the '495 Patent would be considered a continuation application of the '441 Patent, rather than a true divisional of the '441 Patent.

In addition, as Appellant points out, no restriction requirements have been set forth in any of the applications subsequent to the '441 Patent, the '431 Application leading to the '495 Patent, the '241 Application leading to the '415 Patent, and in the '340 application, although such applications contained combinations of method, system, and emitter claims. (Appeal Br. 14; '431 Application, Preliminary Amendment filed December 16, 2008; '241 Application, Preliminary Amendment filed September 28, 2011, claims 13–49; '340 Application, Preliminary Amendments filed January 21, 2015 and April 27, 2015.)

Thus, even if we were to agree with the Examiner that the claims in the '340 Application represented a broadening with respect to subject matter surrendered during the prosecution of the '441 Patent, the '495 Patent issued with claims to an emitter without the "within a conduit" limitation or the "triangle" limitation, such that claim 13 does not trigger the recapture rule.

As a result, we reverse the Examiner's rejection of claims 13–69 under 35 U.S.C. § 251 as an improper recapture of broadened subject matter surrendered during the prosecution of the '495 Patent.

The Written Description Rejection

ISSUE

The Examiner found that there was no support in the Specification for a number of limitations in claims 13–69. (Ans. 16–18.) The Examiner stated that Figures 7A and 7B did not provide support for such limitations because Figures 7A and 7B were not drawn to scale, and the limitations were not otherwise disclosed in the ’495 Patent. (Ans. 17–18.)

The Examiner identified the following claim language as lacking support (“Phrase” number in parentheses corresponding to the numbering scheme set forth by Appellant in the Appeal Brief, pages 30–43):

“each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing” (Phrase 1);

“the electrodes are positioned away from a longitudinal center axis of the tubular housing” (Phrase 2);

“each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing” (Phrase 3);

“a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing” (Phrase 4);

“the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing” (Phrase 5);

“at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes” (Phrase 6);

"the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing" (Phrase 7);

"the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway" (Phrase 8);

"the passageway running for at least the length of that portion of one of the electrodes positioned within the housing" (Phrase 9);

"the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing" (Phrase 10);

"the unobstructed passageway having a substantially uniform cross-sectional area along that length" (Phrase 11);

"first and second conductors coupled to the first and second electrodes" (Phrase 12);

"first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing" (Phrase 13);

"the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that is parallel to the longitudinal axis" (claim 27);

"the water flow area is greater than an area at the cross-section equal to the total area between electrodes of opposite polarity" (claim 27); and

"at least a portion of the outside electrode positioned in the chamber is closer to the inward-facing surface of the oxygenation chamber than said distance separating the inside electrode from the outside electrode" (claim 27).

(Ans. 16–18, 32–33.)

Appellant contends that the limitations that the Examiner found to be unsupported are supported in the '495 Patent. (Appeal Br. 30–43; Reply Br. 7–14.) Appellant relies on a Declaration of Dr. Paul Strykowski under 37 C.F.R. § 1.132 (executed February 3, 2017, the "Strykowski Declaration")[4] as evidence that one of ordinary skill in the art would have understood that Appellant was in possession of the recited subject matter. (*Id.*)

Thus, the issue with respect to this rejection is whether Appellant has established that the Examiner erred in rejecting claims 13–69 under 35 U.S.C. § 112(a) or 35 U.S.C. § 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement.

PRINCIPLES OF LAW

As explained in *Regents of the Univ. of Cal. v. Eli Lilly & Co.*, 119 F.3d 1559, 1566 (Fed. Cir. 1997),

> [t]o fulfill the written description requirement, a patent specification must describe an invention and do so in sufficient detail that one skilled in the art can clearly conclude that "the inventor invented the claimed invention." *Lockwood v. American Airlines, Inc.*, 107 F.3d 1565, 1572, 41 USPQ2d 1961,

[4] The Strykowski Declaration was submitted with Appellant's Amendment and Response filed February 6, 2017 to the Examiner's Non-Final Action entered October 5, 2016. The Examiner does not appear to acknowledge entry or address the Strykowski Declaration in either the Final Action or the Answer. Because the Strykowski Declaration was filed prior to a final rejection, we treat the Strykowski Declaration as entered. (MPEP § 716.01(A)(1).)

> 1966 (1997); *In re Gosteli*, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989) ("[T]he description must clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed."). Thus, an applicant complies with the written description requirement "by describing the invention, with all its claimed limitations, not that which makes it obvious," and by using "such descriptive means as words, structures, figures, diagrams, formulas, etc., that set forth the claimed invention." *Lockwood*, 107 F.3d at 1572, 41 USPQ2d at 1966.

In other words, the disclosure must convey with reasonable clarity to those skilled in the art that the inventor was in possession of the invention. *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563–64 (Fed. Cir. 1991). Compliance with the written description requirement is a question of fact. *Id.* at 1562–63.

DISCUSSION

We are persuaded by Appellant's argument that one of ordinary skill in the art would have understood Appellant to be in possession of the identified limitations in the claims. In particular, we are persuaded by Appellant's position that one of ordinary skill in the art would have understood Appellant to be in possession of the limitations at issue in view of Figures 7A and 7B of the '495 Patent, a position supported by the unrebutted testimony set forth in the Strykowski Declaration. (Appeal Br. 30–43; Strykowski Decl. ¶¶ 5–17.)

In this regard, in describing Figures 7A and 7B, it is clear that Appellant intended that the arrangement of three electrodes to be illustrative, rather than limiting as found by the Examiner. The '495 Patent states that "the oxygen chamber *is comprised of* three anodes 1 and cathodes 2." ('495

Patent, col. 9, ll. 7–8 (emphasis added).) Further, the '495 Patent expressly states that "[t]his invention is not limited to the design selected for this embodiment." ('495 Patent, col. 9, ll. 19–20.) Although we understand the Examiner's position that Figures 7A and 7B are not drawn to scale, the drawings still may be relied on for what they show as understood by one of ordinary skill in the art. *Regents of the Univ. of Cal.*, 119 F.3d at 1566. In this case, the '495 Patent itself and the interpretation thereof provided in the Strykowski Declaration provide evidence that one of ordinary skill in the art would have understood Appellant to be in possession of the particular relationships between the electrodes and tubular housing, as well as the conductive coupling recited in the claims from the example embodiment in Figures 7A and 7B and accompanying description. ('495 Patent, col. 9, ll. 5–24; Figs. 7A and 7B; Strykowski Decl. ¶¶ 5–17.)

Accordingly, we reverse the Examiner's rejection of claims 13–69 as lacking written description.

Improper Dependent Claims Rejection

ISSUE

The Examiner determined that claims 23, 26, 36, 46, 58, 61, and 69 fail to further the claims from which they depend, because the '495 Patent discloses that at a "critical distance" separating the anode and cathode ranging between 0.005 inches to 0.140 inches, evolved oxygen forms microbubbles and nanobubbles, and the claims from which the rejected claims depend already are limited to the critical distance. (Ans. 18–19.)

Appellant contends that none of the claims from which the rejected claims depend recites the terms “microbubbles” or “nanobubbles” such that the rejected dependent claims further limit the claims from which they depend. (Appeal Br. 44–45.) Appellant argues that although the ’495 Patent provides a range for the critical distances of between 0.005 inches to 0.140 inches, the ’495 Patent does not disclose that all distances within that range are always a critical distance, but rather “critical distance” is defined as the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles. (Appeal Br. 45, citing ’495 Patent col. 3, ll. 12–14 and col. 4, ll. 1–3.)

Thus, the issue with respect to this rejection is whether Appellant has established that the Examiner erred in rejecting claims 23, 26, 36, 46, 49, 58, 61, and 69 are rejected under 35 U.S.C. § 112(d) or pre-AIA 35 U.S.C. § 112, 4th paragraph, as being of improper dependent form for failing to further limit the subject matter of the claim upon which it depends, or for failing to include all the limitations of the claim upon which it depends.

DISCUSSION

We are not persuaded by Appellant’s arguments. Although Appellant argues that the language of the dependent claims provides a limit on the distance between the pair of electrodes not in the independent claims to produce microbubbles and nanobubbles, such that the rejected claims are further limiting (Appeal Br. 45–56), we are not persuaded that such limitations further limit the structure of the emitter.

At the outset, we emphasize, as did the Examiner, that the claims are directed to "[a]n emitter," an apparatus, and as such, the question is whether by reciting that the oxygen produced comprises microbubbles or nanobubbles in the dependent claims, the dependent claims further limit the structure of the apparatus. (Ans. 18–19, 33–34.)

The '495 Patent states "the invention provides an oxygen emitter which is an electrolytic cell which generates very small microbubbles and nanobubbles of oxygen in an aqueous medium." ('495 Patent, col. 2, ll. 63–67.) The '495 Patent also states "in order to form microbubbles and nanobubbles, the anode and cathode are separated by a critical distance. The critical distance ranges from 0.005 inches to 0.140 inches." ('495 Patent, col. 3, ll. 11–13.) Thus, although the '495 Patent provides a definition in column 4, lines 1 through 3 that the "'Critical distance' means the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles," the '495 Patent makes clear that the distance range recited therein is synonymous with the definition. To interpret the '495 Patent otherwise would be contrary to the purpose and objective of the '495 Patent, which is to produce microbubbles and nanobubbles of oxygen in order to reduce the size of bubbles to facilitate oxygen transfer. ('495 Patent, col. 2, l. 63 – col. 3, l. 14; *see also* col. 1, ll. 15–21, 25–61.) Therefore, contrary to Appellant's arguments, to interpret claim 13, for example, as not requiring the formation of microbubbles and nanobubbles as a result of the distance between electrodes recited therein is not consistent with the '495 Patent itself and does not comport with the broadest reasonable interpretation of the claims.

Accordingly, in view of the above discussion, we agree with the Examiner's position that because the '495 Patent states that the critical distance required to produce microbubbles and nanobubbles is between 0.005 inches to 0.140 inches, any distance between the electrodes falling within the claimed range would be capable of producing microbubbles and nanobubbles and thus does not further limit the structure of the emitter recited in the claims. Moreover, for the above reasons, we also are not persuaded by Appellant's argument that defining the critical distance as the range of 0.005 inches to 0.140 inches is contrary to the '495 Patent. (Reply Br. 14.)

As a result, we affirm the Examiner's rejection of claims 23, 26, 36, 46, 58, 61, and 69.

DECISION

We affirm the Examiner's decision rejecting claims 23, 26, 36, 46, 58, 61, and 69 rejected under 35 U.S.C. § 112(d) or pre-AIA 35 U.S.C. § 112, 4th paragraph.

We reverse the Examiner's rejection of claims 13–69 on all other grounds.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED-IN-PART

Doc Code: DIST.E.FILE **Document Description: Electronic Terminal Disclaimer - Filed**	PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT**
Application Number	14601340
Filing Date	21-Jan-2015
First Named Inventor	James Senkiw
Attorney Docket Number	1252.002RE1
Title of Invention	FLOW-THROUGH OXYGENATOR

☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent Interest
Oxygenator Water Technologies, Inc.	100%

The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

RE47092

RE45415

as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:
- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

◉ Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request.

○ I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.

Applicant claims the following fee status:

◉ Small Entity

○ Micro Entity

○ Regular Undiscounted

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

◉ An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application

Registration Number 58607

○ A sole inventor

○ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application

○ A joint inventor; all of whom are signing this request

Signature	/Aaron W. Pederson/
Name	Aaron W. Pederson

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal

Application Number:	14601340
Filing Date:	21-Jan-2015
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Filer:	Aaron Wesley Pederson
Attorney Docket Number:	1252.002RE1

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
STATUTORY OR TERMINAL DISCLAIMER	2814	1	160	160
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**160**

Doc Code: DISQ.E.FILE
Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 14601340

Filing Date: 21-Jan-2015

Applicant/Patent under Reexamination: Senkiw

Electronic Terminal Disclaimer filed on July 12, 2019

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt	
EFS ID:	36567589
Application Number:	14601340
International Application Number:	
Confirmation Number:	1069
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Customer Number:	138517
Filer:	Aaron Wesley Pederson
Filer Authorized By:	
Attorney Docket Number:	1252.002RE1
Receipt Date:	12-JUL-2019
Filing Date:	21-JAN-2015
Time Stamp:	12:51:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$160
RAM confirmation Number	071219INTEFSW00010868502880
Deposit Account	502880
Authorized User	Aaron Pederson

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer-Filed (Electronic)	eTerminal-Disclaimer.pdf	33596 1bb3800c65d7279342f6a0445e0c867ebd64d84d	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30248 d62bd0d3a0310eaa972e48d38d90ff34a8fff412	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	63844		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	14/601,340
Applicant	:	Oxygenator Water Technologies, Inc.
Filed	:	January 21, 2015
Art Unit	:	3991
Examiner	:	Jerry D JOHNSON
Confirmation No.	:	1069
Docket No.	:	1252.002RE
Customer No.	:	138517
Title	:	FLOW-THROUGH OXYGENATOR

SUPPLEMENTAL AMENDMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Board Decision mailed June 25, 2019, please consider the following:

Amendments to the Specification, beginning on page 1 of this paper;

Amendments to the Claims, beginning at page 2 of this paper; and

Remarks, beginning on page 17 of this paper.

Should any additional fee be deemed to be due for this filing or any other fees required for the subject application, please charge the appropriate amount to Deposit Account No. 502880.

Electronic Acknowledgement Receipt	
EFS ID:	36567810
Application Number:	14601340
International Application Number:	
Confirmation Number:	1069
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Customer Number:	138517
Filer:	Aaron Wesley Pederson
Filer Authorized By:	
Attorney Docket Number:	1252.002RE1
Receipt Date:	12-JUL-2019
Filing Date:	21-JAN-2015
Time Stamp:	12:58:15
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		1252-002RE1_Supp_Amend_SIGNED.pdf	146356 e79cec05f68ecac5b8a09129a59c6f6581b0452c	yes	17

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	17	17
	Claims	3	16
	Specification	2	2
	Amendment/Argument after Patent Board Decision	1	1
Warnings:			
Information:			
	Total Files Size (in bytes):	146356	

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

REMARKS

This paper is responsive to the Board Decision dated June 25, 2019, wherein claims 13-69 were pending and the rejections to claims 13-22, 24, 25, 27-35, 37-45, 50-57, 59, 60, and 62-68 were reversed and the rejections under pre-AIA 35 U.S.C. §112, 4th paragraph to claims 23, 26, 36, 46, 49, 58, 61 and 69 were affirmed. With this paper, claims 23, 26, 36, 46, 49, 58, 61 and 69 are cancelled. Upon entry, claims 13-22, 24, 25, 27-35, 37-45, 50-57, 59, 60, and 62-68 will be pending in this application. The specification is also amended herein to indicate that multiple reissue applications have been filed for U.S. Patent No. 7,670,495.

Applicant has also filed herewith terminal disclaimers for the present application with respect to U.S. Patent No. RE45,415 and U.S. Patent No. RE47,092.

Applicant respectfully requests entry of the amendments herein in order to place the application in condition for allowance by removing all issues remaining after the Board Decision.

SUMMARY

For the reasons set out above, Applicant respectfully submits that the application is in condition for allowance. Favorable reconsideration and allowance of the application are, therefore, respectfully requested.

If the Examiner believes that anything further is necessary to place the application in better condition for allowance, the Examiner is asked to contact Applicant's undersigned representative at the telephone number below.

Customer No. 138517

Date: July 12, 2019

Respectfully submitted,

/Aaron W. Pederson/

Aaron Pederson
Registration No. 58607

Tel No. (612) 436-9609

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Minneapolis, Minnesota 55402

AMENDMENTS TO THE CLAIMS

Listing of Claims:

1-12. (Canceled)

13. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;

at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches within the tubular housing;

each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing and so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

14. (New) The emitter of claim 13 wherein the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis;

wherein the electrodes extend in a direction that is parallel to the longitudinal axis; and

wherein at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes.

15. (New) The emitter of claim 13 wherein the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis;

wherein said electrodes extend in a direction parallel to the longitudinal axis; and

wherein each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing.

16. (New) The emitter of claim 13 wherein at least one of the electrodes is a stainless steel mesh or screen.

17. (New) The emitter of claim 13 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing.

18. (New) The emitter of claim 17 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing.

19. (New) The emitter of claim 17 wherein the first and second electrodes comprise an outside electrode and an inside electrode, wherein the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is, wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway.

20. (New) The emitter of claim 13 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to and including the center axis, the passageway running for at least the length of one of the electrodes positioned within the housing;

wherein the first and second electrodes comprise an outside electrode and an inside electrode;

wherein the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing;

the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is;

wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway; and

wherein the tubular housing of the emitter is round.

21. (New) The emitter of claim 19 wherein said inward-facing surface is a concave surface.

22. (New) The emitter of claim 13 further including first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing.

23. (Cancelled)

24. (New) The emitter of claim 13 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

25. (New) The emitter of claim 13 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

26. (Cancelled)

27. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing defining an oxygenation chamber and having a water inlet, a water outlet, a longitudinal water flow axis from the inlet to the outlet, and an inward-facing surface that runs parallel to the water flow axis and defines at least in part the oxygenation chamber;

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that is parallel to the longitudinal axis, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber, wherein the position and size of each electrode within the chamber defines a cross-section of the chamber that has a water flow area within the oxygenation chamber through which water may flow without passing between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches, wherein the water flow area is greater than an area at the cross-section equal to the total area between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches, wherein at least a portion of the outside electrode positioned in the chamber is closer to the inward-facing surface of the oxygenation chamber than said distance separating the inside electrode from the outside electrode; and

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the chamber of the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

28. (New) The emitter of claim 27 wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a longitudinal center axis of the oxygenation chamber.

29. (New) The emitter of claim 27 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center

axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber.

30. (New) The emitter of claim 29 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber.

31. (New) The emitter of claim 30 wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway.

32. (New) The emitter of claim 27 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing.

33. (New) The emitter of claim 27 wherein the oxygen produced comprises nanobubbles.

34. (New) The emitter of claim 27 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

35. (New) The emitter of claim 27 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

36. (Cancelled)

37. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing defining an oxygenation chamber and having a water inlet, and a water outlet;

at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the oxygenation chamber, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches, a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber, said portion being a portion that opposes the other of the first and second electrodes, wherein each electrode is positioned within the oxygenation chamber so that a cross section of the oxygenation chamber includes a water flow area that allows water to avoid passing between electrodes separated by 0.005 inches to 0.140 inches;

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

38. (New) The emitter of claim 37 wherein the tubular housing has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal center axis; and

wherein each electrode of the emitter is positioned so that all points midway between all opposing electrodes inside the chamber are closer to said inwardly-facing surface than to the longitudinal center axis.

39. (New) The emitter of claim 37 wherein the chamber has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal axis, wherein the electrodes extend in a direction that is parallel to the longitudinal axis, and wherein at least one of the first and second electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes.

40. (New) The emitter of claim 39 wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to the longitudinal center axis of the oxygenation chamber.

41. (New) The emitter of claim 37 wherein the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing.

42. (New) The emitter of claim 37 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber.

43. (New) The emitter of claim 42 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the chamber.

44. (New) The emitter of claim 42 wherein the chamber has an inward-facing surface that runs parallel to the longitudinal axis;

wherein the first and second electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is; and

wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway.

45. (New) The emitter of claim 37 further including first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing.

46. (Cancelled)

47. (New) The emitter of claim 37 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

48. (New) The emitter of claim 37 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

49. (Cancelled)

50. (New) An emitter for electrolytic generation of bubbles of oxygen in an aqueous medium comprising:

a tubular housing defining an oxygenation chamber, and having an inward-facing surface that defines at least in part the oxygenation chamber, a water inlet, and a water outlet;

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that runs parallel to the inward-facing surface, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the inward-facing surface of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber;

wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a midpoint of the tubular housing and so that at least some water may flow through an unobstructed passageway from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches.

51. (New) The emitter of claim 50 wherein at least one of the inside and outside electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes, and wherein the tubular housing defines a longitudinal center axis that lies in the oxygenation chamber and wherein the unobstructed passageway includes the longitudinal center.

52. (New) The emitter of claim 50 wherein at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber.

53. (New) The emitter of claim 52 wherein the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing.

54. (New) The emitter of claim 50 wherein the unobstructed passageway is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber.

55. (New) The emitter of claim 54 wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway.

56. (New) The emitter of claim 55 wherein said inward-facing surface is a concave surface.

57. (New) The emitter of claim 50 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing.

58. (Cancelled)

59. (New) The emitter of claim 50 coupled to a power source wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

60. (New) The emitter of claim 50 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

61. (Cancelled)

62. (New) An emitter for electrolytic generation of bubbles of oxygen in an aqueous medium comprising:

a tubular housing defining an oxygenation chamber, said housing having an outer wall that runs parallel to a longitudinal center axis of the housing, said housing having a water inlet and a water outlet,

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches;

the electrodes being positioned away from the center axis and maintaining a longitudinal, unobstructed passageway parallel to and including the center axis that runs for at least the length of one of the electrodes positioned within the chamber, the unobstructed passageway having a uniform cross-sectional area along that length, the electrodes being positioned so that water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;

wherein the outside electrode defines a cross-sectional area between the outside electrode and the outer wall of the chamber that is less than said cross-sectional area of the unobstructed passageway.

63. (New) The emitter of claim 62 wherein at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber.

64. (New) The emitter of claim 63 wherein the electrode in contact with a wall of the tubular housing is in contact with the outer wall which is a curved wall of the tubular housing.

65. (New) The emitter of claim 62 wherein the unobstructed passageway is multiple times wider than the distance separating the opposing outside and inside electrodes within the chamber.

66. (New) The emitter of claim 62 wherein said outer wall includes an inwardly-facing concave surface.

67. (New) The emitter of claim 62 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing.

68. (New) The emitter of claim 62 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

69. (Cancelled)

AMENDMENTS TO THE SPECIFICATION

Please replace the first paragraph of the application as filed with the following replacement paragraph:

<u>More than one reissue application has been filed for the reissue of U.S. Patent No. 7,670,495.</u> This application <u>a continuation reissue application of application number 13/247,241, filed September 28, 2011, now U.S. Patent No. RE45,415, which is a reissue of U.S. Patent No. 7,670,495. U.S. Patent No. 6,760,495 is </u>a division of application Ser. No. 10/732,326 filed Dec. 10, 2003, which in turn is a continuation-in-part of application Ser. No. 10/372,017, filed Feb. 21, 2003, now U.S. Pat. No. 6,689,262, which claims the benefit of U.S. Provisional Application No. 60/358,534, filed Feb. 22, 2002, each of which is hereby fully incorporated herein by reference.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/601,340	Filing Date 01/21/2015	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

	(Column 1)	(Column 2)			
FOR	NUMBER FILED	NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $40 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $210 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	07/12/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 49	Minus	** 62	= 0		x $50 =	0
	Independent (37 CFR 1.16(h))	* 5	Minus	*** 5	= 0		x $230 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/DENISE T LILES/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

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NOTICE OF ALLOWANCE AND FEE(S) DUE

138517 7590 07/25/2019

Carlson, Caspers, Vandenburgh & Lindquist, P.A.
225 S. Sixth St.
Ste. 4200
Minneapolis, MN 55402

EXAMINER	
JOHNSON, JERRY D	
ART UNIT	PAPER NUMBER
3991	

DATE MAILED: 07/25/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/601,340	01/21/2015	James Andrew Senkiw	1252.002RE1	1069

TITLE OF INVENTION: FLOW-THROUGH OXYGENATOR

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	10/25/2019

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

138517 7590 07/25/2019
Carlson, Caspers, Vandenburgh & Lindquist, P.A.
225 S. Sixth St.
Ste. 4200
Minneapolis, MN 55402

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/601,340	01/21/2015	James Andrew Senkiw	1252.002RE1	1069

TITLE OF INVENTION: FLOW-THROUGH OXYGENATOR

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	10/25/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
JOHNSON, JERRY D	3991	210-748100

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 ______________________________

2 ______________________________

3 ______________________________

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required) ❑Advance Order - # of Copies ____________________

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. __________

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature ______________________________ Date ______________________________

Typed or printed name ______________________________ Registration No. ______________________________

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/601,340	01/21/2015	James Andrew Senkiw	1252.002RE1	1069

138517 7590 07/25/2019

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Minneapolis, MN 55402

EXAMINER	
JOHNSON, JERRY D	
ART UNIT	PAPER NUMBER
3991	

DATE MAILED: 07/25/2019

Determination of Patent Term Extension or Adjustment under 35 U.S.C. 154 (b)

A reissue patent is for "the unexpired part of the term of the original patent." See 35 U.S.C. 251. Accordingly, the above-identified reissue application is not eligible for Patent Term Extension or Adjustment under 35 U.S.C. 154(b).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	**Application No.** 14/601,340	**Applicant(s)** Senkiw, James Andrew	
	Examiner Jerry D Johnson	**Art Unit** 3991	**AIA (FITF) Status** No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1.☑ This communication is responsive to the amendment filed 12 July 2019.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2.☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3.☑ The allowed claim(s) is/are See Continuation Sheet . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4.☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☐All b) ☐ Some *c) ☐ None of the:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file areply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5.☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.

☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6.☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1.☐ Notice of References Cited (PTO-892)
2.☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3.☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4.☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/JERRY D JOHNSON/
Patent Reexam Specialist, CRU 3991

Continuation of 3. The allowed claim(s) is/are: 13-22,24-25,27-35,37-45,47-48,50-57,59-60 and 62-68

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Reasons for Allowance

The following is an examiner's statement of reasons for allowance: It is readily agreed if the divisional '495 patent "is more properly considered a continuation" (Patent Trial and Appeal Board Decision, page 13) despite applicants having argued the claims are patentably distinct, then the instant claims do not represent broadening with respect to subject matter surrendered during prosecution of the '441 Patent and do not trigger the recapture rule.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Correspondence

Any inquiry concerning this communication or earlier communications from the specialist should be directed to JERRY D JOHNSON whose telephone number is (571)272-1448. The specialist can normally be reached on 5:30-3:00.

If attempts to reach the specialist by telephone are unsuccessful, the specialist's supervisor, Jean Witz can be reached on 571 272-0927.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Signed:

/JERRY D JOHNSON/
Patent Reexamination Specialist
Central Reexamination Unit 3991

/Alan Diamond/
Patent Reexamination Specialist
Central Reexamination Unit 3991

/Jean C. Witz/
Supervisory Patent Reexamination Specialist
Central Reexamination Unit 3991

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/601,340	Senkiw, James Andrew
	Examiner	Art Unit
	Jerry D Johnson	3991

CPC - Searched*		
Symbol	**Date**	**Examiner**
A01G31/02; C02F1/727; A01G31/00; A01K63/042; C02F1/46109; C02F3/26; Y02P60/216; Y02W10/15; Y02E60/366; C02F7/00; C02F2001/46138; C02F2209/02; C02F2001/46133; C02F2001/46157; C02F1/4672; C02F1/68; C02F2201/4612; C02F2201/4615	07/15/2019	JDJ

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
Reviewed prosecution history in 6,689,262; 7,396,441; 7,670,495; RE45,415	05/06/15	JDJ

/J.D.J/
Patent Reexam Specialist, CRU 3991

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/601,340	Senkiw, James Andrew
	Examiner	Art Unit
	Jerry D Johnson	3991

Interference Search

US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
A01G31/02; C02F1/727; A01G31/00; A01K63/042; C02F1/46109; C02F3/26; Y02P60/216; Y02W10/15; Y02E60/366; C02F7/00; C02F2001/46138; C02F2209/02; C02F2001/46133; C02F2001/46157; C02F1/4672; C02F1/68; C02F2201/4612; C02F2201/4615		07/15/2019	JDJ

	/J.D.J/ Patent Reexam Specialist, CRU 3991

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/601,340	Senkiw, James Andrew
	Examiner	**Art Unit**
	Jerry D Johnson	3991

CPC

Symbol					Type	Version
A01G	/	31	/	02	F	2013-01-01
A01K	/	63	/	042	I	2013-01-01
C02F	/	1	/	46109	I	2013-01-01
C02F	/	1	/	727	I	2013-01-01
C02F	/	3	/	26	I	2013-01-01
A01G	/	31	/	00	I	2013-01-01
C02F	/	1	/	4672	A	2013-01-01
C02F	/	1	/	68	A	2013-01-01
Y02P	/	60	/	216	A	2015-11-01
C02F	/	2001	/	46133	A	2013-01-01
C02F	/	2001	/	46138	A	2013-01-01
C02F	/	2001	/	46157	A	2013-01-01
C02F	/	2201	/	4612	A	2013-01-01
C02F	/	2201	/	4615	A	2013-01-01
C02F	/	2209	/	02	A	2013-01-01
Y02E	/	60	/	366	A	2013-01-01
Y02W	/	10	/	15	A	2015-05-01
C02F	/	7	/	00	A	2013-01-01

CPC Combination Sets

Symbol					Type	Set	Ranking	Version
	/		/					

NONE (Assistant Examiner) (Date)	**Total Claims Allowed:** 49	
/JERRY D JOHNSON/ 15 July 2019 Patent Reexam Specialist, CRU 3991 (Primary Examiner) (Date)	O.G. Print Claim(s) 13	O.G. Print Figure 7a

U.S. Patent and Trademark Office Part of Paper No.: 20190715

OWT Ex. 2119
Tennant Company v. OWT
IPR2021-00625

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/601,340	Senkiw, James Andrew
	Examiner	Art Unit
	Jerry D Johnson	3991

INTERNATIONAL CLASSIFICATION				
CLAIMED				
A01G31/02	/	31	/	02
A01K63/04	/	63	/	04
C02F1/461	/	1	/	461
C02F1/72	/	1	/	72
C02F3/26	/	3	/	26
A01G31/00	/	31	/	00
C02F1/467	/	1	/	467
C02F1/68	/	1	/	68
CPCONLY	/	NLY	/	
C02F7/00	/	7	/	00

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE (Assistant Examiner) (Date)	Total Claims Allowed: 49	
/JERRY D JOHNSON/ Patent Reexam Specialist, CRU 3991 (Primary Examiner) 15 July 2019 (Date)	O.G. Print Claim(s) 13	O.G. Print Figure 7a

U.S. Patent and Trademark Office Part of Paper No.: 20190715

OWT Ex. 2119
Tennant Company v. OWT
IPR2021-00625

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/601,340	Senkiw, James Andrew
	Examiner	Art Unit
	Jerry D Johnson	3991

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☑ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE (Assistant Examiner) (Date)	Total Claims Allowed: 49	
/JERRY D JOHNSON/ Patent Reexam Specialist, CRU 3991 (Primary Examiner) 15 July 2019 (Date)	O.G. Print Claim(s) 13	O.G. Print Figure 7a

U.S. Patent and Trademark Office Part of Paper No.: 20190715

United States Patent And Trademark Office **Reissue Terminal Disclaimer Review Form**	**Application No.** 14/601,340	**Art Unit** 3991
	Examiner JERRY D JOHNSON	**AIA Status** No

Original Patent Number of Patent to be Reissued is: 7670495	**The Maintenance fee status is:** ◉ up to date ○ not up to date (Consult with SPRS)

Is there a terminal disclaimer filed and accepted during the prosecution of (i) the current reissue application, (ii) the underlying patent, and/or (iii) reexamination proceeding(s) of the underlying patent?

○ NO
◉ YES (Complete the rest of the form)

The reissue patent is subject to Terminal Disclaimer(s) that was/were:

☑ filed and accepted (DISQ or DISQ.E.FILE) during the prosecution of the current reissue application. (Enter terminal disclaimer(s) filing date(s) below).

1. 12 July 2019 2. _____ 3. _____

The underlying patent of the current reissue application is subject to Terminal DIsclaimer(s) that was/were:

☑ accepted (DISQ or DISQ.E.FILE) and of record in the prosecution of the underlying patent and/or reexamination procceeding(s) of the underlying patent. (Enter application/control no(s) and terminal disclaimer(s) filing date(s) below).

1. 12/023,431 20 August 2009 2. _____ _____ 3. _____ _____

U.S. Patent and Trademark Office Last revised: 12/2016

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1	("7670495").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/07/15 11:38
L2	11133	(A01G31/02 or C02F1/727 or A01G31/00 or A01K63/042 or C02F1/46109 or C02F3/26 or Y02P60/216 or Y02W10/15 or Y02E60/366 or C02F7/00 or C02F2001/46138 or C02F2209/02 or C02F2001/46133 or C02F2001/46157 or C02F1/4672 or C02F1/68 or C02F2201/4612 or C02F2201/4615).cpc.	USPAT	OR	OFF	2019/07/15 11:43
L3	2665	l2 and electrode	USPAT	OR	OFF	2019/07/15 11:47
L4	2626	l3 and (water or aqueous)	USPAT	OR	OFF	2019/07/15 11:47
L5	771	l4 and bubbles	USPAT	OR	OFF	2019/07/15 11:47
L6	185	l5 and oxygen.AB.	USPAT	OR	OFF	2019/07/15 11:49
L7	19	l6 and bubbles.AB.	USPAT	OR	OFF	2019/07/15 11:49
L8	1	("re47092").PN.	USPAT; USOCR	OR	OFF	2019/07/15 11:54

EAST Search History (Interference)

<This search history is empty>

7/15/2019 11:55:21 AM
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BIB DATA SHEET

CONFIRMATION NO. 1069

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
14/601,340	01/21/2015 **RULE**	210	3991	1252.002RE1

APPLICANTS
Oxygenator Water Technologies, Inc., St. Louis Park, MN, Assignee (with 37 CFR 1.172 Interest);

INVENTORS
James Andrew Senkiw, St. Louis Park, MONGOLIA;

** **CONTINUING DATA** *************************
This application is a CON of 13/247,241 09/28/2011 PAT RE45415
which is a REI of 12/023,431 01/31/2008 PAT 7670495
which is a DIV of 10/732,326 12/10/2003 PAT 7396441
which is a CIP of 10/372,017 02/21/2003 PAT 6689262
which claims benefit of 60/358,534 02/22/2002

** **FOREIGN APPLICATIONS** *************************

** **IF REQUIRED, FOREIGN FILING LICENSE GRANTED** ** ** SMALL ENTITY **
01/24/2015

		STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /JERRY D JOHNSON/ Examiner's Signature	☐ Met after Allowance Initials	MONGOLIA	8	55	5

ADDRESS

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225 S. Sixth St.
Ste. 4200
Minneapolis, MN 55402
UNITED STATES

TITLE

FLOW-THROUGH OXYGENATOR

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
3380	No.____________ to charge/credit DEPOSIT ACCOUNT No.____________ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other ________________ ☐ Credit

BIB (Rev. 05/07).

OK to enter
/JDJ/
07/15/2019

AMENDMENTS TO THE CLAIMS

Listing of Claims:

1-12. (Canceled)

13. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing having a water inlet, a water outlet, and a longitudinal water flow axis from the inlet to the outlet;

at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the tubular housing, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches within the tubular housing;

each electrode of the emitter is positioned so that all points midway between all opposing electrodes are closer to a surface of the tubular housing than to a center point within the tubular housing and so that at least some water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

14. (New) The emitter of claim 13 wherein the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis;

wherein the electrodes extend in a direction that is parallel to the longitudinal axis; and

wherein at least one of the first and second electrodes is positioned in the tubular housing closer to the inward-facing surface than said distance separating the electrodes.

15. (New) The emitter of claim 13 wherein the tubular housing includes an inward-facing surface that runs parallel to the longitudinal axis;

wherein said electrodes extend in a direction parallel to the longitudinal axis; and

wherein each electrode of the emitter is positioned closer to the inward-facing surface than to the longitudinal axis at the center of the tubular housing.

16. (New) The emitter of claim 13 wherein at least one of the electrodes is a stainless steel mesh or screen.

17. (New) The emitter of claim 13 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the tubular housing.

18. (New) The emitter of claim 17 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the tubular housing.

19. (New) The emitter of claim 17 wherein the first and second electrodes comprise an outside electrode and an inside electrode, wherein the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is, wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway.

20. (New) The emitter of claim 13 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to and including the center axis, the passageway running for at least the length of one of the electrodes positioned within the housing;

wherein the first and second electrodes comprise an outside electrode and an inside electrode;

wherein the first and second electrodes extend in a longitudinal direction parallel to the longitudinal axis and an inward-facing surface of the tubular housing;

the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is;

wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway; and

wherein the tubular housing of the emitter is round.

21. (New) The emitter of claim 19 wherein said inward-facing surface is a concave surface.

22. (New) The emitter of claim 13 further including first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing.

23. (Cancelled)

24. (New) The emitter of claim 13 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

25. (New) The emitter of claim 13 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

26. (Cancelled)

27. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing defining an oxygenation chamber and having a water inlet, a water outlet, a longitudinal water flow axis from the inlet to the outlet, and an inward-facing surface that runs parallel to the water flow axis and defines at least in part the oxygenation chamber;

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that is parallel to the longitudinal axis, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber, wherein the position and size of each electrode within the chamber defines a cross-section of the chamber that has a water flow area within the oxygenation chamber through which water may flow without passing between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches, wherein the water flow area is greater than an area at the cross-section equal to the total area between electrodes of opposite polarity that are separated by a distance of between 0.005 inches to 0.140 inches, wherein at least a portion of the outside electrode positioned in the chamber is closer to the inward-facing surface of the oxygenation chamber than said distance separating the inside electrode from the outside electrode; and

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the chamber of the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

28. (New) The emitter of claim 27 wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a longitudinal center axis of the oxygenation chamber.

29. (New) The emitter of claim 27 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center

axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber.

30. (New) The emitter of claim 29 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber.

31. (New) The emitter of claim 30 wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway.

32. (New) The emitter of claim 27 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing.

33. (New) The emitter of claim 27 wherein the oxygen produced comprises nanobubbles.

34. (New) The emitter of claim 27 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

35. (New) The emitter of claim 27 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

36. (Cancelled)

37. (New) An emitter for electrolytic generation of bubbles of oxygen in water, the emitter comprising:

a tubular housing defining an oxygenation chamber and having a water inlet, and a water outlet;

at least two electrodes comprising a first electrode and a second electrode, the first and second electrodes being positioned in the oxygenation chamber, the first electrode opposing and separated from the second electrode by a distance of between 0.005 inches to 0.140 inches, a portion of at least one of the first and second electrodes being in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber, said portion being a portion that opposes the other of the first and second electrodes, wherein each electrode is positioned within the oxygenation chamber so that a cross section of the oxygenation chamber includes a water flow area that allows water to avoid passing between electrodes separated by 0.005 inches to 0.140 inches;

a power source in electrical communication with the electrodes, the power source configured to deliver a voltage to the electrodes, the voltage being less than or equal to 28.3 volts, the power source being configured to deliver a current to the electrodes, the current being less than or equal to 12.8 amps;

the power source being operable to deliver electrical current to the electrodes while water flows through the tubular housing and is in contact with the electrodes to produce oxygen in said water via electrolysis.

38. (New) The emitter of claim 37 wherein the tubular housing has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal center axis; and

wherein each electrode of the emitter is positioned so that all points midway between all opposing electrodes inside the chamber are closer to said inwardly-facing surface than to the longitudinal center axis.

39. (New) The emitter of claim 37 wherein the chamber has a longitudinal center axis and an inward-facing surface that runs parallel to the longitudinal axis, wherein the electrodes extend in a direction that is parallel to the longitudinal axis, and wherein at least one of the first and second electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes.

40. (New) The emitter of claim 39 wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to the longitudinal center axis of the oxygenation chamber.

41. (New) The emitter of claim 37 wherein the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing.

42. (New) The emitter of claim 37 wherein the electrodes are positioned away from a longitudinal center axis of the tubular housing and maintain an unobstructed passageway parallel to the center axis, the passageway running longitudinally for at least the length of one of the electrodes positioned within the chamber.

43. (New) The emitter of claim 42 wherein the unobstructed passageway includes the center axis and is multiple times wider than the distance separating the opposing first and second electrodes within the chamber.

44. (New) The emitter of claim 42 wherein the chamber has an inward-facing surface that runs parallel to the longitudinal axis;

wherein the first and second electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to an outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal axis at the center of the tubular housing than the outside electrode is; and

wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward facing surface of the tubular housing that is less than a cross-sectional area of the unobstructed passageway.

45. (New) The emitter of claim 37 further including first and second conductors coupled to the first and second electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal axis of the housing.

46. (Cancelled)

47. (New) The emitter of claim 37 wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

48. (New) The emitter of claim 37 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

49. (Cancelled)

50. (New) An emitter for electrolytic generation of bubbles of oxygen in an aqueous medium comprising:

a tubular housing defining an oxygenation chamber, and having an inward-facing surface that defines at least in part the oxygenation chamber, a water inlet, and a water outlet;

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber and extending in a direction that runs parallel to the inward-facing surface, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the inward-facing surface of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches within the chamber;

wherein each electrode of the emitter is positioned closer to the inward-facing surface of the chamber than to a midpoint of the tubular housing and so that at least some water may flow through an unobstructed passageway from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches.

51. (New) The emitter of claim 50 wherein at least one of the inside and outside electrodes is positioned in the chamber closer to the inward-facing surface than said distance separating the electrodes, and wherein the tubular housing defines a longitudinal center axis that lies in the oxygenation chamber and wherein the unobstructed passageway includes the longitudinal center.

52. (New) The emitter of claim 50 wherein at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber.

53. (New) The emitter of claim 52 wherein the electrode in contact with a wall of the tubular housing is in contact with a curved wall of the tubular housing.

54. (New) The emitter of claim 50 wherein the unobstructed passageway is multiple times wider than the distance separating the opposing inner and outer electrodes within the chamber.

55. (New) The emitter of claim 54 wherein the outside electrode defines a cross-sectional area between the outside electrode and the inward-facing surface of the chamber that is less than a cross-sectional area of said unobstructed passageway.

56. (New) The emitter of claim 55 wherein said inward-facing surface is a concave surface.

57. (New) The emitter of claim 50 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to a longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing.

58. (Cancelled)

59. (New) The emitter of claim 50 coupled to a power source wherein the power source delivers a current to the electrodes at a ratio of 1.75 amps or less per 3 square inches of active electrode.

60. (New) The emitter of claim 50 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

61. (Cancelled)

62. (New) An emitter for electrolytic generation of bubbles of oxygen in an aqueous medium comprising:

a tubular housing defining an oxygenation chamber, said housing having an outer wall that runs parallel to a longitudinal center axis of the housing, said housing having a water inlet and a water outlet,

at least two electrodes comprising an outside electrode and an inside electrode, the outside and inside electrodes being positioned in the oxygenation chamber, the outside and inside electrodes being outside and inside electrodes respectively in that the electrodes are positioned relative to each other so that the outside electrode is closer to the outer wall of the chamber than the inside electrode is and so that the inside electrode is closer to the longitudinal center axis than the outside electrode is, the outside electrode opposing and separated from the inside electrode by a distance of between 0.005 inches to 0.140 inches;

the electrodes being positioned away from the center axis and maintaining a longitudinal, unobstructed passageway parallel to and including the center axis that runs for at least the length of one of the electrodes positioned within the chamber, the unobstructed passageway having a uniform cross-sectional area along that length, the electrodes being positioned so that water may flow from the water inlet to the water outlet without passing through a space between electrodes of opposite polarity separated by a distance of between 0.005 inches to 0.140 inches;

wherein the outside electrode defines a cross-sectional area between the outside electrode and the outer wall of the chamber that is less than said cross-sectional area of the unobstructed passageway.

63. (New) The emitter of claim 62 wherein at least one of the outside and inside electrodes is in contact with at least one wall of the tubular housing, said wall defining at least in part the oxygenation chamber.

64. (New) The emitter of claim 63 wherein the electrode in contact with a wall of the tubular housing is in contact with the outer wall which is a curved wall of the tubular housing.

65. (New) The emitter of claim 62 wherein the unobstructed passageway is multiple times wider than the distance separating the opposing outside and inside electrodes within the chamber.

66. (New) The emitter of claim 62 wherein said outer wall includes an inwardly-facing concave surface.

67. (New) The emitter of claim 62 further including first and second conductors coupled to the outside and inside electrodes respectively, the first conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing, the second conductor exiting a wall of the housing in a radial direction relative to the longitudinal center axis of the housing.

68. (New) The emitter of claim 62 wherein the at least two electrodes includes a first anode electrode portion that is nonparallel to a second anode electrode portion, the first and second anode electrode portions each being parallel to respective opposing cathode electrode portions.

69. (Cancelled)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

138517 7590 07/25/2019
Carlson, Caspers, Vandenburgh & Lindquist, P.A.
225 S. Sixth St.
Ste. 4200
Minneapolis, MN 55402

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/601,340	01/21/2015	James Andrew Senkiw	1252.002RE1	1069

TITLE OF INVENTION: FLOW-THROUGH OXYGENATOR

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	10/25/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
JOHNSON, JERRY D	3991	210-748100

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Carlson Caspers Vandenburgh & Lindquist, PA
2 ______
3 ______

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ☒ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies ______

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☒ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 502880

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Aaron W. Pederson/ Date 7/29/2019

Typed or printed name Aaron W. Pederson Registration No. 58,607

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Electronic Patent Application Fee Transmittal

Application Number:	14601340
Filing Date:	21-Jan-2015
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Filer:	Aaron Wesley Pederson/Selina Padilla
Attorney Docket Number:	1252.002RE1

Filed as Small Entity

Filing Fees for **Utility under 35 USC 111(a)**

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
REISSUE ISSUE FEE	2511	1	500	500

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**500**

Electronic Acknowledgement Receipt

EFS ID:	36712495
Application Number:	14601340
International Application Number:	
Confirmation Number:	1069
Title of Invention:	FLOW-THROUGH OXYGENATOR
First Named Inventor/Applicant Name:	James Andrew Senkiw
Customer Number:	138517
Filer:	Aaron Wesley Pederson/Selina Padilla
Filer Authorized By:	Aaron Wesley Pederson
Attorney Docket Number:	1252.002RE1
Receipt Date:	29-JUL-2019
Filing Date:	21-JAN-2015
Time Stamp:	12:51:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$500
RAM confirmation Number	E20197SC53135958
Deposit Account	502880
Authorized User	Selina Padilla

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	1252-002RE1_Issue_Fee_Trans_FINAL.pdf	126446 74837f0d0312577b8a30fa5430ce21018c44a379	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	29758 46e82c9d6f58a4d45565285f7e89346a39b94c40	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	156204		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/601,340	10/29/2019	RE47665	1252.002RE1	1069

138517 7590 10/09/2019

Carlson, Caspers, Vandenburgh & Lindquist, P.A.
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ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Extension or Adjustment under 35 U.S.C. 154 (b)

A reissue patent is for "the unexpired part of the term of the original patent." See 35 U.S.C. 251. Accordingly, the above-identified reissue application is not eligible for Patent Term Extension or Adjustment under 35 U.S.C. 154(b).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

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Oxygenator Water Technologies, Inc., St. Louis Park, MN, Assignee (with 37 CFR 1.172 Interest);