EXHIBIT 12

US010420374B2

(12) **United States Patent**
Liu

(10) **Patent No.: US 10,420,374 B2**
(45) **Date of Patent: Sep. 24, 2019**

(54) **ELECTRONIC SMOKE APPARATUS**

(71) Applicant: **Altria Client Services LLC**, Richmond, VA (US)

(72) Inventor: **Loi Ying Liu**, Tsuen Wan (HK)

(73) Assignee: **Altria Client Services LLC**, Richmond, VA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 502 days.

(21) Appl. No.: **14/793,453**

(22) Filed: **Jul. 7, 2015**

(65) **Prior Publication Data**

US 2015/0305410 A1 Oct. 29, 2015

Related U.S. Application Data

(63) Continuation-in-part of application No. 13/131,705, filed as application No. PCT/IB2010/052949 on Jun. 29, 2010, now Pat. No. 9,072,321.

(30) **Foreign Application Priority Data**

Sep. 18, 2009 (CN) ..... 2009 2 0179316 U

(51) **Int. Cl.**
A24F 47/00 (2006.01)

(52) **U.S. Cl.**
CPC ***A24F 47/008*** (2013.01)

(58) **Field of Classification Search**
CPC A24F 47/008; A24F 47/002; G01L 9/0072
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,200,863 A 5/1940 Hugo
2,907,320 A 10/1959 De Weese
(Continued)

FOREIGN PATENT DOCUMENTS

AU 2008351672 9/2009
CA 2169765 2/1995
(Continued)

OTHER PUBLICATIONS

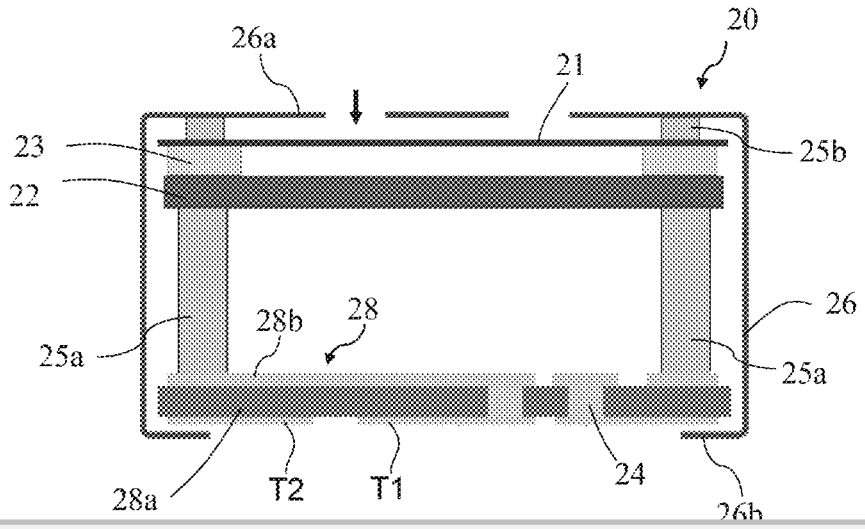
International Search Report for PCT/IB2010/052949 dated Apr. 21, 2011.
(Continued)

Primary Examiner — Matthew J Daniels
(74) *Attorney, Agent, or Firm* — Harness, Dickey & Pierce, P.L.C.

(57) **ABSTRACT**

An electronic smoke comprises a puff detection sub-assembly module. The puff detection sub-assembly comprises a first conductive surface, a second conductive surface and an insulated ring spacer separating the first and the second conductive surfaces at an effective separation distance. The first conductive surface, the second conductive surface and the insulated ring spacer are housed inside a metallic can. The first conductive surface is electrically connected to the metal can by a first conductive ring which is disposed between the first conductive surface and a ceiling portion of the metal can. The second conductive surface is electrically connected to an output terminal through a second conductive ring, the second conductive ring elevating the puff detection sub-assembly above a floor portion of the metal can and urging the first conductive ring against a ceiling portion of the metal can.

25 Claims, 15 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

3,389,601	A		6/1968	Semplak
3,534,728	A		10/1970	Barrows
3,814,998	A		6/1974	Thoma et al.
3,946,726	A		3/1976	Pikul
3,965,746	A		6/1976	Rabek
4,141,252	A		2/1979	Lodge
4,206,644	A		6/1980	Platt
4,484,479	A		11/1984	Eckhardt
4,488,439	A		12/1984	Gast et al.
4,490,773	A		12/1984	Moffatt
4,599,907	A		7/1986	Kraus et al.
4,876,892	A		10/1989	Arabia et al.
4,922,901	A		5/1990	Brooks et al.
4,945,929	A		8/1990	Egilmex
5,107,860	A		4/1992	Malouvier et al.
5,134,886	A		8/1992	Ball
5,146,435	A	*	9/1992	Bernstein G01H 11/06 29/25.42
5,388,594	A		2/1995	Counts et al.
5,665,262	A		9/1997	Hajaligol et al.
5,666,977	A		9/1997	Higgins et al.
5,692,525	A		12/1997	Counts et al.
5,692,526	A		12/1997	Adams et al.
5,902,501	A		5/1999	Nunnally et al.
5,934,289	A		8/1999	Watkins et al.
5,959,219	A		9/1999	Saunders
5,988,176	A		11/1999	Baggett, Jr. et al.
6,040,560	A		3/2000	Fleischhauer et al.
6,615,840	B1		9/2003	Fournier et al.
6,803,545	B2		10/2004	Blake et al.
6,803,550	B2		10/2004	Sharpe et al.
6,810,883	B2		11/2004	Felter et al.
7,171,012	B2		1/2007	Izuchi et al.
7,353,711	B2		4/2008	O'down et al.
7,726,320	B2		6/2010	Robinson et al.
7,832,410	B2		11/2010	Hon
7,845,359	B2		12/2010	Montaser
8,079,371	B2		12/2011	Robinson et al.
8,091,558	B2		1/2012	Martzel
8,127,772	B2		3/2012	Montaser
8,156,944	B2		4/2012	Han
8,205,622	B2		6/2012	Pan
8,314,591	B2		11/2012	Terry et al.
8,365,742	B2		2/2013	Hon
8,375,957	B2		2/2013	Hon
8,393,331	B2		3/2013	Hon
8,490,628	B2		7/2013	Hon
8,511,318	B2		8/2013	Hon
8,550,068	B2		10/2013	Terry et al.
8,689,805	B2		4/2014	Hon
8,746,240	B2		6/2014	Terry et al.
8,863,752	B2		10/2014	Hon
8,863,753	B2		10/2014	Li et al.
8,893,726	B2		11/2014	Hon
8,897,628	B2		11/2014	Conley et al.
8,899,238	B2		12/2014	Robinson et al.
8,899,239	B2		12/2014	Hon
8,910,641	B2		12/2014	Hon
9,072,321	B2	*	7/2015	Liu A24F 47/008
9,259,035	B2		2/2016	Terry et al.
9,320,300	B2		4/2016	Hon
9,326,548	B2		5/2016	Hon
9,326,549	B2		5/2016	Hon
9,326,550	B2		5/2016	Hon
9,326,551	B2		5/2016	Hon
9,339,062	B2		5/2016	Hon
9,364,027	B2		6/2016	Hon
9,370,205	B2		6/2016	Hon
9,439,455	B2		9/2016	Alarcon et al.
9,456,632	B2		10/2016	Hon
2002/0005207	A1		1/2002	Wrenn et al.
2002/0123669	A1		9/2002	Wickstrom
2004/0129280	A1		7/2004	Woodson et al.
2005/0016550	A1		1/2005	Katase
2005/0081639	A1		4/2005	Gourlay
2005/0172976	A1		8/2005	Newman et al.
2005/0229710	A1		10/2005	O'dowd et al.
2006/0196518	A1		9/2006	Hon
2007/0006889	A1		1/2007	Kobal et al.
2007/0102013	A1		5/2007	Adams et al.
2008/0173303	A1		7/2008	McLaughlin et al.
2009/0095311	A1		4/2009	Han
2010/0200008	A1		8/2010	Taieb
2010/0242974	A1	*	9/2010	Pan A24F 47/008 131/273
2011/0011396	A1		1/2011	Fang
2011/0075863	A1	*	3/2011	Rosen H04R 19/04 381/111
2011/0155151	A1		6/2011	Newman et al.
2011/0226236	A1		9/2011	Buchberger
2011/0277780	A1		11/2011	Terry et al.
2011/0304282	A1		12/2011	Li et al.
2012/0090630	A1		4/2012	Hon
2012/0118301	A1		5/2012	Montaser
2012/0234315	A1		9/2012	Li et al.
2012/0273589	A1		11/2012	Hon
2013/0139833	A1		6/2013	Hon
2013/0283885	A1		10/2013	Lee
2014/0150810	A1		6/2014	Hon
2014/0246020	A1		9/2014	Minskoff et al.
2014/0299137	A1		10/2014	Kieckbusch et al.
2015/0020825	A1		1/2015	Galloway et al.
2015/0020831	A1		1/2015	Weigensborg et al.
2015/0020833	A1		1/2015	Conley et al.
2015/0040930	A1		2/2015	Robinson et al.
2015/0047656	A1		2/2015	Robinson et al.
2015/0053214	A1		2/2015	Alarcon et al.
2015/0053217	A1		2/2015	Steingraber et al.
2015/0059779	A1		3/2015	Alarcon et al.
2015/0128974	A1		5/2015	Hon
2015/0150306	A1		6/2015	Chen
2015/0272224	A1		10/2015	Hon
2015/0366267	A1		12/2015	Liu
2016/0021930	A1		1/2016	Minskoff et al.
2016/0073691	A1		3/2016	Liu
2016/0213067	A1		7/2016	Hon
2016/0213068	A1		7/2016	Hon
2016/0255878	A1		9/2016	Huang et al.
2016/0270448	A1		9/2016	Hon
2016/0270449	A1		9/2016	Hon
2016/0270450	A1		9/2016	Hon
2016/0270451	A1		9/2016	Hon
2016/0286865	A1		10/2016	King et al.

FOREIGN PATENT DOCUMENTS

CN	1040914		4/1990
CN	1530041		9/2004
CN	2643681		9/2004
CN	1541577	A	11/2004
CN	2719043	Y	8/2005
CN	1717186		1/2006
CN	1741684		3/2006
CN	1791790		6/2006
CN	1284493		11/2006
CN	1864054		11/2006
CN	201051862	Y	4/2008
CN	201054788		4/2008
CN	201054789		4/2008
CN	201054977	Y	5/2008
CN	101228969	A	7/2008
CN	101366554	A	2/2009
CN	201199922		3/2009
CN	201238610	Y	5/2009
CN	101518361		9/2009
CN	101518361	A	9/2009
CN	101524187		9/2009
CN	101524187	A	9/2009
CN	101606758	A	12/2009
CN	201490998		5/2010

(56) **References Cited**

FOREIGN PATENT DOCUMENTS

CN	1864054		8/2012
CN	103251133	A	8/2013
CN	203314104		12/2013
CN	203913376		11/2014
CN	203952419		11/2014
CN	204070537		1/2015
CN	204232300		4/2015
CN	105476069	A	4/2016
CN	105876869	A	8/2016
EP	0358114	A2	3/1990
EP	0488488	A1	6/1992
EP	0592173		4/1994
GB	1252433		11/1971
JP	63271121		11/1988
JP	H0348166		3/1991
JP	H6-117890		4/1994
JP	09005191		1/1997
JP	H09113326		5/1997
JP	11351921		12/1999
JP	2004163221		6/2004
JP	2005-034021		2/2005
JP	2005-265432		9/2005
JP	2007-010484		1/2007
JP	2009-066142		4/2009
JP	2013-526834		6/2013
JP	2014-521961		8/2014
KR	102005010773		11/2005
WO	WO-1992007599		5/1992
WO	WO-03012565		2/2003
WO	WO-2004/043175	A1	5/2004
WO	WO2004/080216	A1	9/2004
WO	WO-2004/086457		10/2004
WO	WO-2005/019785		3/2005
WO	WO-2007/131449	A1	11/2007
WO	WO-2008108889		9/2008
WO	WO-2009005211		1/2009
WO	WO-2010045671		4/2010
WO	WO-2011033396	A2	3/2011
WO	WO-2015089711		6/2015

OTHER PUBLICATIONS

Wei, Ze-Wen et al., "A Novel 2-D Capacitive Silicon Flow Sensor", IEEE Sensors 2007 conference, 2007.

Wolfgang Demtroder, "Experimentalphysik1 Mechanik and Warme", Springer-Verlag Berlin Heidelberg, 3rd edition, 2003.

Jin Hai Xu, "Capacitive Pressure; Microsensor and Wireless Measurement System Thereof", Thesis for Master Degree of Xiamen University, Xu Jinhai May 20, 2010.

Notice of Opposition dated Jul. 7, 2017 in European Patent No. 2477514.

Response to Notice of Opposition filed Mar. 8, 2018 in European Patent No. 2477514.

Examination Decision of Invalidation Request No. 26243 dated Jun. 23, 2015 in Chinese Application or Patent No. 201080003430.9 (or Document Issuance No. 2015061700379090).

Examination Decision of Invalidation Request No. 28219 dated Feb. 6, 2016 in Chinese Application or Patent No. 201080003430.9 (or Document Issuance No. 2016020300672460).

Xu Zhou, "Modern Sensor Technologies", the National Defense Industry Press, Jan. 2007, the 1st Ed. and the 1st Print, Beijing, China.

"Handbook of Flow Measurement", the China Metrology Publishing House, the 1st Ed. Published and First Printed in Feb. 1982 in China.

"Non Contacting Measurement Method and Technology of Pipe Flow", the China Metrology Publishing House, version 1, Published and First Printed in Jan. 1999, in China.

Datasheet for Honeywell AWM 2100V Airflow Sensor. "Installation Instructions for the AWM2000 Series", Issue 3 PK 88544, (2003).

Administrative Written Judgment issued Dec. 18, 2018 in Chinese Patent No. 201080003430.9.

Brief Communication issued Feb. 8, 2019 regarding Letter from the Opponent filed Feb. 1, 2019 in European Application No. 10816778.4.

Summons to attend oral proceedings pursuant to Rule 115(1) issued on Sep. 3, 2018 in European Patent Application No. 10816778.4.

Office Action dated Jul. 1, 2013 in Chinese Patent Application No. 201210118301.5.

Office Action dated Mar. 3, 2014 in Chinese Patent Application No. 201210118301.5.

Office Action dated Aug. 13, 2014 in Chinese Patent Application No. 201210118301.5.

Notification to Grant Patent Right for Invention dated Nov. 4, 2014 in Chinese Patent Application No. 201210118301.5.

English Translation of Search Report dated Jun. 24, 2013 in Chinese Patent Application No. 201210118301.5.

English Translation of Search Report dated Jun. 9, 2013 in Chinese Patent Application No. 201210118451.6.

Office Action dated Jun. 28, 2013 in Chinese Patent Application No. 201210118451.6.

Office Action dated Feb. 8, 2014 in Chinese Patent Application No. 201210118451.6.

Office Action dated Jul. 22, 2014 in Chinese Patent Application No. 201210118451.6.

Notification to Grant Patent Right for Invention dated Nov. 24, 2014 in Chinese Patent Application No. 201210118451.6.

English Translation of Search Report dated Dec. 19, 2011 in Chinese Patent Application No. 201080003430.9.

Office Action dated Dec. 23, 2011 in Chinese Patent Application No. 201080003430.9.

Notification to Grant Patent Right for Invention dated Feb. 6, 2012 in Chinese Patent Application No. 201080003430.9.

Office Action dated Jan. 7, 2014 in Japanese Patent Application No. 2012-529362.

Decision to Grant a Patent dated Sep. 30, 2014 in Japanese Patent Application No. 2012-529362.

Extended European Search Report dated Jan. 22, 2015 in European Patent Application No. 10816778.4.

Communication pursuant to Article 94(3) dated Nov. 2, 2015 in European Patent Application No. 10816778.4.

Decision to grant a European patent dated Aug. 25, 2016 in European Patent Application No. 10816778.4.

International Preliminary Report on Patentability dated Mar. 20, 2012 in International Application No. PCT/IB2010/052949.

Non-Final Office Action dated Jun. 30, 2014 in U.S. Appl. No. 13/131,705.

Final Office Action dated Mar. 11, 2015 in U.S. Appl. No. 13/131,705.

Notice of Allowance dated May 20, 2015 in U.S. Appl. No. 13/131,705.

Letter regarding the opposition procedure issued Nov. 16, 2017 in European Patent Application No. 10816778.4.

* cited by examiner

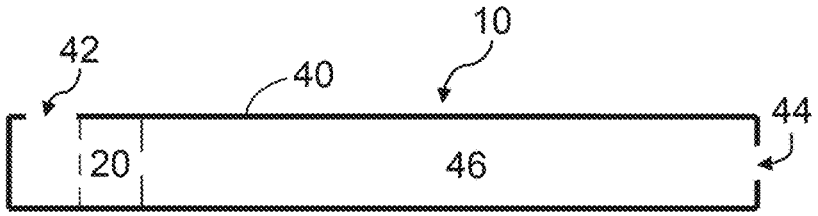


Figure 1

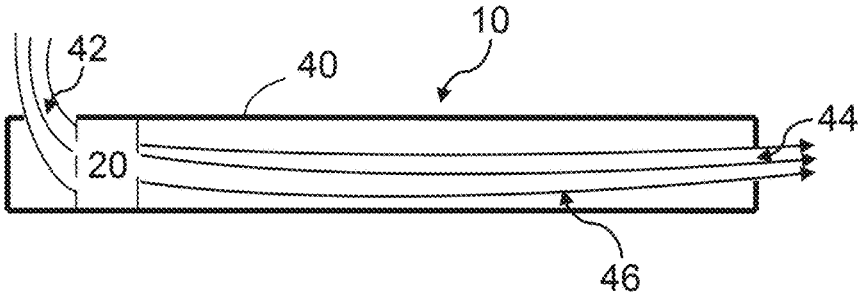


Figure 1A

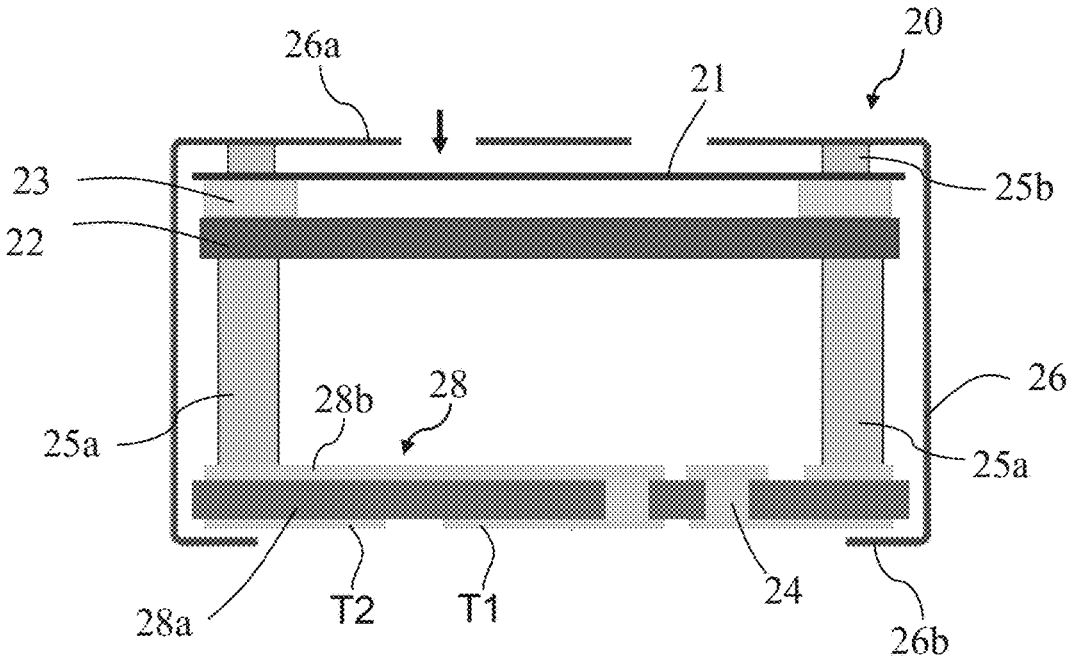


Figure 2

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS
Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS
Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS
Sync your system to PACER to automate legal marketing.