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Dingmann et al.

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(54) **SYSTEM FOR TESTING VALVES**

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(56) **References Cited**

U.S. PATENT DOCUMENTS

3,376,660 A	4/1968	McGinnis	434/268
4,546,642 A *	10/1985	Swanson	A61F 2/2472 73/168
4,682,491 A *	7/1987	Pickard	A61F 2/2472 73/168
5,052,934 A	10/1991	Carey et al.	
5,176,153 A *	1/1993	Eberhardt	A61F 2/2472 128/897
5,670,708 A	9/1997	Vilendrer	
6,863,123 B2 *	3/2005	Wang	F25D 3/10 165/263
6,881,224 B2	4/2005	Kruse et al.	623/2.11
8,444,935 B2 *	5/2013	Nickel	G01N 3/12 422/505
8,490,504 B2	7/2013	Weinberg et al.	73/865.6
8,584,538 B2	11/2013	McCloskey et al.	73/865.6

(Continued)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 282 days.

FOREIGN PATENT DOCUMENTS

WO	2014/000105	1/2014
WO	WO-2014/000105 A1	1/2014

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OTHER PUBLICATIONS

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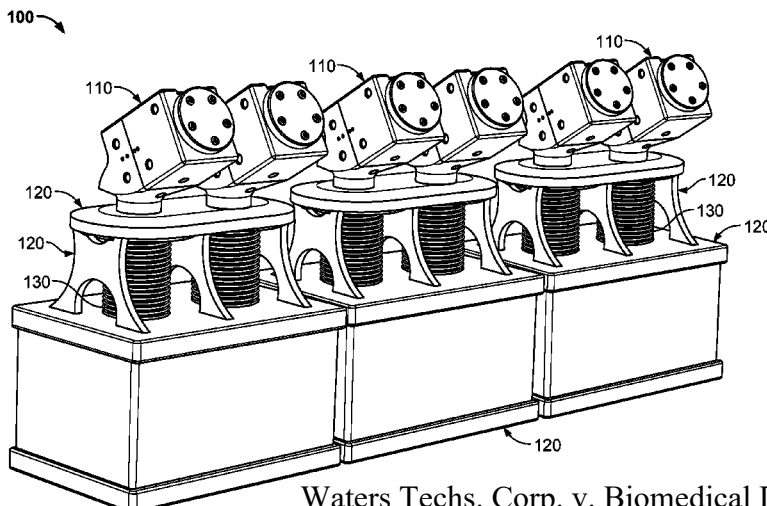
(51) **Int. Cl.**
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(58) **Field of Classification Search**
 USPC 73/865.6
 See application file for complete search history.

(57) **ABSTRACT**
 This document provides systems and methods for testing of various kinds of valves. For example, this document provides systems and methods for accelerated life testing of prosthetic heart valves.

20 Claims, 11 Drawing Sheets



Waters Techs. Corp. v. Biomedical Device Consultants & Labs

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(56)

References Cited

U.S. PATENT DOCUMENTS

8,627,708	B2	1/2014	McCloskey et al.	73/37
2010/0225478	A1	9/2010	McCloskey et al.	
2010/0313683	A1*	12/2010	Nickel	G01N 3/12 73/863
2011/0303026	A1*	12/2011	Lee	A61F 2/2472 73/866.4
2013/0233397	A1	9/2013	McCloskey et al.	137/12
2014/0076029	A1*	3/2014	Lee	A61F 2/2472 73/37
2014/0109651	A1	4/2014	McCloskey et al.	73/37
2015/0359634	A1*	12/2015	Dingmann	G01N 3/00 73/865.6
2016/0230619	A1*	8/2016	McCarthy, Jr.	F01L 13/0005

OTHER PUBLICATIONS

Reul et al., "Durability/Wear Testing of Heart Valve Substitutes," J. Heart Valve Dis. 7(2): 151-157 (1998).

* cited by examiner

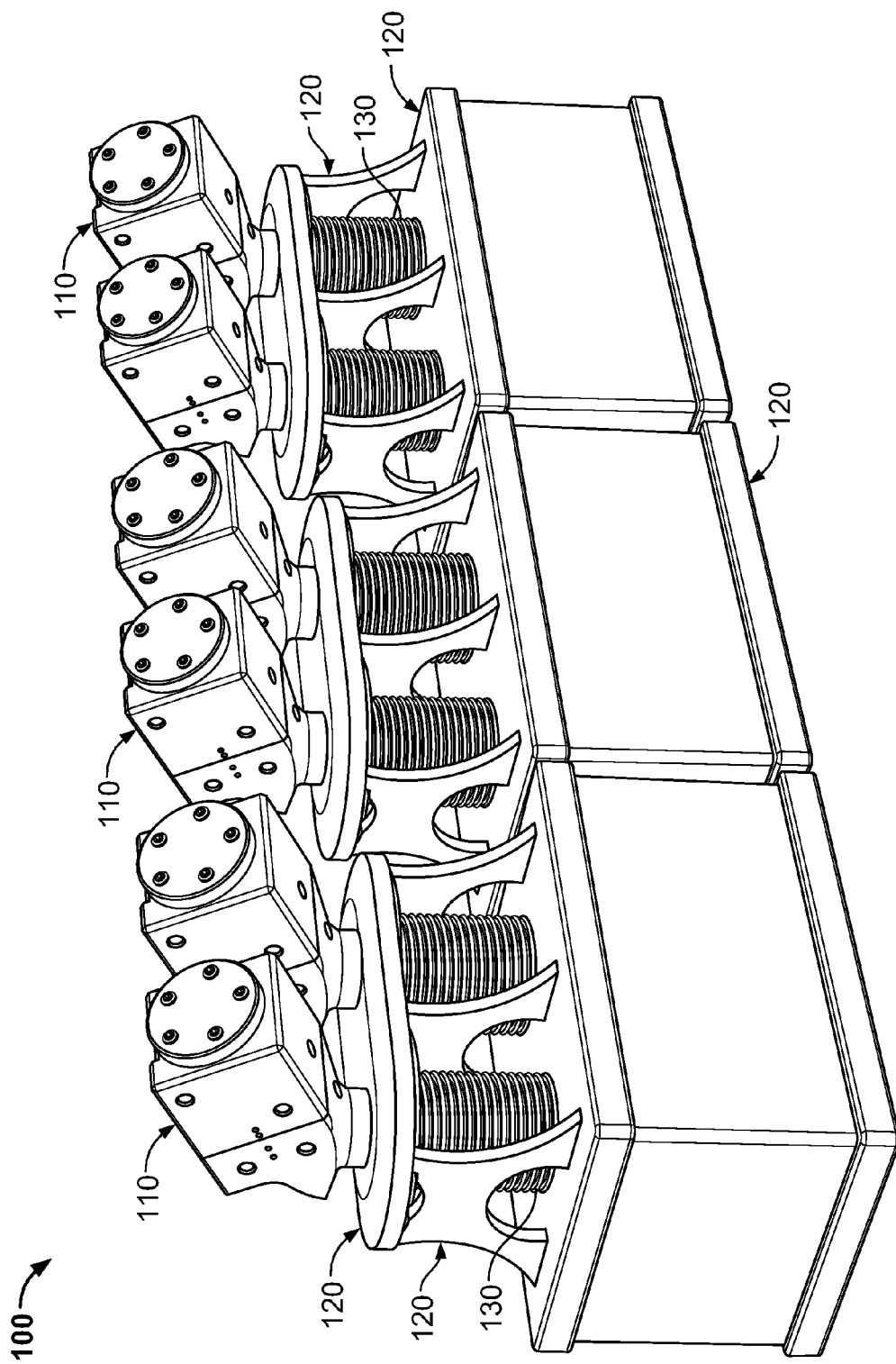


FIG. 1

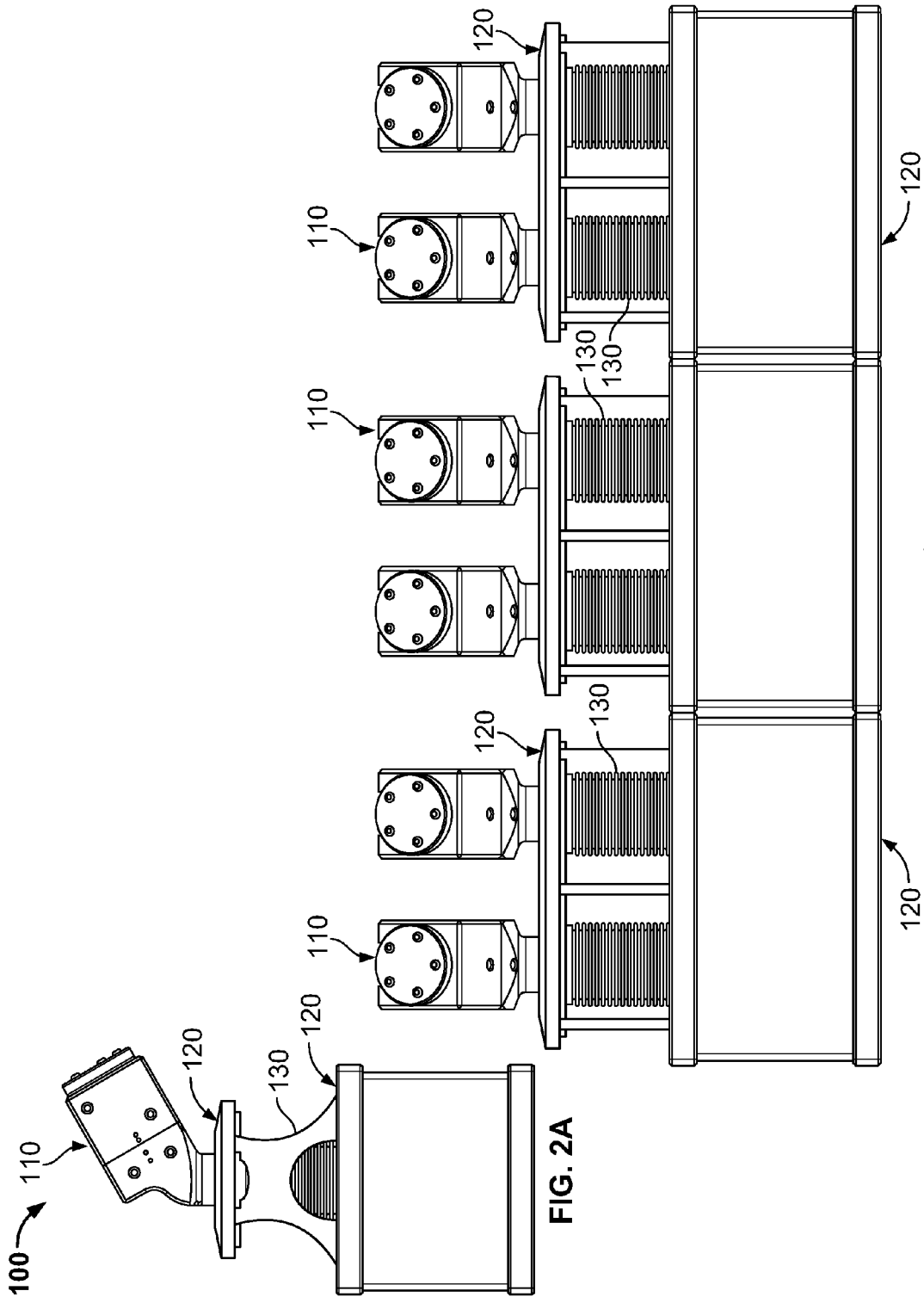


FIG. 2B

FIG. 2A

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