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(12) **United States Patent**
McCloskey et al.

(10) **Patent No.:** **US 8,627,708 B2**
(45) **Date of Patent:** **Jan. 14, 2014**

- (54) **FATIGUE TESTING SYSTEM FOR PROSTHETIC DEVICES**
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4,546,642 A	10/1985	Swanson	
4,682,491 A *	7/1987	Pickard	73/37
4,972,721 A	11/1990	Conti	
5,176,153 A	1/1993	Eberhardt	
5,272,909 A	12/1993	Nguyen et al.	
5,406,857 A	4/1995	Eberhardt et al.	
5,528,944 A	6/1996	Hoyt et al.	
5,670,708 A *	9/1997	Vilendrer	73/37
5,792,603 A	8/1998	Dunkelman et al.	
6,062,075 A	5/2000	Ritz et al.	
6,810,751 B2	11/2004	Moreno et al.	
6,881,224 B2	4/2005	Kruse et al.	
7,254,988 B2	8/2007	Keeble	

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 887 days.

(21) Appl. No.: **12/718,316**

(22) Filed: **Mar. 5, 2010**

(65) **Prior Publication Data**

US 2010/0225478 A1 Sep. 9, 2010

Related U.S. Application Data

(60) Provisional application No. 61/158,185, filed on Mar. 6, 2009.

(51) **Int. Cl.**
G01M 3/02 (2006.01)

(52) **U.S. Cl.**
USPC **73/37**

(58) **Field of Classification Search**
USPC 623/2.11, 2.1, 912; 73/37, 865.6, 168;
600/300, 301, 559, 324
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,911,735 A	10/1975	Di Crispino
4,381,663 A	5/1983	Swanson
4,450,710 A	5/1984	Nettekoven

(Continued)

FOREIGN PATENT DOCUMENTS

JP 08086728 A2 4/1996

OTHER PUBLICATIONS

International Publication No. WO 2010/102185 A3 with Search Report for PCT/US2010/026329.

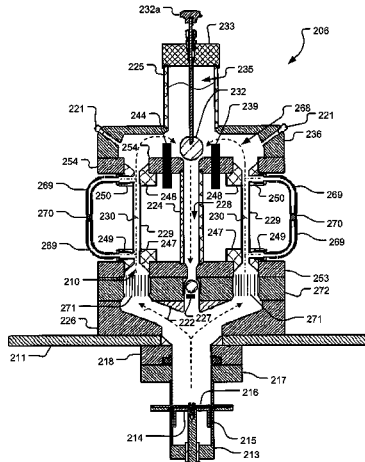
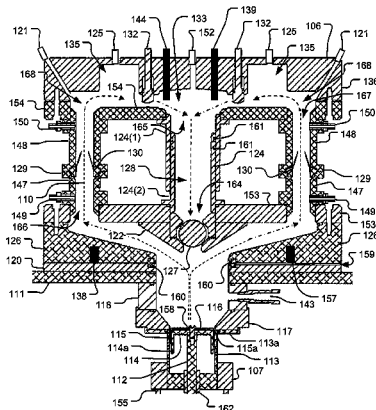
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(57) **ABSTRACT**

A fatigue testing system provides simultaneous cycle testing for a plurality of prosthetic devices under simulated physiological loading conditions. A plurality of sample holders containing test samples of prosthetic devices is positioned between a distribution chamber and a return fluid chamber to form an integrated test chamber. A reciprocating linear drive motor operates a rolling bellows diaphragm to cyclically pressurize fluid within the test chamber and drive the pressurized fluid through the prosthetic devices being tested. The test chamber defines a return flow conduit in fluid communication with each of the sample holders, the return fluid chamber, and the distribution chamber. Compliance chambers and throttle valves associated with each of the sample holders regulate the pressure gradient and back pressure across the prosthetic devices being tested.

26 Claims, 9 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

7,348,175	B2	3/2008	Vilendrer et al.	8,318,414	B2	11/2012	Dancu et al.
7,363,821	B2	4/2008	Black et al.	2003/0066338	A1	4/2003	Michalsky et al.
7,472,604	B2	1/2009	Moore et al.	2003/0110830	A1	6/2003	Dehdashtian et al.
7,587,949	B2	9/2009	Dingmann et al.	2003/0125804	A1*	7/2003	Kruse et al. 623/2.1
7,621,192	B2	11/2009	Conti et al.	2003/0199083	A1	10/2003	Vilendrer et al.
8,034,608	B2	10/2011	Dancu	2004/0016301	A1	1/2004	Moreno et al.
8,196,478	B2	6/2012	Lorenz et al.	2010/0225478	A1*	9/2010	McCloskey et al. 340/540
				2011/0066237	A1	3/2011	Matheny
				2011/0146385	A1	6/2011	Weinberg et al.
				2011/0259439	A1	10/2011	Neerincx

* cited by examiner

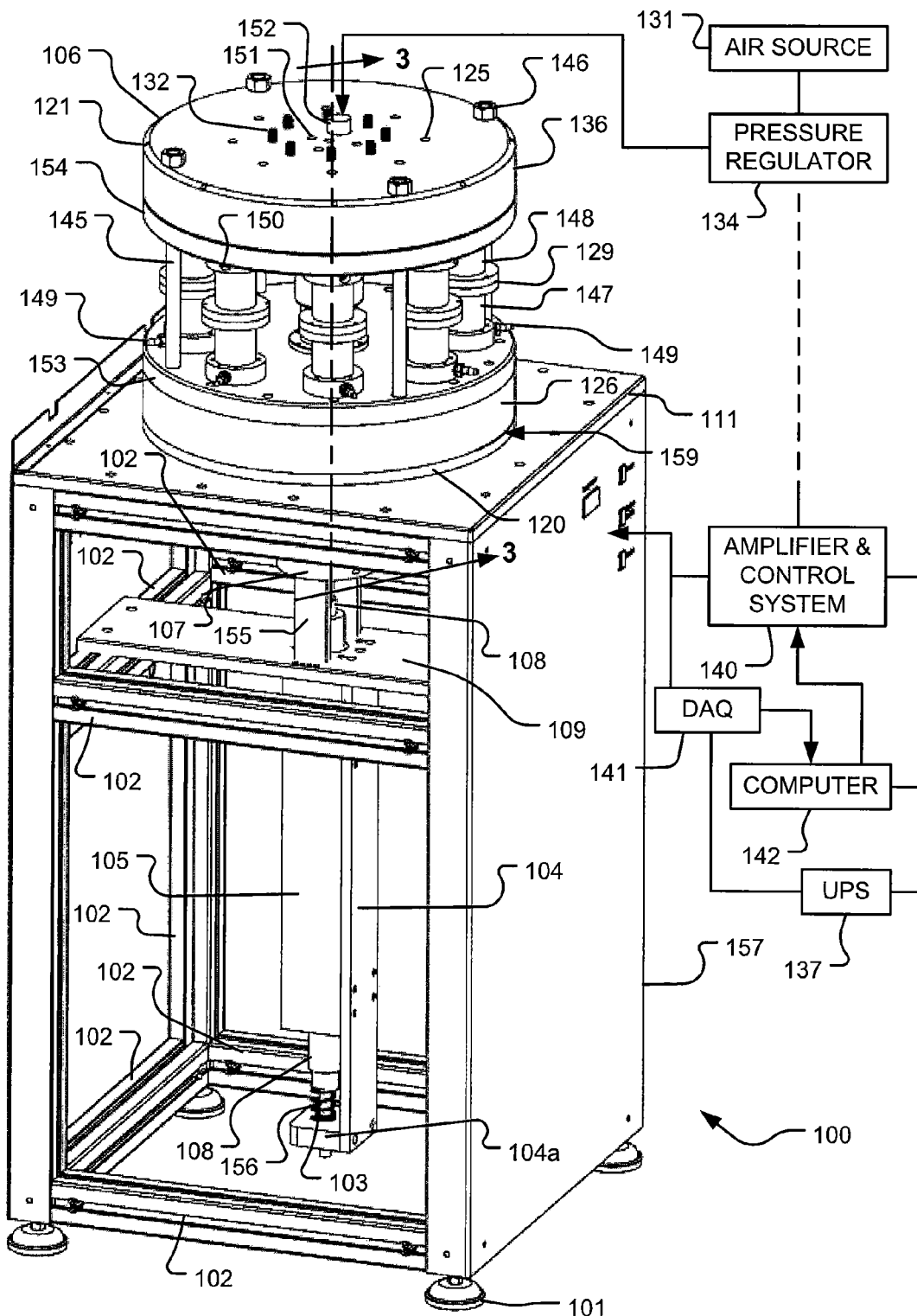


Fig. 1

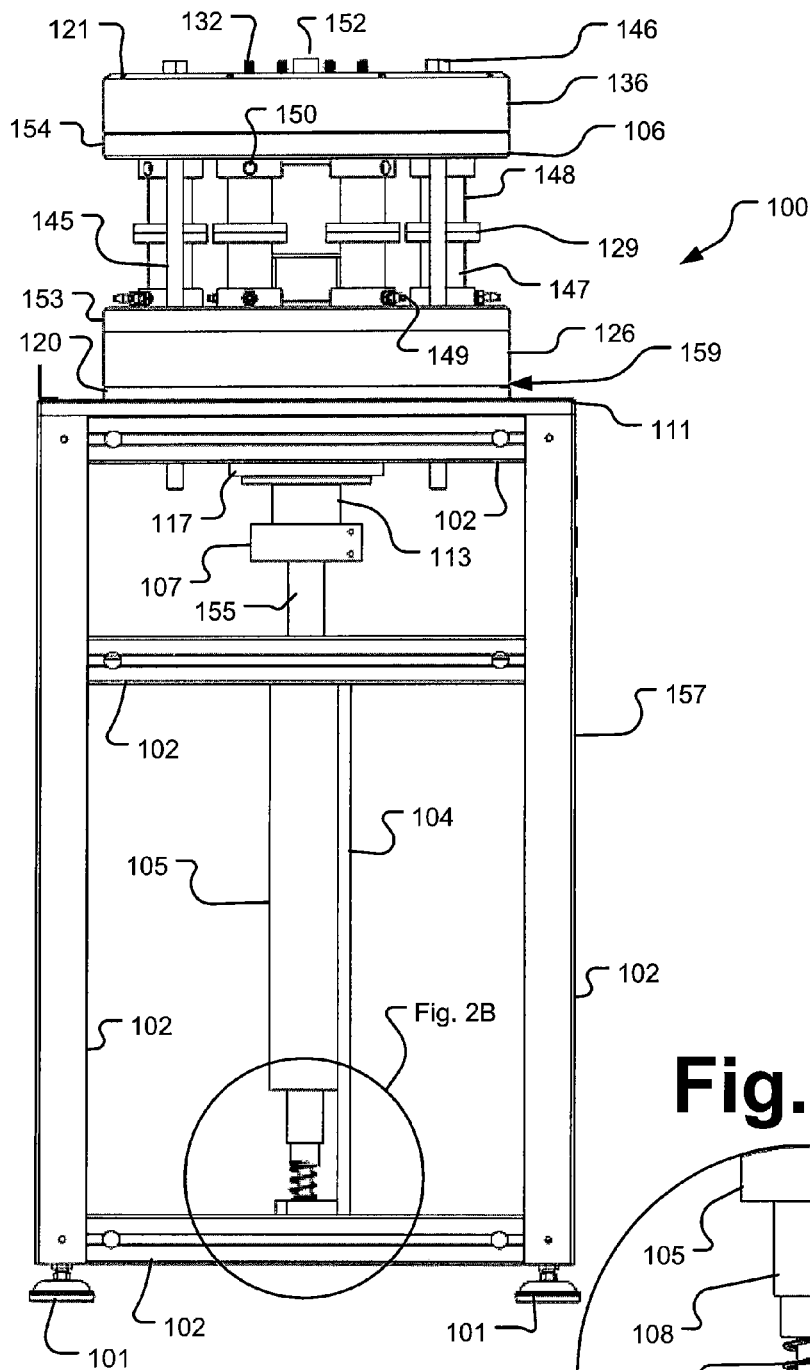
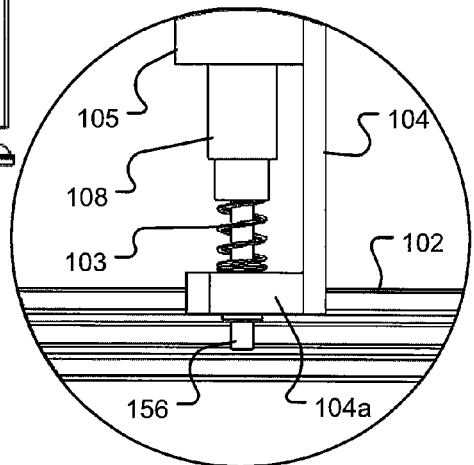


Fig. 2A

Fig. 2B



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