US00D800908S

(12) **United States Design Patent**
Hariton et al.

(10) **Patent No.: US D800,908 S**
(45) **Date of Patent: ** Oct. 24, 2017**

(54) **PROSTHETIC VALVE ELEMENT**

(71) Applicant: **MITRALTECH LTD.**, Or Yehuda (IL)

(72) Inventors: **Ilia Hariton**, Zichron Yaackov (IL); **Boaz Harari**, Ganey Tikva (IL); **Meni Iamberger**, Kfar Saba (IL); **Aviram Baum**, Tel Aviv (IL)

(73) Assignee: **MITRALTECH LTD.**, Or Yehuda (IL)

(**) Term: **15 Years**

(21) Appl. No.: **29/573,863**

(22) Filed: **Aug. 10, 2016**

(51) **LOC (10) Cl.** **24-02**

(52) **U.S. Cl.**
USPC **D24/155**

(58) **Field of Classification Search**
USPC D24/155–157
CPC A61F 2/07; A61F 2/90; A61F 2/958; A61F 2002/016; A61F 2002/072; A61F 2002/075; A61F 2002/91541; A61F 2220/0075; A61F 2230/0069
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,261,342	A	4/1981	Duo
4,423,525	A	1/1984	Vallana et al.
4,853,986	A	8/1989	Allen
4,892,541	A	1/1990	Alonso
5,108,420	A	4/1992	Marks
5,405,378	A	4/1995	Strecker
5,443,500	A	8/1995	Sigwart
5,607,444	A	3/1997	Lam
5,607,470	A	3/1997	Milo
5,647,357	A	7/1997	Anderson et al.
5,765,682	A	6/1998	Bley et al.
5,868,777	A	2/1999	Lam
5,873,906	A	2/1999	Lau et al.
5,980,565	A	11/1999	Jayaraman
6,019,787	A	2/2000	Richard et al.
6,042,607	A	3/2000	Williamson, IV et al.
6,074,417	A	6/2000	Peredo
6,113,612	A	9/2000	Swanson et al.
6,120,534	A	9/2000	Ruiz
6,152,937	A	11/2000	Peterson et al.
6,165,210	A	12/2000	Lau et al.
6,187,020	B1	2/2001	Zegdi et al.
6,193,745	B1	2/2001	Fogarty et al.
6,287,339	B1	9/2001	Vazquez et al.

(Continued)

FOREIGN PATENT DOCUMENTS

EP	1264582 A2	12/2002
WO	99/30647 A1	6/1999

(Continued)

OTHER PUBLICATIONS

USPTO NFOA dated May 29, 2012 in connection with U.S. Appl. No. 12/840,463.

(Continued)

Primary Examiner — Charles Hanson
(74) *Attorney, Agent, or Firm* — Ladas & Parry LLP

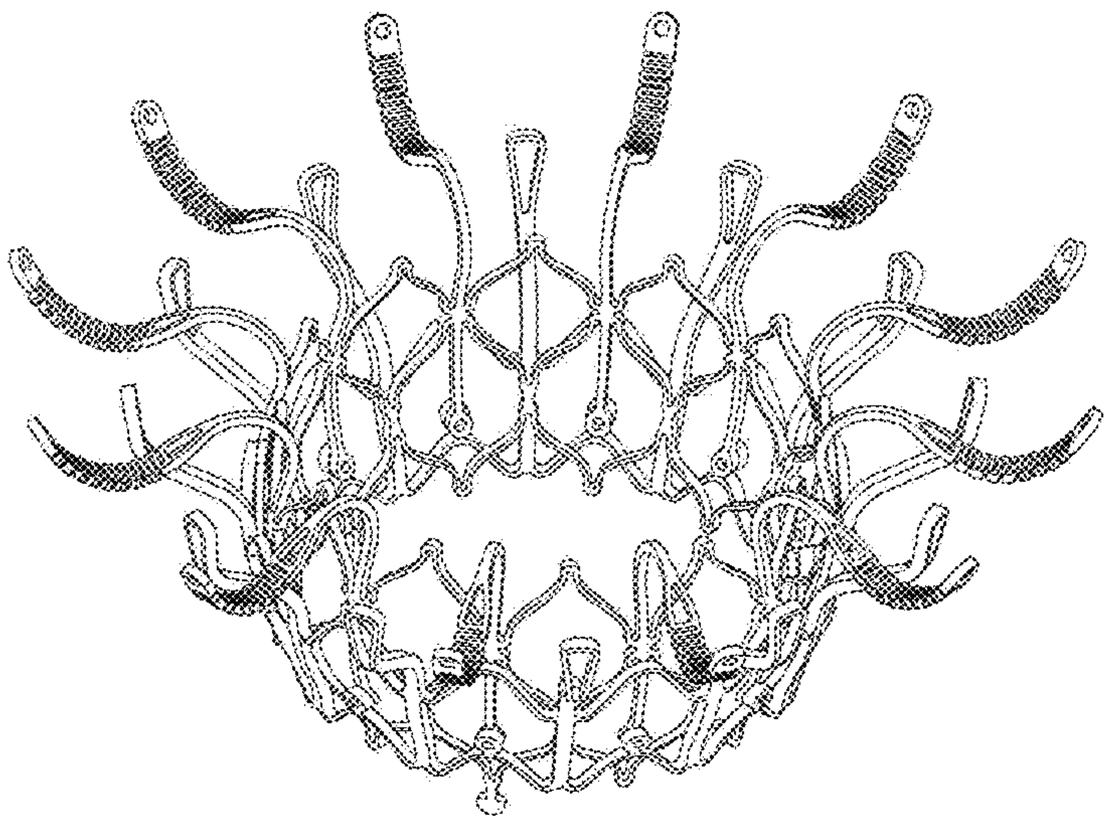
(57) **CLAIM**

The ornamental design for a prosthetic valve element, as shown and described.

DESCRIPTION

FIG. **1** is a perspective view from above of the prosthetic valve element embodying our new design;
FIG. **2** is a perspective view from the bottom thereof;
FIG. **3** is a front side view thereof, the right side, left side and rear side views appearing the same;
FIG. **4** is a bottom view thereof; and,
FIG. **5** is a top view thereof.

1 Claim, 5 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

6,332,893	B1	12/2001	Mortier et al.
6,350,278	B1	2/2002	Lenker et al.
6,352,561	B1	3/2002	Leopold et al.
6,391,036	B1	5/2002	Berg et al.
6,402,780	B2	6/2002	Williamson, IV et al.
6,409,755	B1	6/2002	Vrba
6,419,696	B1	7/2002	Ortiz et al.
6,428,550	B1	8/2002	Vargas et al.
6,440,164	B1	8/2002	DiMatteo et al.
6,458,153	B1	10/2002	Bailey et al.
6,511,491	B2	1/2003	Grudem et al.
6,530,952	B2	3/2003	Vesely
6,540,782	B1	4/2003	Snyders
6,551,350	B1	4/2003	Thornton et al.
6,558,396	B1	5/2003	Inoue
6,558,418	B2	5/2003	Carpentier et al.
6,569,196	B1	5/2003	Vesely
6,602,263	B1	8/2003	Swanson et al.
6,616,675	B1	9/2003	Evard et al.
6,652,556	B1	11/2003	VanTassel et al.
6,682,558	B2	1/2004	Tu et al.
6,699,256	B1	3/2004	Logan et al.
6,716,244	B2	4/2004	Klaco
6,719,781	B1	4/2004	Kim
6,730,118	B2	5/2004	Spenser et al.
6,767,362	B2	7/2004	Schreck
6,797,002	B2	9/2004	Spence et al.
6,821,297	B2	11/2004	Snyders
6,830,585	B1	12/2004	Artof et al.
6,830,638	B2	12/2004	Boylan et al.
6,893,460	B2	5/2005	Spenser et al.
6,960,217	B2	11/2005	Bolduc
6,964,684	B2	11/2005	Ortiz et al.
6,974,476	B2	12/2005	McGuckin, Jr. et al.
7,011,681	B2	3/2006	Vesely
7,018,406	B2	3/2006	Seguin et al.
7,041,132	B2	5/2006	Quijano et al.
7,077,861	B2	7/2006	Spence
7,101,395	B2	9/2006	Tremulis et al.
7,101,396	B2	9/2006	Artof et al.
7,137,184	B2	11/2006	Schreck
7,172,625	B2	2/2007	Shu et al.
7,198,646	B2	4/2007	Figulla et al.
7,201,772	B2	4/2007	Schwammenthal et al.
7,226,477	B2	6/2007	Cox
7,288,111	B1	10/2007	Holloway et al.
7,329,279	B2	2/2008	Haug et al.
7,335,213	B1	2/2008	Hyde et al.
7,351,256	B2	4/2008	Hojeibane et al.
7,374,573	B2	5/2008	Gabbay
7,377,938	B2	5/2008	Sarac et al.
7,381,218	B2	6/2008	Schreck
7,381,219	B2	6/2008	Salahieh et al.
7,404,824	B1	7/2008	Webler et al.
7,422,593	B2	9/2008	Lane
7,429,269	B2	9/2008	Schwammenthal et al.
7,442,204	B2	10/2008	Schwammenthal et al.
7,445,630	B2	11/2008	Lashinski et al.
7,455,677	B2	11/2008	Vargas et al.
7,455,688	B2	11/2008	Furst et al.
7,462,162	B2	12/2008	Phan et al.
7,481,838	B2	1/2009	Carpentier et al.
7,510,575	B2	3/2009	Spenser et al.
7,513,909	B2	4/2009	Lane et al.
7,524,331	B2	4/2009	Birdsall
7,527,646	B2	5/2009	Rahdert et al.
7,556,646	B2	7/2009	Yang et al.
7,582,111	B2	9/2009	Krolik et al.
7,585,321	B2	9/2009	Cribier
7,597,711	B2	10/2009	Drews et al.
7,611,534	B2	11/2009	Kapadia et al.
7,621,948	B2	11/2009	Herrmann et al.
7,625,403	B2	12/2009	Krivoruchko
7,632,302	B2	12/2009	Vreeman et al.
7,648,528	B2	1/2010	Styrc
7,682,380	B2	3/2010	Thornton et al.
7,708,775	B2	5/2010	Rowe et al.
7,717,952	B2	5/2010	Case et al.
7,717,955	B2	5/2010	Lane et al.
7,731,741	B2	6/2010	Eidenschink
7,748,389	B2	7/2010	Salahieh et al.
7,753,922	B2	7/2010	Starksen
7,758,595	B2	7/2010	Allen et al.
7,758,632	B2	7/2010	Hojeibane et al.
7,758,640	B2	7/2010	Vesely
7,771,467	B2	8/2010	Svensson
7,771,469	B2	8/2010	Liddicoat
7,776,083	B2	8/2010	Vesely
7,780,726	B2	8/2010	Seguin
7,799,069	B2	9/2010	Bailey et al.
7,803,181	B2	9/2010	Furst et al.
7,811,316	B2	10/2010	Kalmann et al.
7,824,442	B2	11/2010	Salahieh et al.
7,837,727	B2	11/2010	Goetz et al.
7,842,081	B2	11/2010	Yadin
7,850,725	B2	12/2010	Vardi et al.
7,871,432	B2	1/2011	Bergin
7,871,436	B2	1/2011	Ryan et al.
7,887,583	B2	2/2011	Macoviak
7,892,281	B2	2/2011	Seguin et al.
7,896,915	B2	3/2011	Guyenot et al.
7,914,544	B2	3/2011	Nguyen et al.
7,914,569	B2	3/2011	Nguyen et al.
7,927,370	B2	4/2011	Webler et al.
7,942,927	B2	5/2011	Kaye et al.
7,947,072	B2	5/2011	Yang et al.
7,947,075	B2	5/2011	Goetz et al.
7,955,375	B2	6/2011	Agnew
7,955,377	B2	6/2011	Melsheimer
7,955,384	B2	6/2011	Rafiee et al.
7,959,666	B2	6/2011	Salahieh et al.
7,959,672	B2	6/2011	Salahieh et al.
7,967,833	B2	6/2011	Sterman et al.
7,967,857	B2	6/2011	Lane
7,981,151	B2	7/2011	Rowe
7,981,153	B2	7/2011	Fogarty et al.
7,992,567	B2	8/2011	Hirotsuka et al.
7,993,393	B2	8/2011	Carpentier et al.
8,002,825	B2	8/2011	Letac et al.
8,002,826	B2	8/2011	Seguin
8,016,877	B2	9/2011	Seguin et al.
8,016,882	B2	9/2011	Macoviak et al.
8,021,420	B2	9/2011	Dolan
8,021,421	B2	9/2011	Fogarty et al.
8,025,695	B2	9/2011	Fogarty et al.
8,029,518	B2	10/2011	Goldfarb et al.
8,029,564	B2	10/2011	Johnson et al.
8,034,104	B2	10/2011	Carpentier et al.
8,043,360	B2	10/2011	McNamara et al.
8,048,138	B2	11/2011	Sullivan et al.
8,048,140	B2	11/2011	Purdy
8,048,153	B2	11/2011	Salahieh et al.
8,052,741	B2	11/2011	Bruszewski et al.
8,052,749	B2	11/2011	Salahieh et al.
8,057,493	B2	11/2011	Goldfarb et al.
8,057,532	B2	11/2011	Hoffman
8,057,540	B2	11/2011	Letac et al.
8,062,355	B2	11/2011	Figulla et al.
8,062,359	B2	11/2011	Marquez et al.
8,070,708	B2	12/2011	Rottenberg et al.
8,070,800	B2	12/2011	Lock et al.
8,070,802	B2	12/2011	Lamphere et al.
8,070,804	B2	12/2011	Hyde et al.
8,075,611	B2	12/2011	Millwee et al.
8,080,054	B2	12/2011	Rowe
8,083,793	B2	12/2011	Lane et al.
D652,927	S *	1/2012	Braido A61F 2/91 D24/155
D653,341	S *	1/2012	Braido A61F 2/91 D24/155
8,092,518	B2	1/2012	Schreck
8,092,520	B2	1/2012	Quadri
8,092,521	B2	1/2012	Figulla et al.
8,105,377	B2	1/2012	Liddicoat

(56) **References Cited**

U.S. PATENT DOCUMENTS

8,109,996	B2	2/2012	Stacchino et al.	
8,118,866	B2	2/2012	Herrmann et al.	
8,133,270	B2	3/2012	Kheradvar et al.	
8,136,218	B2	3/2012	Millwee et al.	
8,137,398	B2	3/2012	Tuval et al.	
8,142,492	B2	3/2012	Forster et al.	
8,142,494	B2	3/2012	Rahdert et al.	
8,142,496	B2	3/2012	Berreklouw	
8,142,497	B2	3/2012	Friedman	
8,147,504	B2	4/2012	Ino et al.	
8,157,852	B2	4/2012	Bloom et al.	
8,157,853	B2	4/2012	Laske et al.	
8,157,860	B2	4/2012	McNamara et al.	
8,163,008	B2	4/2012	Wilson et al.	
8,163,014	B2	4/2012	Lane et al.	
D660,433	S *	5/2012	Braido	A61F 2/91 D24/155
D660,967	S *	5/2012	Braido	A61F 2/91 D24/155
8,167,894	B2	5/2012	Miles et al.	
8,167,932	B2	5/2012	Bourang et al.	
8,167,935	B2	5/2012	McGuckin, Jr. et al.	
8,172,896	B2	5/2012	McNamara et al.	
8,172,898	B2	5/2012	Alferness et al.	
8,177,836	B2	5/2012	Lee et al.	
8,182,528	B2	5/2012	Salahieh et al.	
8,211,169	B2	7/2012	Lane et al.	
8,216,301	B2	7/2012	Bonhoeffer et al.	
8,221,492	B2	7/2012	Case et al.	
8,221,493	B2	7/2012	Boyle et al.	
8,226,710	B2	7/2012	Nguyen et al.	
8,231,670	B2	7/2012	Salahieh et al.	
8,236,045	B2	8/2012	Benichou et al.	
8,236,049	B2	8/2012	Rowe et al.	
8,252,042	B2	8/2012	McNamara et al.	
8,252,051	B2	8/2012	Chau et al.	
8,252,052	B2	8/2012	Salahieh et al.	
8,257,390	B2	9/2012	Carley et al.	
8,267,988	B2	9/2012	Hamer et al.	
8,277,501	B2	10/2012	Chalekian et al.	
8,287,591	B2	10/2012	Keidar et al.	
8,298,280	B2	10/2012	Yadin et al.	
8,303,653	B2	11/2012	Bonhoeffer et al.	
8,308,798	B2	11/2012	Pintor et al.	
8,317,853	B2	11/2012	Agnew	
8,317,855	B2	11/2012	Gregorich et al.	
8,323,335	B2	12/2012	Rowe et al.	
8,326,868	B2	12/2012	Paul et al.	
8,337,541	B2	12/2012	Quadri et al.	
8,343,174	B2	1/2013	Goldfarb et al.	
8,343,213	B2	1/2013	Salahieh et al.	
8,348,999	B2	1/2013	Kheradvar et al.	
8,366,767	B2	2/2013	Zhang	
8,372,140	B2	2/2013	Hoffman et al.	
8,377,119	B2	2/2013	Drews et al.	
8,398,708	B2	3/2013	Meiri et al.	
8,403,981	B2	3/2013	Forster et al.	
8,403,983	B2	3/2013	Quadri et al.	
8,408,214	B2	4/2013	Spenser	
8,414,644	B2	4/2013	Quadri et al.	
8,425,593	B2	4/2013	Braido et al.	
8,430,934	B2	4/2013	Das	
8,444,689	B2	5/2013	Zhang	
8,449,599	B2	5/2013	Chau et al.	
8,449,625	B2	5/2013	Campbell et al.	
8,454,686	B2	6/2013	Alkhatib	
8,460,365	B2	6/2013	Haverkost et al.	
8,512,400	B2	8/2013	Tran et al.	
8,539,662	B2	9/2013	Stacchino et al.	
8,540,767	B2	9/2013	Zhang	
8,545,544	B2	10/2013	Spenser et al.	
8,551,160	B2	10/2013	Figulla et al.	
8,551,161	B2	10/2013	Dolan	
8,562,672	B2	10/2013	Bonhoeffer et al.	
8,579,964	B2	11/2013	Lane et al.	
8,579,965	B2	11/2013	Bonhoeffer et al.	
8,585,755	B2	11/2013	Chau et al.	
8,585,756	B2	11/2013	Bonhoeffer et al.	
8,591,570	B2	11/2013	Revuelta et al.	
8,623,075	B2	1/2014	Murray, III et al.	
8,623,080	B2	1/2014	Fogarty et al.	
8,623,570	B2	1/2014	Seguin	
8,628,569	B2	1/2014	Benichou et al.	
8,628,571	B1	1/2014	Hacohen et al.	
8,652,203	B2	2/2014	Quadri et al.	
8,652,204	B2	2/2014	Quill et al.	
8,663,322	B2	3/2014	Keranen	
8,679,174	B2	3/2014	Ottma et al.	
8,685,086	B2	4/2014	Navia et al.	
8,696,742	B2	4/2014	Pintor et al.	
8,728,155	B2	5/2014	Montorfano et al.	
8,734,507	B2	5/2014	Keranen	
8,747,460	B2	6/2014	Tuval et al.	
8,771,345	B2	7/2014	Tuval et al.	
8,784,472	B2	7/2014	Eidenschink	
8,784,479	B2	7/2014	Antonsson et al.	
8,784,481	B2 *	7/2014	Alkhatib	A61F 2/2418 623/2.18
8,795,355	B2	8/2014	Alkhatib	
8,795,356	B2	8/2014	Quadri et al.	
8,795,357	B2	8/2014	Yohanan et al.	
8,801,776	B2	8/2014	House et al.	
8,808,366	B2	8/2014	Braido et al.	
8,840,663	B2	9/2014	Salahieh et al.	
8,840,664	B2	9/2014	Karapetian et al.	
8,845,722	B2	9/2014	Gabbay	
8,852,261	B2	10/2014	White	
8,852,272	B2	10/2014	Gross et al.	
8,870,948	B1	10/2014	Erzberger et al.	
8,870,949	B2	10/2014	Rowe	
8,870,950	B2	10/2014	Hacohen	
8,894,702	B2	11/2014	Quadri et al.	
8,900,294	B2	12/2014	Paniagua et al.	
8,900,295	B2	12/2014	Migliazza et al.	
8,906,083	B2	12/2014	Obermiller et al.	
8,911,455	B2	12/2014	Quadri et al.	
8,911,489	B2	12/2014	Ben-Muvhar	
8,911,493	B2	12/2014	Rowe et al.	
8,932,343	B2	1/2015	Alkhatib et al.	
8,961,595	B2	2/2015	Alkhatib	
8,979,922	B2	3/2015	Jayasinghe et al.	
8,986,370	B2	3/2015	Annest	
8,986,373	B2	3/2015	Chau et al.	
8,986,375	B2 *	3/2015	Garde	A61F 2/2403 623/1.26
8,992,599	B2	3/2015	Thubrikar et al.	
8,992,604	B2	3/2015	Gross et al.	
8,992,608	B2	3/2015	Haug et al.	
8,998,982	B2	4/2015	Richter et al.	
9,005,273	B2	4/2015	Salahieh et al.	
9,011,527	B2	4/2015	Li et al.	
9,017,399	B2	4/2015	Gross et al.	
D730,520	S *	5/2015	Braido	D24/155
D730,521	S *	5/2015	Braido	D24/155
9,023,100	B2	5/2015	Quadri et al.	
9,034,032	B2	5/2015	McLean et al.	
9,034,033	B2	5/2015	McLean et al.	
9,039,757	B2	5/2015	McLean et al.	
D732,666	S *	6/2015	Nguyen	A61F 2/2412 D24/155
9,050,188	B2	6/2015	Schweich, Jr. et al.	
9,072,603	B2	7/2015	Tuval et al.	
9,084,676	B2	7/2015	Chau et al.	
9,125,738	B2	9/2015	Figulla et al.	
9,125,740	B2	9/2015	Morriss et al.	
9,132,006	B2	9/2015	Spenser et al.	
9,132,009	B2	9/2015	Hacohen et al.	
9,138,312	B2	9/2015	Tuval et al.	
9,173,738	B2	11/2015	Murray, III et al.	
9,220,594	B2	12/2015	Braido et al.	
9,226,820	B2	1/2016	Braido et al.	
9,226,839	B1	1/2016	Kariniemi et al.	
9,232,995	B2	1/2016	Kovalsky et al.	
9,241,791	B2	1/2016	Braido et al.	

(56) **References Cited**

U.S. PATENT DOCUMENTS

9,241,794	B2	1/2016	Braido et al.	
9,248,014	B2	2/2016	Lane et al.	
9,289,290	B2	3/2016	Alkhatib et al.	
9,289,291	B2	3/2016	Gorman, III et al.	
9,295,550	B2	3/2016	Nguyen et al.	
9,295,552	B2	3/2016	McLean et al.	
9,301,836	B2	4/2016	Buchbinder et al.	
D755,384	S *	5/2016	Pesce	D24/155
9,326,852	B2	5/2016	Spenser	
9,387,078	B2	7/2016	Gross et al.	
9,427,316	B2	8/2016	Schweich, Jr. et al.	
2001/0021872	A1	9/2001	Bailey et al.	
2001/0056295	A1	12/2001	Solem	
2002/0032481	A1	3/2002	Gabbay	
2002/0099436	A1	7/2002	Thornton et al.	
2002/0151970	A1	10/2002	Garrison et al.	
2003/0036791	A1	2/2003	Philipp et al.	
2003/0074052	A1	4/2003	Besselink	
2003/0083742	A1	5/2003	Spence et al.	
2003/0105519	A1	6/2003	Fasol et al.	
2003/0158578	A1	8/2003	Pantages et al.	
2004/0010272	A1	1/2004	Manetakis et al.	
2004/0039414	A1	2/2004	Carley et al.	
2004/0093060	A1	5/2004	Seguin et al.	
2004/0122503	A1	6/2004	Campbell et al.	
2004/0122514	A1	6/2004	Fogarty et al.	
2004/0143315	A1	7/2004	Bruun et al.	
2004/0176839	A1	9/2004	Huynh et al.	
2004/0186565	A1	9/2004	Schreck	
2004/0186566	A1	9/2004	Hindrichs et al.	
2004/0210244	A1	10/2004	Vargas et al.	
2004/0220593	A1	11/2004	Greenhalgh	
2004/0225354	A1	11/2004	Allen et al.	
2004/0249433	A1	12/2004	Freitag	
2004/0260389	A1	12/2004	Case et al.	
2004/0260394	A1	12/2004	Douk et al.	
2005/0004668	A1	1/2005	Aklog et al.	
2005/0021056	A1	1/2005	St. Goar et al.	
2005/0038494	A1	2/2005	Eidenschink	
2005/0055066	A1	3/2005	Stobie	
2005/0075731	A1	4/2005	Artof et al.	
2005/0080430	A1	4/2005	Wright, Jr. et al.	
2005/0137686	A1	6/2005	Salahieh et al.	
2005/0137688	A1	6/2005	Salahieh et al.	
2005/0137689	A1	6/2005	Salahieh et al.	
2005/0137690	A1	6/2005	Salahieh et al.	
2005/0137695	A1	6/2005	Salahieh et al.	
2005/0143809	A1	6/2005	Salahieh et al.	
2005/0154443	A1	7/2005	Linder et al.	
2005/0182486	A1	8/2005	Gabbay	
2005/0197695	A1	9/2005	Stacchino et al.	
2005/0203549	A1	9/2005	Realyvasquez	
2005/0216079	A1	9/2005	MaCoviak	
2005/0234508	A1	10/2005	Cummins et al.	
2005/0240200	A1	10/2005	Bergheim	
2005/0251251	A1	11/2005	Cribier	
2005/0267573	A9	12/2005	Macoviak et al.	
2006/0015171	A1	1/2006	Armstrong	
2006/0020333	A1	1/2006	Lashinski et al.	
2006/0047297	A1	3/2006	Case	
2006/0089627	A1	4/2006	Burnett et al.	
2006/0135964	A1	6/2006	Vesely	
2006/0178700	A1	8/2006	Quinn	
2006/0178740	A1	8/2006	Stacchino et al.	
2006/0190036	A1	8/2006	Wendel et al.	
2006/0190038	A1	8/2006	Carley et al.	
2006/0195183	A1	8/2006	Navia et al.	
2006/0195184	A1	8/2006	Lane et al.	
2006/0201519	A1	9/2006	Frazier et al.	
2006/0212111	A1	9/2006	Case et al.	
2006/0241656	A1	10/2006	Starksen et al.	
2006/0241748	A1	10/2006	Lee et al.	
2006/0247680	A1	11/2006	Amplatz et al.	
2006/0253191	A1	11/2006	Salahieh et al.	
2006/0259136	A1	11/2006	Nguyen et al.	
2006/0259137	A1	11/2006	Artof et al.	
2006/0271166	A1	11/2006	Thill et al.	
2006/0271171	A1	11/2006	McQuinn et al.	
2006/0287719	A1	12/2006	Rowe et al.	
2007/0016288	A1	1/2007	Gurskis et al.	
2007/0027549	A1	2/2007	Godin	
2007/0038295	A1	2/2007	Case et al.	
2007/0043435	A1	2/2007	Seguin et al.	
2007/0055340	A1	3/2007	Pryor	
2007/0112422	A1	5/2007	Dehdashtian	
2007/0118151	A1	5/2007	Davidson	
2007/0162103	A1	7/2007	Case et al.	
2007/0162107	A1	7/2007	Haug et al.	
2007/0162111	A1	7/2007	Fukamachi et al.	
2007/0173932	A1	7/2007	Cali et al.	
2007/0198077	A1	8/2007	Cully et al.	
2007/0198097	A1	8/2007	Zegdi	
2007/0213813	A1	9/2007	Von Segesser et al.	
2007/0225759	A1	9/2007	Thommen et al.	
2007/0225760	A1	9/2007	Moszner et al.	
2007/0233186	A1	10/2007	Meng	
2007/0233237	A1	10/2007	Krivoruchko	
2007/0239272	A1	10/2007	Navia et al.	
2007/0255400	A1	11/2007	Parravicini et al.	
2008/0004688	A1	1/2008	Spenser et al.	
2008/0004697	A1	1/2008	Lichtenstein et al.	
2008/0051703	A1	2/2008	Thornton et al.	
2008/0071363	A1	3/2008	Tuval et al.	
2008/0071366	A1	3/2008	Tuval et al.	
2008/0071369	A1	3/2008	Tuval et al.	
2008/0077235	A1	3/2008	Kirson	
2008/0082083	A1	4/2008	Forde et al.	
2008/0086164	A1	4/2008	Rowe	
2008/0086204	A1	4/2008	Rankin	
2008/0097595	A1	4/2008	Gabbay	
2008/0140003	A1	6/2008	Bei et al.	
2008/0161910	A1	7/2008	Revuelta et al.	
2008/0167705	A1	7/2008	Agnew	
2008/0167714	A1	7/2008	St. Goar et al.	
2008/0188929	A1	8/2008	Schreck	
2008/0195200	A1	8/2008	Vidlund et al.	
2008/0208332	A1	8/2008	Lamphere et al.	
2008/0221672	A1	9/2008	Lamphere et al.	
2008/0234814	A1	9/2008	Salahieh et al.	
2008/0243245	A1	10/2008	Thambar et al.	
2008/0255580	A1	10/2008	Hoffman et al.	
2008/0262609	A1	10/2008	Gross et al.	
2008/0281411	A1	11/2008	Berreklouw	
2008/0294234	A1	11/2008	Hartley et al.	
2009/0005863	A1	1/2009	Goetz et al.	
2009/0054969	A1	2/2009	Salahieh et al.	
2009/0099650	A1	4/2009	Bolduc et al.	
2009/0112159	A1	4/2009	Slattery et al.	
2009/0171363	A1	7/2009	Chocron	
2009/0177278	A1	7/2009	Spence	
2009/0210052	A1	8/2009	Forster et al.	
2009/0222081	A1	9/2009	Linder et al.	
2009/0241656	A1	10/2009	Jacquemin	
2009/0264994	A1	10/2009	Saadat	
2009/0287304	A1	11/2009	Dahlgren et al.	
2009/0299449	A1	12/2009	Styrc	
2009/0306768	A1	12/2009	Quadri	
2009/0319037	A1	12/2009	Rowe et al.	
2010/0023117	A1	1/2010	Yoganathan et al.	
2010/0036479	A1	2/2010	Hill et al.	
2010/0076548	A1	3/2010	Konno	
2010/0114299	A1	5/2010	Muvhar et al.	
2010/0131054	A1	5/2010	Tuval et al.	
2010/0137979	A1	6/2010	Tuval et al.	
2010/0160958	A1	6/2010	Clark	
2010/0161036	A1	6/2010	Pintor et al.	
2010/0161042	A1	6/2010	Maisano et al.	
2010/0174363	A1	7/2010	Castro	
2010/0179643	A1	7/2010	Shalev	
2010/0179648	A1	7/2010	Richter et al.	
2010/0179649	A1	7/2010	Richter et al.	
2010/0217382	A1	8/2010	Chau et al.	
2010/0222810	A1	9/2010	DeBeer et al.	
2010/0228285	A1	9/2010	Miles et al.	

(56) **References Cited**

U.S. PATENT DOCUMENTS

2010/0234940 A1 9/2010 Dolan
2010/0249908 A1 9/2010 Chau et al.
2010/0249917 A1 9/2010 Zhang
2010/0262232 A1 10/2010 Annest
2010/0280603 A1 11/2010 Maisano et al.
2010/0280606 A1 11/2010 Naor
2010/0324595 A1 12/2010 Linder et al.
2011/0004296 A1 1/2011 Lutter et al.
2011/0015729 A1 1/2011 Jimenez et al.
2011/0015731 A1 1/2011 Carpentier et al.
2011/0022165 A1 1/2011 Oba et al.
2011/0040374 A1 2/2011 Goetz et al.
2011/0040375 A1 2/2011 Letac et al.
2011/0046662 A1 2/2011 Moszner et al.
2011/0054466 A1 3/2011 Rothstein et al.
2011/0054596 A1 3/2011 Taylor
2011/0054598 A1 3/2011 Johnson
2011/0071626 A1 3/2011 Wright et al.
2011/0077730 A1 3/2011 Fenster
2011/0082538 A1 4/2011 Dahlgren et al.
2011/0087322 A1 4/2011 Letac et al.
2011/0093063 A1 4/2011 Schreck
2011/0098525 A1 4/2011 Kermode et al.
2011/0106247 A1 5/2011 Miller et al.
2011/0112625 A1 5/2011 Ben-Muvhar et al.
2011/0112632 A1 5/2011 Chau et al.
2011/0118830 A1 5/2011 Liddicoat et al.
2011/0125257 A1 5/2011 Seguin et al.
2011/0125258 A1 5/2011 Centola
2011/0137326 A1 6/2011 Bachman
2011/0137397 A1 6/2011 Chau et al.
2011/0137409 A1 6/2011 Yang et al.
2011/0137410 A1 6/2011 Hacohen
2011/0166636 A1 7/2011 Rowe
2011/0172784 A1 7/2011 Richter et al.
2011/0178597 A9 7/2011 Navia et al.
2011/0184510 A1 7/2011 Maisano et al.
2011/0190877 A1 8/2011 Lane et al.
2011/0190879 A1 8/2011 Bobo et al.
2011/0202076 A1 8/2011 Richter
2011/0208283 A1 8/2011 Rust
2011/0208293 A1 8/2011 Tabor
2011/0208298 A1 8/2011 Tuval et al.
2011/0213461 A1 9/2011 Seguin et al.
2011/0218619 A1 9/2011 Benichou et al.
2011/0218620 A1 9/2011 Meiri et al.
2011/0224785 A1 9/2011 Hacohen
2011/0238159 A1 9/2011 Guyenot et al.
2011/0245911 A1 10/2011 Quill et al.
2011/0245917 A1 10/2011 Savage et al.
2011/0251675 A1 10/2011 Dwork
2011/0251676 A1 10/2011 Sweeney et al.
2011/0251678 A1 10/2011 Eidenschink et al.
2011/0251679 A1 10/2011 Wiemeyer et al.
2011/0251680 A1 10/2011 Tran et al.
2011/0251682 A1 10/2011 Murray, III et al.
2011/0251683 A1 10/2011 Tabor
2011/0257721 A1 10/2011 Tabor
2011/0257729 A1 10/2011 Spenser et al.
2011/0257736 A1 10/2011 Marquez et al.
2011/0257737 A1 10/2011 Fogarty et al.
2011/0264191 A1 10/2011 Rothstein
2011/0264196 A1* 10/2011 Savage A61F 2/2418 623/1.26
2011/0264198 A1 10/2011 Murray, III et al.
2011/0264199 A1 10/2011 Tran et al.
2011/0264200 A1 10/2011 Tran et al.
2011/0264201 A1 10/2011 Yeung et al.
2011/0264202 A1 10/2011 Murray, III et al.
2011/0264203 A1 10/2011 Dwork et al.
2011/0264206 A1 10/2011 Tabor
2011/0264208 A1 10/2011 Duffy et al.
2011/0270276 A1 11/2011 Rothstein et al.
2011/0271967 A1 11/2011 Mortier et al.
2011/0282438 A1 11/2011 Drews et al.
2011/0282439 A1 11/2011 Thill et al.
2011/0282440 A1 11/2011 Cao et al.
2011/0283514 A1 11/2011 Fogarty et al.
2011/0288634 A1 11/2011 Tuval et al.
2011/0295363 A1 12/2011 Girard et al.
2011/0301688 A1 12/2011 Dolan
2011/0301701 A1 12/2011 Padala et al.
2011/0301702 A1 12/2011 Rust et al.
2011/0313452 A1 12/2011 Carley et al.
2011/0319989 A1 12/2011 Lane et al.
2011/0319991 A1 12/2011 Hariton et al.
2012/0010694 A1 1/2012 Lutter et al.
2012/0022633 A1 1/2012 Olson et al.
2012/0022637 A1 1/2012 Ben-Muvhar
2012/0022639 A1 1/2012 Hacohen et al.
2012/0022640 A1 1/2012 Gross et al.
2012/0035703 A1 2/2012 Lutter et al.
2012/0035713 A1 2/2012 Lutter et al.
2012/0035722 A1 2/2012 Tuval
2012/0041547 A1 2/2012 Duffy et al.
2012/0041551 A1 2/2012 Spenser et al.
2012/0046738 A1 2/2012 Lau et al.
2012/0046742 A1 2/2012 Tuval et al.
2012/0053682 A1 3/2012 Kovalsky et al.
2012/0053688 A1 3/2012 Fogarty et al.
2012/0059454 A1 3/2012 Millwee et al.
2012/0078353 A1 3/2012 Quadri et al.
2012/0078357 A1 3/2012 Conklin
2012/0083832 A1 4/2012 Delaloye et al.
2012/0083839 A1 4/2012 Letac et al.
2012/0083879 A1 4/2012 Eberhardt et al.
2012/0089223 A1 4/2012 Nguyen et al.
2012/0101570 A1 4/2012 Tuval et al.
2012/0101572 A1 4/2012 Kovalsky et al.
2012/0123511 A1 5/2012 Brown
2012/0123530 A1 5/2012 Carpentier et al.
2012/0130473 A1 5/2012 Norris et al.
2012/0130474 A1 5/2012 Buckley
2012/0130475 A1 5/2012 Shaw
2012/0136434 A1 5/2012 Carpentier et al.
2012/0150218 A1 6/2012 Sandgren et al.
2012/0165915 A1 6/2012 Melsheimer et al.
2012/0179244 A1 7/2012 Schankereli et al.
2012/0197292 A1 8/2012 Chin-Chen et al.
2012/0283824 A1 11/2012 Lutter et al.
2012/0290062 A1 11/2012 McNamara et al.
2012/0296360 A1 11/2012 Norris et al.
2012/0310328 A1 12/2012 Olson et al.
2012/0323316 A1 12/2012 Chau et al.
2012/0330408 A1 12/2012 Hillukka et al.
2013/0006347 A1 1/2013 McHugo
2013/0018450 A1 1/2013 Hunt
2013/0035759 A1 2/2013 Gross et al.
2013/0041451 A1 2/2013 Patterson et al.
2013/0116780 A1 5/2013 Miller et al.
2013/0123896 A1 5/2013 Bloss et al.
2013/0123900 A1 5/2013 Eblacas et al.
2013/0150945 A1 6/2013 Crawford et al.
2013/0158647 A1 6/2013 Norris et al.
2013/0166017 A1 6/2013 Cartledge et al.
2013/0166022 A1 6/2013 Conklin
2013/0172978 A1 7/2013 Vidlund et al.
2013/0172992 A1 7/2013 Gross et al.
2013/0211501 A1 8/2013 Buckley et al.
2013/0245742 A1 9/2013 Norris
2013/0261737 A1 10/2013 Costello
2013/0297013 A1 11/2013 Klima et al.
2013/0304197 A1 11/2013 Buchbinder et al.
2013/0310928 A1 11/2013 Morriss et al.
2013/0325114 A1 12/2013 McLean et al.
2013/0331929 A1 12/2013 Mitra et al.
2014/0005778 A1 1/2014 Buchbinder et al.
2014/0018911 A1 1/2014 Zhou et al.
2014/0031928 A1 1/2014 Murphy et al.
2014/0046430 A1 2/2014 Shaw
2014/0052237 A1 2/2014 Lane
2014/0067054 A1 3/2014 Chau et al.
2014/0081376 A1 3/2014 Burkart et al.
2014/0106951 A1 4/2014 Brandon

(56) **References Cited**

U.S. PATENT DOCUMENTS

2014/0120287	A1	5/2014	Jacoby et al.	
2014/0121763	A1	5/2014	Duffy et al.	
2014/0135894	A1	5/2014	Norris et al.	
2014/0135895	A1	5/2014	Andress et al.	
2014/0142681	A1	5/2014	Norris	
2014/0148891	A1	5/2014	Johnson	
2014/0163690	A1	6/2014	White	
2014/0172069	A1	6/2014	Roeder et al.	
2014/0188210	A1	7/2014	Beard et al.	
2014/0194981	A1*	7/2014	Menk	A61F 2/2418 623/2.17
2014/0194983	A1	7/2014	Kovalsky et al.	
2014/0207231	A1	7/2014	Hacohen et al.	
2014/0214159	A1	7/2014	Vidlund et al.	
2014/0222136	A1	8/2014	Geist et al.	
2014/0222163	A1	8/2014	Xu et al.	
2014/0249622	A1	9/2014	Carmi et al.	
2014/0257467	A1	9/2014	Lane et al.	
2014/0257475	A1	9/2014	Gross et al.	
2014/0257476	A1	9/2014	Montorfano et al.	
2014/0277358	A1	9/2014	Slazas	
2014/0277409	A1	9/2014	Bortlein et al.	
2014/0324164	A1	10/2014	Gross et al.	
2014/0343670	A1	11/2014	Bakis et al.	
2014/0358224	A1	12/2014	Tegels et al.	
2014/0379065	A1	12/2014	Johnson et al.	
2014/0379074	A1	12/2014	Spence et al.	
2014/0379076	A1	12/2014	Vidlund et al.	
2015/0018944	A1*	1/2015	O'Connell	A61F 2/2427 623/2.42
2015/0045881	A1	2/2015	Lim	
2015/0094802	A1	4/2015	Buchbinder et al.	
2015/0127097	A1	5/2015	Neumann et al.	
2015/0142103	A1	5/2015	Vidlund	
2015/0164640	A1	6/2015	McLean et al.	
2015/0173896	A1	6/2015	Richter et al.	
2015/0173897	A1	6/2015	Raanani et al.	
2015/0216661	A1	8/2015	Hacohen et al.	
2015/0272730	A1	10/2015	Melnick et al.	
2015/0327994	A1	11/2015	Morriss et al.	
2015/0328000	A1	11/2015	Ratz et al.	
2016/0095700	A1	4/2016	Righini	
2016/0106539	A1	4/2016	Buchbinder et al.	
2016/0310274	A1	10/2016	Gross et al.	
2016/0324633	A1	11/2016	Gross et al.	

FOREIGN PATENT DOCUMENTS

WO	00/47139	A1	8/2000
WO	01/62189	A1	8/2001
WO	01/87190	A2	11/2001
WO	03/028558	A2	4/2003
WO	2006/054930	A1	5/2006
WO	2006/070372	A2	7/2006
WO	2006/089236	A1	8/2006
WO	200/013915	A3	1/2008
WO	2008/029296	A2	3/2008
WO	2008/103722	A2	8/2008
WO	2009/033469	A1	3/2009
WO	2009/053497	A1	4/2009
WO	2010/006627	A1	1/2010
WO	2010/073246	A2	7/2010
WO	2010/081033	A1	7/2010
WO	2011/069048	A2	6/2011
WO	2011/106137	A1	9/2011
WO	2011/111047	A2	9/2011
WO	2011/143263	A2	11/2011
WO	2011137531	A1	11/2011
WO	2011/154942	A2	12/2011
WO	2012/011108	A2	1/2012
WO	2012/127309	A1	9/2012
WO	2012/177942	A2	12/2012
WO	2013/021374	A2	2/2013
WO	2013/021375	A2	2/2013
WO	2013/021384	A1	2/2013
WO	2013/059747	A1	4/2013
WO	2013/078497	A1	6/2013
WO	2013/128436	A1	9/2013
WO	2014/022124	A1	2/2014
WO	2014/0145338	A1	9/2014
WO	2014/164364	A1	10/2014
WO	2015/173794	A1	11/2015
WO	2016/093877	A1	6/2016

OTHER PUBLICATIONS

USPTO FOA dated Feb. 15, 2013 in connection with U.S. Appl. No. 12/840,463.
USPTO NFOA dated Nov. 8, 2013 in connection with U.S. Appl. No. 12/840,463.
USPTO NFOA dated Jun. 4, 2014 in connection with U.S. Appl. No. 12/840,463.
USPTO FOA dated Mar. 25, 2015 in connection with U.S. Appl. No. 12/840,463.
USPTO NOA dated May 5, 2015 in connection with U.S. Appl. No. 12/840,463.
USPTO RR dated Aug. 14, 2012 in connection with U.S. Appl. No. 12/961,721.
USPTO NFOA dated Nov. 28, 2012 in connection with U.S. Appl. No. 12/961,721.
USPTO FOA dated Jul. 23, 2013 in connection with U.S. Appl. No. 12/961,721.
USPTO NFOA dated Jun. 17, 2014 in connection with U.S. Appl. No. 12/961,721.
USPTO RR dated Jul. 2, 2012 in connection with U.S. Appl. No. 13/033,852.
USPTO NFOA dated Nov. 23, 2012 in connection with U.S. Appl. No. 13/033,852.
USPTO NFOA dated Aug. 2, 2013 in connection with U.S. Appl. No. 13/033,852.
USPTO FOA dated Feb. 10, 2014 in connection with U.S. Appl. No. 13/033,852.
USPTO NFOA dated Jul. 3, 2014 in connection with U.S. Appl. No. 13/033,852.
USPTO NOA dated Feb. 11, 2015 in connection with U.S. Appl. No. 13/033,852.
USPTO RR dated Aug. 13, 2012 in connection with U.S. Appl. No. 13/044,694.
USPTO NFOA dated Dec. 31, 2012 in connection with U.S. Appl. No. 13/044,694.
USPTO FOA dated Jul. 18, 2013 in connection with U.S. Appl. No. 13/044,694.
USPTO NFOA dated Sep. 19, 2014 in connection with U.S. Appl. No. 13/044,694.
USPTO NFOA dated Feb. 6, 2013 in connection with U.S. Appl. No. 13/412,814.
USPTO NFOA dated Sep. 12, 2013 in connection with U.S. Appl. No. 13/412,814.
USPTO FOA dated May 23, 2014 in connection with U.S. Appl. No. 13/412,814.
USPTO NOA dated Aug. 15, 2014 in connection with U.S. Appl. No. 13/412,814.
USPTO RR dated Feb. 3, 2014 in connection with U.S. Appl. No. 13/811,308.
USPTO NFOA dated Jul. 2, 2014 in connection with U.S. Appl. No. 13/811,308.
USPTO NOA dated Mar. 10, 2015 in connection with U.S. Appl. No. 13/811,308.
USPTO RR dated Jan. 20, 2016 in connection with U.S. Appl. No. 14/161,921.
USPTO NFOA dated Dec. 10, 2015 in connection with U.S. Appl. No. 14/237,258.
USPTO RR dated Aug. 28, 2015 in connection with U.S. Appl. No. 14/237,264.
USPTO NFOA dated Jan. 21, 2016 in connection with U.S. Appl. No. 14/237,264.

(56) **References Cited**

OTHER PUBLICATIONS

USPTO NOA dated Apr. 8, 2016 in connection with U.S. Appl. No. 14/237,258.
USPTO Supplemental NOA dated May 10, 2016 in connection with U.S. Appl. No. 14/237,258.
USPTO Supplemental NOA dated May 20, 2018 in connection with U.S. Appl. No. 14/237,258.
USPTO NFOA dated Jun. 30, 2015 in connection with U.S. Appl. No. 14/522.987.
USPTO FOA dated Feb. 25, 2016 in connection with U.S. Appl. No. 14/522,987.
USPTO NFOA dated Nov. 27, 2015 in connection with U.S. Appl. No. 14/626,267.
USPTO FOA dated Apr. 13, 2016 in connection with U.S. Appl. No. 14/626,267.
USPTO RR dated Sep. 26, 2016 in connection with U.S. Appl. No. 14/763,004.
USPTO NFOA dated Jan. 18, 2017 in connection with U.S. Appl. No. 14/626,267.
USPTO NFOA dated Feb. 7, 2017 in connection with U.S. Appl. No. 14/689,608.
USPTO NFOA dated Jul. 1, 2016 in connection with U.S. Appl. No. 14/161,921.
UKOA dated Feb. 8, 2017; Appln. No. 1613219.3.
EPO Office Action dated Feb. 10, 2017; Appln. No. 12821522.5.
USPTO NFOA dated May 15, 2013 in connection with U.S. Appl. No. 12/583,979.
Alexander S. Geha, et al; "Replacement of Degenerated Mitral and Aortic Bioprostheses Without Explantation", Ann Thorac Surg: Jun. 2001; 72:1509-1514
Dominique Himbert, "Mitral Regurgitation and Stensos from Bioprosthesis and Annuloplasty Failure: Transcatheter approaches and outcomes", 24 pages, Oct. 28, 2013.
J. Jansen, et al; "Detachable shape-memory sewing ring for heart valves", Artificial Organs, 16:294-297, 1992 (abstract only).
Frank Langer; "RING plus STRING: Papillary muscle repositioning as an adjunctive repair technque for ischemic mitral regurgitation", J. Thorac Cardiovasc Surg; 133:247-9, Jan. 2007.
Frank Langer, et al; "RING+STRING Successful Repair Technique for Ischemic Mitral Regurgitation With Severe Leaflet Tethering", Circulation 120[suppl 1]: S85-S91, Sep. 2009.
Francesco Maisano; "Valtech Cardiovalve: Novel Design Feature Cardiovalve and Clinical Update", TCR 2015 presentation re Cardiovalve.
John G. Webb, et al; "Transcatheter Valve-in-Valve Implantation for Failed Bioprosthetic Heart Valves", Circulation, Apr. 2010; 121: 1848-1857.
Extended European Search Report dated Feb. 18, 2015; Appln. 12821522.5-1651/2739214 PCT/IL2012000293.
Invitation to Pay Additional Fees; dated Jun. 12, 2014; PCT/IL2014/050087.
International Preliminary Report on Patentability dated Dec. 2, 2013; PCT/IL2011/000582.
International Preliminary Report on Patentability dated Sep. 11, 2012; PCT/IL2011/000231.
International Preliminary Report on Patentability dated Feb. 11, 2014; PCT/IL2012/000292.
International Preliminary Report on Patentability dated Feb. 11, 2014; PCT/IL2012/000293.
International Search Report and Written Opinion dated Feb. 6, 2013; PCT/IL12/00292.
International Search Report and Written Opinion dated Feb. 6, 2013; PCT/IL2012/000293.
International Search Report and Written Opinion dated Mar. 17, 2014; PCT/IL13/50937.
International Search Report and Written Opinion dated May 30, 2016; PCT/IL2016/050125.
International Search Report and Written Opinion dated Sep. 4, 2014; PCT/IL2014/050087.
International Search Report and Written Opinion dated Oct. 13, 2011; PCT/IL11/00231.
International Search Report and Written Opinion dated Oct. 27, 2015; PCT/IL2015/050792.
International Search Report and Written Opinion dated Dec. 5, 2011: PCT/IL11/00582.
U.S. Appl. No. 61/283,819, filed Dec. 8, 2009.
U.S. Appl. No. 61/492,449, filed Jun. 2, 2011.
U.S. Appl. No. 61/515,372, filed Aug. 5, 2011.
U.S. Appl. No. 61/525,281, filed Aug. 19, 2011.
U.S. Appl. No. 61/537,276, filed Sep. 21, 2011.
U.S. Appl. No. 61/555,160, filed Nov. 3, 2011.
U.S. Appl. No. 61/588,892, filed Jan. 20, 2012.
U.S. Appl. No. 61/312,412, filed Mar. 10, 2010.
Righini, Presentation EuroPCR May 2015 (Saturn)—(downloaded from: https://www.pcronline.com/Cases-resourcesimages/Resources/Course-videos-slides/2015/Cardiovascularinnovation-pipeline-Mitral-and-tricuspid-valve-interventions).
Saturn Project—a novel solution for transcatheter heart valve replacement specifically designed to address clinical therapeutic needs on mitral valve: Dec. 2016.

* cited by examiner

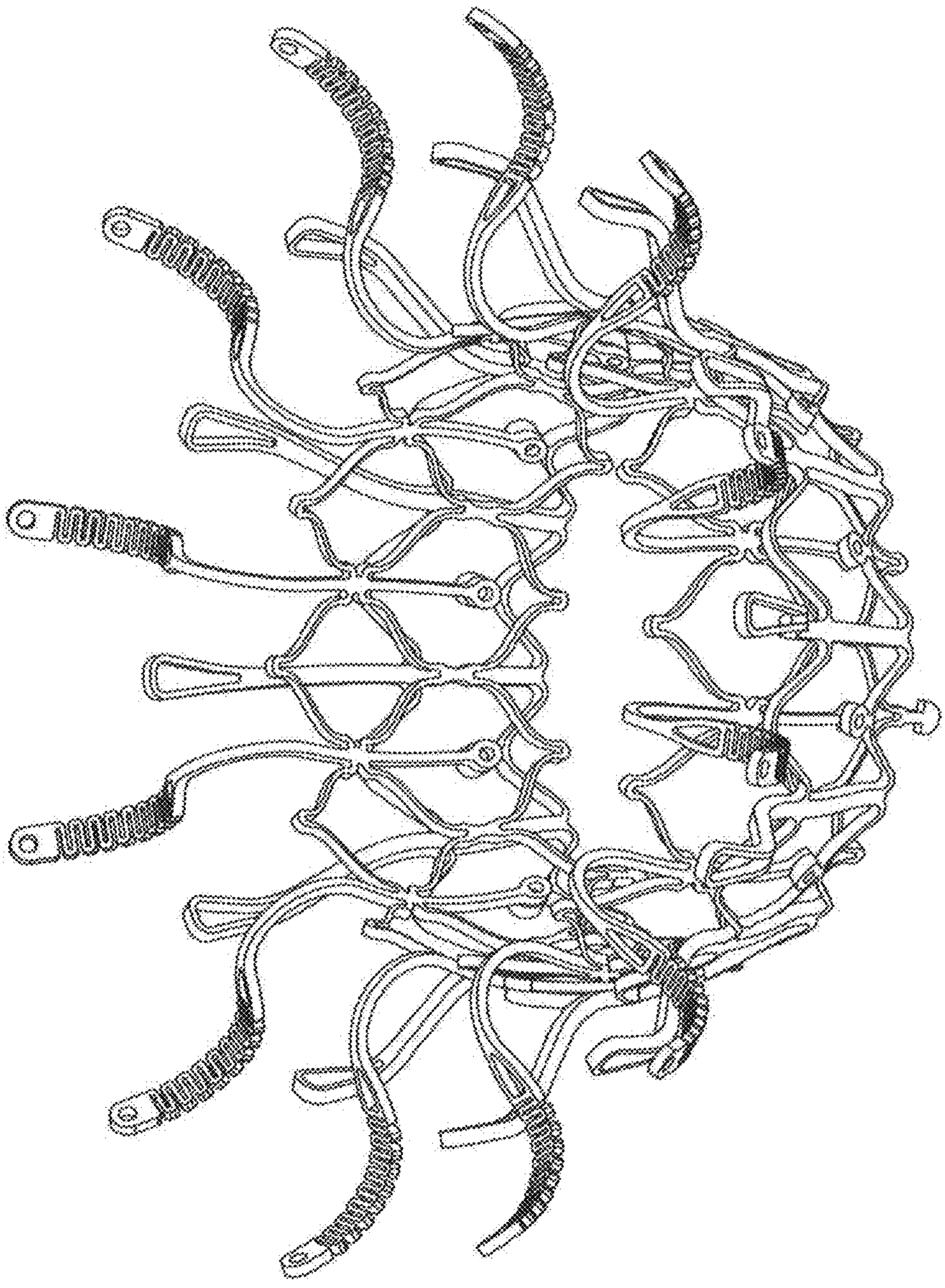


FIG. 1

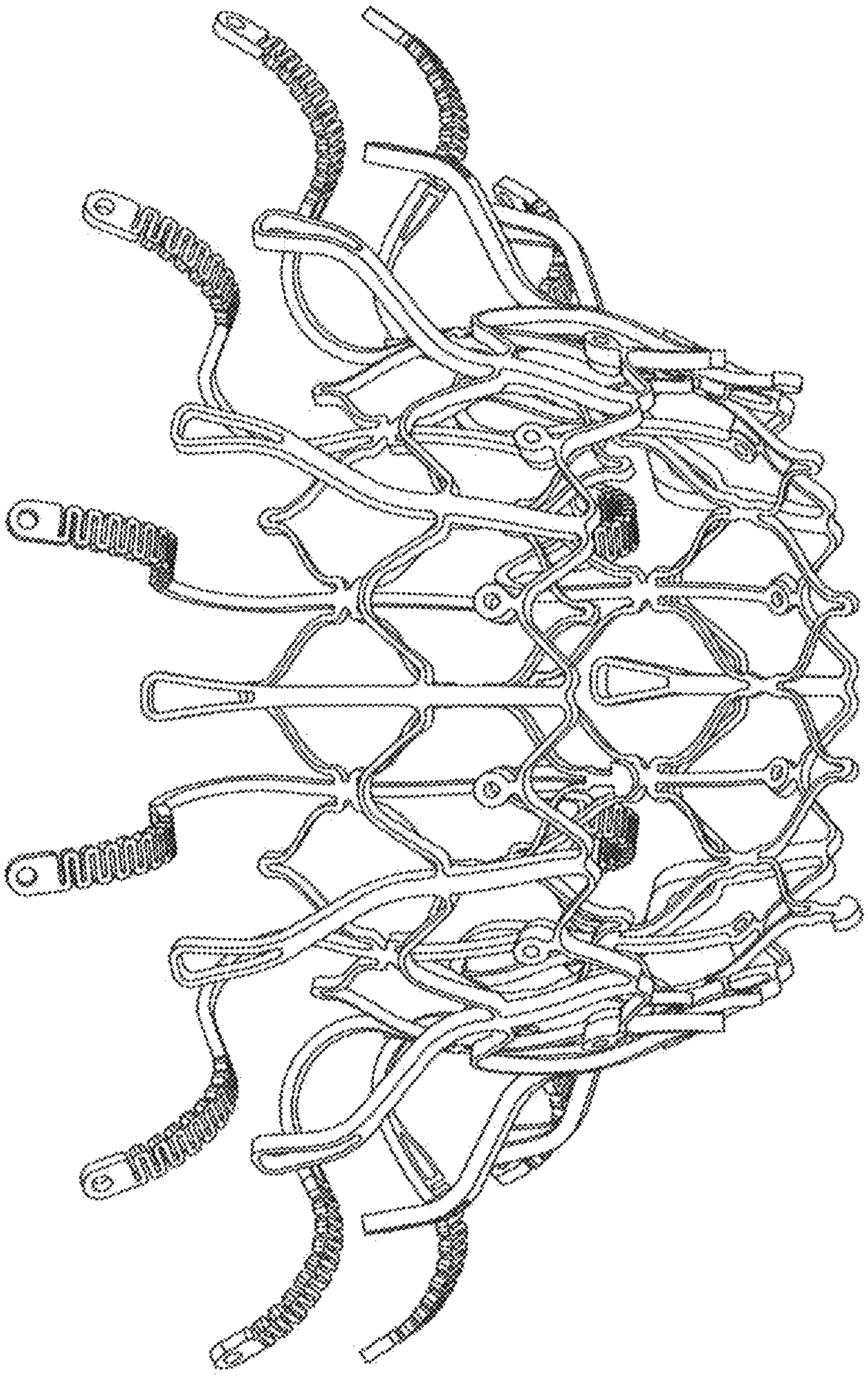


FIG. 2

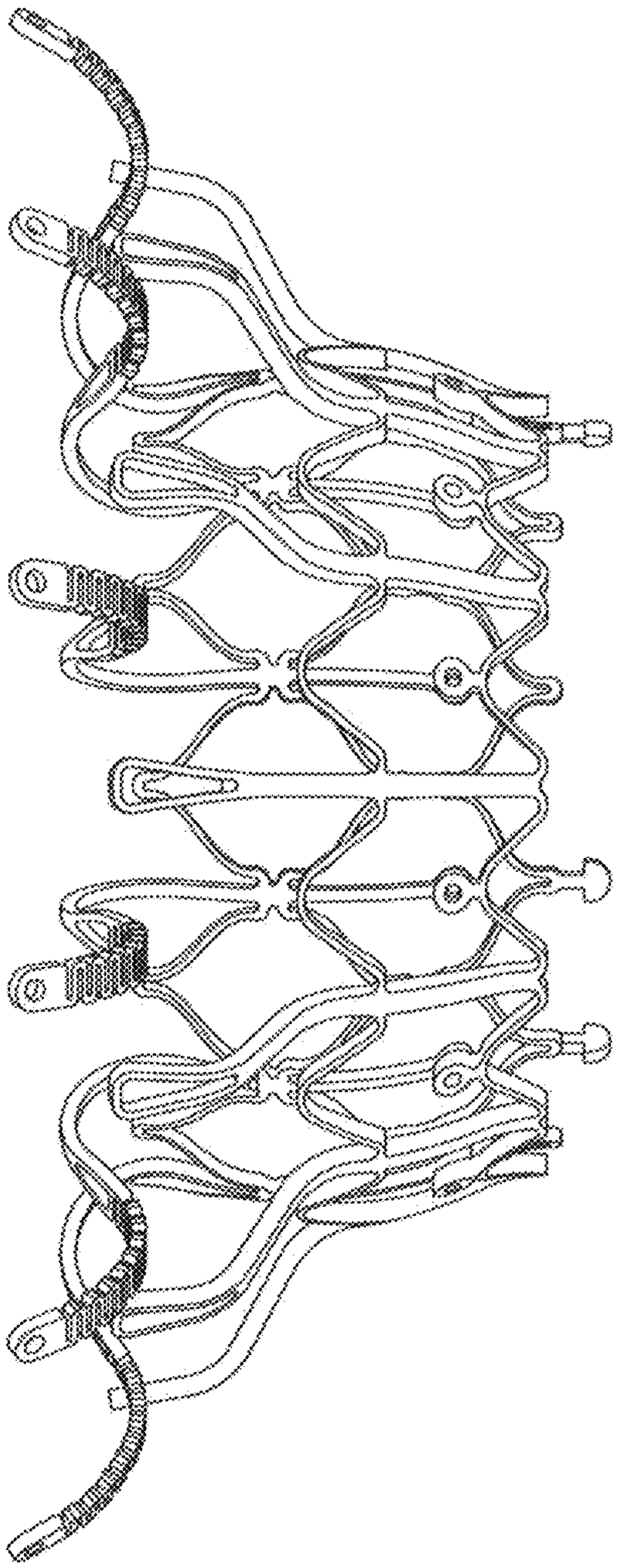


FIG. 3

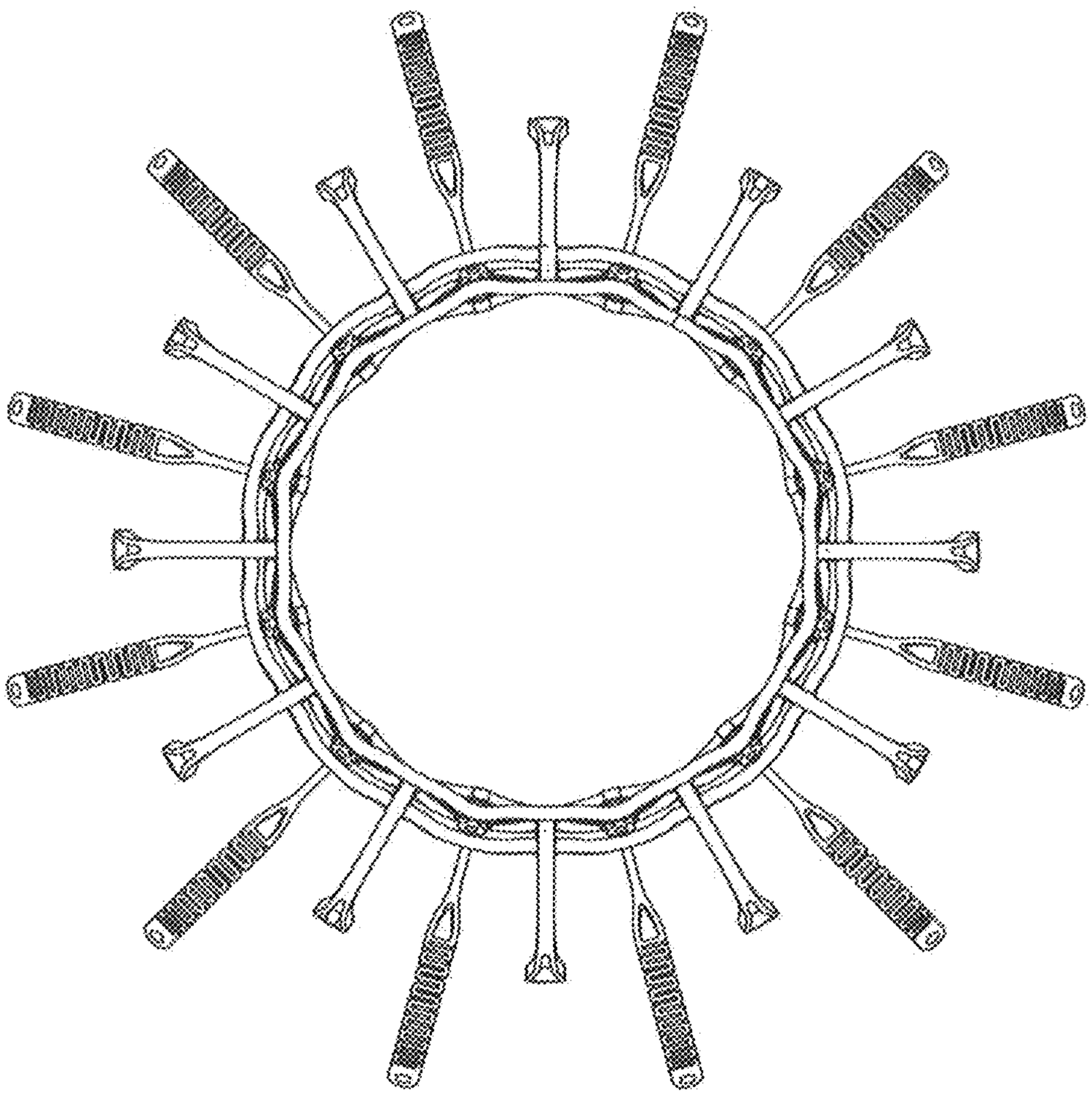


FIG. 4

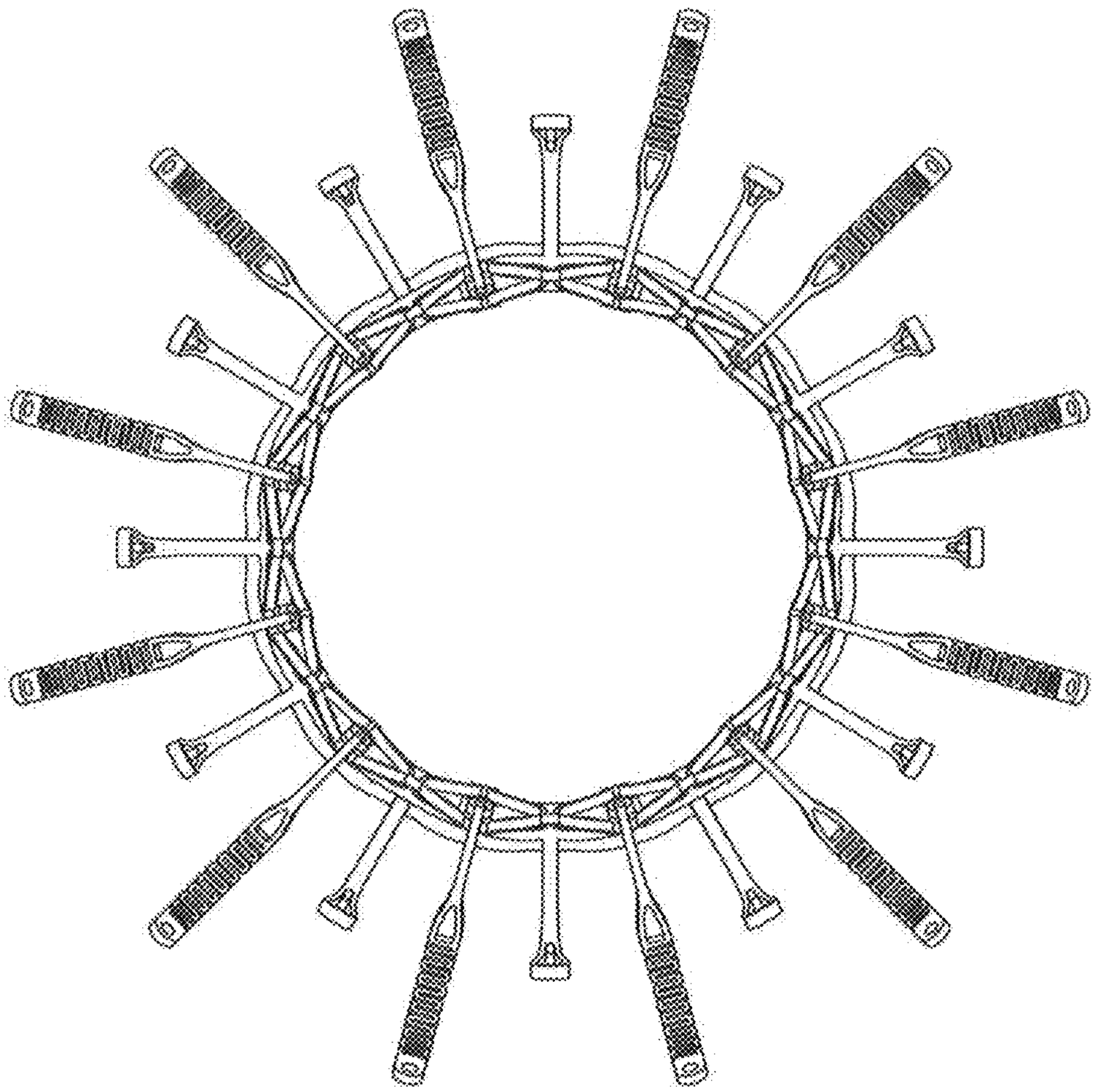


FIG. 5