



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)

- 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)

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

FOREIGN PATENT DOCUMENTS

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

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

(Continued)

(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.

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

(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.

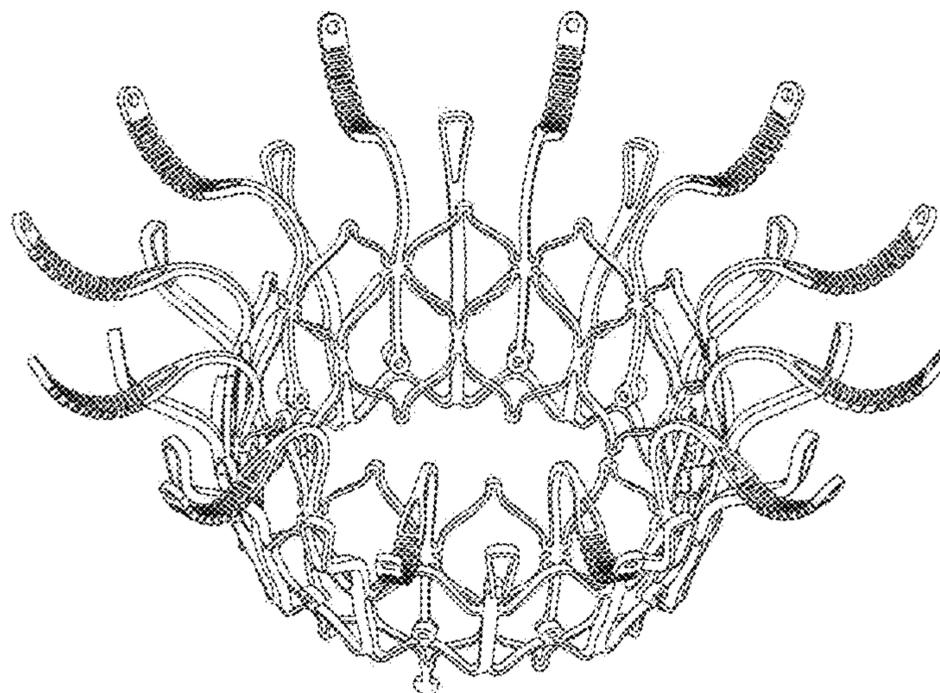
(57) **CLAIM**

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.	7,682,380 B2	3/2010	Thornton et al.
6,350,278 B1	2/2002	Lenker et al.	7,708,775 B2	5/2010	Rowe et al.
6,352,561 B1	3/2002	Leopold et al.	7,717,952 B2	5/2010	Case et al.
6,391,036 B1	5/2002	Berg et al.	7,717,955 B2	5/2010	Lane et al.
6,402,780 B2	6/2002	Williamson, IV et al.	7,731,741 B2	6/2010	Eidenschink
6,409,755 B1	6/2002	Vrba	7,748,389 B2	7/2010	Salahieh et al.
6,419,696 B1	7/2002	Ortiz et al.	7,753,922 B2	7/2010	Starksen
6,428,550 B1	8/2002	Vargas et al.	7,758,595 B2	7/2010	Allen et al.
6,440,164 B1	8/2002	DiMatteo et al.	7,758,632 B2	7/2010	Hojeibane et al.
6,458,153 B1	10/2002	Bailey et al.	7,758,640 B2	7/2010	Vesely
6,511,491 B2	1/2003	Grudem et al.	7,771,467 B2	8/2010	Svensson
6,530,952 B2	3/2003	Vesely	7,771,469 B2	8/2010	Liddicoat
6,540,782 B1	4/2003	Snyders	7,776,083 B2	8/2010	Vesely
6,551,350 B1	4/2003	Thornton et al.	7,780,726 B2	8/2010	Seguin
6,558,396 B1	5/2003	Inoue	7,799,069 B2	9/2010	Bailey et al.
6,558,418 B2	5/2003	Carpentier et al.	7,803,181 B2	9/2010	Furst et al.
6,569,196 B1	5/2003	Vesely	7,811,316 B2	10/2010	Kalman et al.
6,602,263 B1	8/2003	Swanson et al.	7,824,442 B2	11/2010	Salahieh et al.
6,616,675 B1	9/2003	Evard et al.	7,837,727 B2	11/2010	Goetz et al.
6,652,556 B1	11/2003	VanTassel et al.	7,842,081 B2	11/2010	Yadin
6,682,558 B2	1/2004	Tu et al.	7,850,725 B2	12/2010	Vardi et al.
6,699,256 B1	3/2004	Logan et al.	7,871,432 B2	1/2011	Bergin
6,716,244 B2	4/2004	Klaco	7,871,436 B2	1/2011	Ryan et al.
6,719,781 B1	4/2004	Kim	7,887,583 B2	2/2011	Macoviak
6,730,118 B2	5/2004	Spenser et al.	7,892,281 B2	2/2011	Seguin et al.
6,767,362 B2	7/2004	Schreck	7,896,915 B2	3/2011	Guyenot et al.
6,797,002 B2	9/2004	Spence et al.	7,914,544 B2	3/2011	Nguyen et al.
6,821,297 B2	11/2004	Snyders	7,914,569 B2	3/2011	Nguyen et al.
6,830,585 B1	12/2004	Artof et al.	7,927,370 B2	4/2011	Webler et al.
6,830,638 B2	12/2004	Boylan et al.	7,942,927 B2	5/2011	Kaye et al.
6,893,460 B2	5/2005	Spenser et al.	7,947,072 B2	5/2011	Yang et al.
6,960,217 B2	11/2005	Bolduc	7,947,075 B2	5/2011	Goetz et al.
6,964,684 B2	11/2005	Ortiz et al.	7,955,375 B2	6/2011	Agnew
6,974,476 B2	12/2005	McGuckin, Jr. et al.	7,955,377 B2	6/2011	Melsheimer
7,011,681 B2	3/2006	Vesely	7,955,384 B2	6/2011	Rafiee et al.
7,018,406 B2	3/2006	Seguin et al.	7,959,666 B2	6/2011	Salahieh et al.
7,041,132 B2	5/2006	Quijano et al.	7,959,672 B2	6/2011	Salahieh et al.
7,077,861 B2	7/2006	Spence	7,967,833 B2	6/2011	Serman et al.
7,101,395 B2	9/2006	Tremulis et al.	7,967,857 B2	6/2011	Lane
7,101,396 B2	9/2006	Artof et al.	7,981,151 B2	7/2011	Rowe
7,137,184 B2	11/2006	Schreck	7,981,153 B2	7/2011	Fogarty et al.
7,172,625 B2	2/2007	Shu et al.	7,992,567 B2	8/2011	Hirotsuka et al.
7,198,646 B2	4/2007	Figulla et al.	7,993,393 B2	8/2011	Carpentier et al.
7,201,772 B2	4/2007	Schwammenthal et al.	8,002,825 B2	8/2011	Letac et al.
7,226,477 B2	6/2007	Cox	8,002,826 B2	8/2011	Seguin
7,288,111 B1	10/2007	Holloway et al.	8,016,877 B2	9/2011	Seguin et al.
7,329,279 B2	2/2008	Haug et al.	8,016,882 B2	9/2011	Macoviak et al.
7,335,213 B1	2/2008	Hyde et al.	8,021,420 B2	9/2011	Dolan
7,351,256 B2	4/2008	Hojeibane et al.	8,021,421 B2	9/2011	Fogarty et al.
7,374,573 B2	5/2008	Gabbay	8,025,695 B2	9/2011	Fogarty et al.
7,377,938 B2	5/2008	Sarac et al.	8,029,518 B2	10/2011	Goldfarb et al.
7,381,218 B2	6/2008	Schreck	8,029,564 B2	10/2011	Johnson et al.
7,381,219 B2	6/2008	Salahieh et al.	8,034,104 B2	10/2011	Carpentier et al.
7,404,824 B1	7/2008	Webler et al.	8,043,360 B2	10/2011	McNamara et al.
7,422,593 B2	9/2008	Lane	8,048,138 B2	11/2011	Sullivan et al.
7,429,269 B2	9/2008	Schwammenthal et al.	8,048,140 B2	11/2011	Purdy
7,442,204 B2	10/2008	Schwammenthal et al.	8,048,153 B2	11/2011	Salahieh et al.
7,445,630 B2	11/2008	Lashinski et al.	8,052,741 B2	11/2011	Bruszewski et al.
7,455,677 B2	11/2008	Vargas et al.	8,052,749 B2	11/2011	Salahieh et al.
7,455,688 B2	11/2008	Furst et al.	8,057,493 B2	11/2011	Goldfarb et al.
7,462,162 B2	12/2008	Phan et al.	8,057,532 B2	11/2011	Hoffman
7,481,838 B2	1/2009	Carpentier et al.	8,057,540 B2	11/2011	Letac et al.
7,510,575 B2	3/2009	Spenser et al.	8,062,355 B2	11/2011	Figulla et al.
7,513,909 B2	4/2009	Lane et al.	8,062,359 B2	11/2011	Marquez et al.
7,524,331 B2	4/2009	Birdsall	8,070,708 B2	12/2011	Rottenberg et al.
7,527,646 B2	5/2009	Rahdert et al.	8,070,800 B2	12/2011	Lock et al.
7,556,646 B2	7/2009	Yang et al.	8,070,802 B2	12/2011	Lamphere et al.
7,582,111 B2	9/2009	Krolik et al.	8,070,804 B2	12/2011	Hyde et al.
7,585,321 B2	9/2009	Cribier	8,075,611 B2	12/2011	Millwee et al.
7,597,711 B2	10/2009	Drews et al.	8,080,054 B2	12/2011	Rowe
7,611,534 B2	11/2009	Kapadia et al.	8,083,793 B2	12/2011	Lane et al.
7,621,948 B2	11/2009	Herrmann et al.	D652,927 S *	1/2012	Braido A61F 2/91 D24/155
7,625,403 B2	12/2009	Krivoruchko	D653,341 S *	1/2012	Braido A61F 2/91 D24/155
7,632,302 B2	12/2009	Vreeman et al.	8,092,518 B2	1/2012	Schreck
7,648,528 B2	1/2010	Styrc	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.	8,579,965 B2	11/2013	Bonhoeffer et al.
8,118,866 B2	2/2012	Herrmann et al.	8,585,755 B2	11/2013	Chau et al.
8,133,270 B2	3/2012	Kheradvar et al.	8,585,756 B2	11/2013	Bonhoeffer et al.
8,136,218 B2	3/2012	Millwee et al.	8,591,570 B2	11/2013	Revuelta et al.
8,137,398 B2	3/2012	Tuval et al.	8,623,075 B2	1/2014	Murray, III et al.
8,142,492 B2	3/2012	Forster et al.	8,623,080 B2	1/2014	Fogarty et al.
8,142,494 B2	3/2012	Rahdert et al.	8,623,570 B2	1/2014	Seguin
8,142,496 B2	3/2012	Berrekouw	8,628,569 B2	1/2014	Benichou et al.
8,142,497 B2	3/2012	Friedman	8,628,571 B1	1/2014	Hacohen et al.
8,147,504 B2	4/2012	Ino et al.	8,652,203 B2	2/2014	Quadri et al.
8,157,852 B2	4/2012	Bloom et al.	8,652,204 B2	2/2014	Quill et al.
8,157,853 B2	4/2012	Laske et al.	8,663,322 B2	3/2014	Keranen
8,157,860 B2	4/2012	McNamara et al.	8,679,174 B2	3/2014	Ottma et al.
8,163,008 B2	4/2012	Wilson et al.	8,685,086 B2	4/2014	Navia et al.
8,163,014 B2	4/2012	Lane et al.	8,696,742 B2	4/2014	Pintor et al.
D660,433 S *	5/2012	Braido A61F 2/91	8,728,155 B2	5/2014	Montorfano et al.
			8,734,507 B2	5/2014	Keranen
D660,967 S *	5/2012	Braido A61F 2/91	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
8,167,894 B2	5/2012	Miles et al.	8,795,355 B2	8/2014	Alkhatib
8,167,932 B2	5/2012	Bourang et al.	8,795,356 B2	8/2014	Quadri et al.
8,167,935 B2	5/2012	McGuckin, Jr. et al.	8,795,357 B2	8/2014	Yohanan et al.
8,172,896 B2	5/2012	McNamara et al.	8,801,776 B2	8/2014	House et al.
8,172,898 B2	5/2012	Alferness et al.	8,808,366 B2	8/2014	Braido et al.
8,177,836 B2	5/2012	Lee et al.	8,840,663 B2	9/2014	Salahieh et al.
8,182,528 B2	5/2012	Salahieh et al.	8,840,664 B2	9/2014	Karapetian et al.
8,211,169 B2	7/2012	Lane et al.	8,845,722 B2	9/2014	Gabbay
8,216,301 B2	7/2012	Bonhoeffer et al.	8,852,261 B2	10/2014	White
8,221,492 B2	7/2012	Case et al.	8,852,272 B2	10/2014	Gross et al.
8,221,493 B2	7/2012	Boyle et al.	8,870,948 B1	10/2014	Erzberger et al.
8,226,710 B2	7/2012	Nguyen et al.	8,870,949 B2	10/2014	Rowe
8,231,670 B2	7/2012	Salahieh et al.	8,870,950 B2	10/2014	Hacohen
8,236,045 B2	8/2012	Benichou et al.	8,894,702 B2	11/2014	Quadri et al.
8,236,049 B2	8/2012	Rowe et al.	8,900,294 B2	12/2014	Paniagua et al.
8,252,042 B2	8/2012	McNamara et al.	8,900,295 B2	12/2014	Migliazza et al.
8,252,051 B2	8/2012	Chau et al.	8,906,083 B2	12/2014	Obermiller et al.
8,252,052 B2	8/2012	Salahieh et al.	8,911,455 B2	12/2014	Quadri et al.
8,257,390 B2	9/2012	Carley et al.	8,911,489 B2	12/2014	Ben-Muvhar
8,267,988 B2	9/2012	Hamer et al.	8,911,493 B2	12/2014	Rowe et al.
8,277,501 B2	10/2012	Chalekian et al.	8,932,343 B2	1/2015	Alkhatib et al.
8,287,591 B2	10/2012	Keidar et al.	8,961,595 B2	2/2015	Alkhatib
8,298,280 B2	10/2012	Yadin et al.	8,979,922 B2	3/2015	Jayasinghe et al.
8,303,653 B2	11/2012	Bonhoeffer et al.	8,986,370 B2	3/2015	Annest
8,308,798 B2	11/2012	Pintor et al.	8,986,373 B2	3/2015	Chau et al.
8,317,853 B2	11/2012	Agnew	8,986,375 B2 *	3/2015	Garde A61F 2/2403
8,317,855 B2	11/2012	Gregorich et al.			623/1.26
8,323,335 B2	12/2012	Rowe et al.	8,992,599 B2	3/2015	Thubrikar et al.
8,326,868 B2	12/2012	Paul et al.	8,992,604 B2	3/2015	Gross et al.
8,337,541 B2	12/2012	Quadri et al.	8,992,608 B2	3/2015	Haug et al.
8,343,174 B2	1/2013	Goldfarb et al.	8,998,982 B2	4/2015	Richter et al.
8,343,213 B2	1/2013	Salahieh et al.	9,005,273 B2	4/2015	Salahieh et al.
8,348,999 B2	1/2013	Kheradvar et al.	9,011,527 B2	4/2015	Li et al.
8,366,767 B2	2/2013	Zhang	9,017,399 B2	4/2015	Gross et al.
8,372,140 B2	2/2013	Hoffman et al.	D730,520 S *	5/2015	Braido D24/155
8,377,119 B2	2/2013	Drews et al.	D730,521 S *	5/2015	Braido D24/155
8,398,708 B2	3/2013	Meiri et al.	9,023,100 B2	5/2015	Quadri et al.
8,403,981 B2	3/2013	Forster et al.	9,034,032 B2	5/2015	McLean et al.
8,403,983 B2	3/2013	Quadri et al.	9,034,033 B2	5/2015	McLean et al.
8,408,214 B2	4/2013	Spenser	9,039,757 B2	5/2015	McLean et al.
8,414,644 B2	4/2013	Quadri et al.	D732,666 S *	6/2015	Nguyen A61F 2/2412
8,425,593 B2	4/2013	Braido et al.			D24/155
8,430,934 B2	4/2013	Das	9,050,188 B2	6/2015	Schweich, Jr. et al.
8,444,689 B2	5/2013	Zhang	9,072,603 B2	7/2015	Tuval et al.
8,449,599 B2	5/2013	Chau et al.	9,084,676 B2	7/2015	Chau et al.
8,449,625 B2	5/2013	Campbell et al.	9,125,738 B2	9/2015	Figulla et al.
8,454,686 B2	6/2013	Alkhatib	9,125,740 B2	9/2015	Morriss et al.
8,460,365 B2	6/2013	Haverkost et al.	9,132,006 B2	9/2015	Spenser et al.
8,512,400 B2	8/2013	Tran et al.	9,132,009 B2	9/2015	Hacohen et al.
8,539,662 B2	9/2013	Stacchino et al.	9,138,312 B2	9/2015	Tuval et al.
8,540,767 B2	9/2013	Zhang	9,173,738 B2	11/2015	Murray, III et al.
8,545,544 B2	10/2013	Spenser et al.	9,220,594 B2	12/2015	Braido et al.
8,551,160 B2	10/2013	Figulla et al.	9,226,820 B2	1/2016	Braido et al.
8,551,161 B2	10/2013	Dolan	9,226,839 B1	1/2016	Kariniemi et al.
8,562,672 B2	10/2013	Bonhoeffer et al.	9,232,995 B2	1/2016	Kovalsky et al.
8,579,964 B2	11/2013	Lane 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.	2006/0259137 A1	11/2006	Artof et al.
9,248,014 B2	2/2016	Lane et al.	2006/0271166 A1	11/2006	Thill et al.
9,289,290 B2	3/2016	Alkhatib et al.	2006/0271171 A1	11/2006	McQuinn et al.
9,289,291 B2	3/2016	Gorman, III et al.	2006/0287719 A1	12/2006	Rowe et al.
9,295,550 B2	3/2016	Nguyen et al.	2007/0016288 A1	1/2007	Gurskis et al.
9,295,552 B2	3/2016	McLean et al.	2007/0027549 A1	2/2007	Godin
9,301,836 B2	4/2016	Buchbinder et al.	2007/0038295 A1	2/2007	Case et al.
D755,384 S *	5/2016	Pesce D24/155	2007/0043435 A1	2/2007	Seguin et al.
9,326,852 B2	5/2016	Spenser	2007/0055340 A1	3/2007	Pryor
9,387,078 B2	7/2016	Gross et al.	2007/0112422 A1	5/2007	Dehdashtian
9,427,316 B2	8/2016	Schweich, Jr. et al.	2007/0118151 A1	5/2007	Davidson
2001/0021872 A1	9/2001	Bailey et al.	2007/0162103 A1	7/2007	Case et al.
2001/0056295 A1	12/2001	Solem	2007/0162107 A1	7/2007	Haug et al.
2002/0032481 A1	3/2002	Gabbay	2007/0162111 A1	7/2007	Fukamachi et al.
2002/0099436 A1	7/2002	Thornton et al.	2007/0173932 A1	7/2007	Cali et al.
2002/0151970 A1	10/2002	Garrison et al.	2007/0198077 A1	8/2007	Cully et al.
2003/0036791 A1	2/2003	Philipp et al.	2007/0198097 A1	8/2007	Zegdi
2003/0074052 A1	4/2003	Besselink	2007/0213813 A1	9/2007	Von Segesser et al.
2003/0083742 A1	5/2003	Spence et al.	2007/0225759 A1	9/2007	Thommen et al.
2003/0105519 A1	6/2003	Fasol et al.	2007/0225760 A1	9/2007	Moszner et al.
2003/0158578 A1	8/2003	Pantages et al.	2007/0233186 A1	10/2007	Meng
2004/0010272 A1	1/2004	Manetakis et al.	2007/0233237 A1	10/2007	Krivoruchko
2004/0039414 A1	2/2004	Carley et al.	2007/0239272 A1	10/2007	Navia et al.
2004/0093060 A1	5/2004	Seguin et al.	2007/0255400 A1	11/2007	Parravicini et al.
2004/0122503 A1	6/2004	Campbell et al.	2008/0004688 A1	1/2008	Spenser et al.
2004/0122514 A1	6/2004	Fogarty et al.	2008/0004697 A1	1/2008	Lichtenstein et al.
2004/0143315 A1	7/2004	Bruun et al.	2008/0051703 A1	2/2008	Thornton et al.
2004/0176839 A1	9/2004	Huynh et al.	2008/0071363 A1	3/2008	Tuval et al.
2004/0186565 A1	9/2004	Schreck	2008/0071366 A1	3/2008	Tuval et al.
2004/0186566 A1	9/2004	Hindrichs et al.	2008/0071369 A1	3/2008	Tuval et al.
2004/0210244 A1	10/2004	Vargas et al.	2008/0077235 A1	3/2008	Kirson
2004/0220593 A1	11/2004	Greenhalgh	2008/0082083 A1	4/2008	Forde et al.
2004/0225354 A1	11/2004	Allen et al.	2008/0086164 A1	4/2008	Rowe
2004/0249433 A1	12/2004	Freitag	2008/0086204 A1	4/2008	Rankin
2004/0260389 A1	12/2004	Case et al.	2008/0097595 A1	4/2008	Gabbay
2004/0260394 A1	12/2004	Douk et al.	2008/0140003 A1	6/2008	Bei et al.
2005/0004668 A1	1/2005	Aklog et al.	2008/0161910 A1	7/2008	Revuelta et al.
2005/0021056 A1	1/2005	St. Goar et al.	2008/0167705 A1	7/2008	Agnew
2005/0038494 A1	2/2005	Eidenschink	2008/0167714 A1	7/2008	St. Goar et al.
2005/0055066 A1	3/2005	Stobie	2008/0188929 A1	8/2008	Schreck
2005/0075731 A1	4/2005	Artof et al.	2008/0195200 A1	8/2008	Vidlund et al.
2005/0080430 A1	4/2005	Wright, Jr. et al.	2008/0208332 A1	8/2008	Lamphere et al.
2005/0137686 A1	6/2005	Salahieh et al.	2008/0221672 A1	9/2008	Lamphere et al.
2005/0137688 A1	6/2005	Salahieh et al.	2008/0234814 A1	9/2008	Salahieh et al.
2005/0137689 A1	6/2005	Salahieh et al.	2008/0243245 A1	10/2008	Thambar et al.
2005/0137690 A1	6/2005	Salahieh et al.	2008/0255580 A1	10/2008	Hoffman et al.
2005/0137695 A1	6/2005	Salahieh et al.	2008/0262609 A1	10/2008	Gross et al.
2005/0143809 A1	6/2005	Salahieh et al.	2008/0281411 A1	11/2008	Berrekouw
2005/0154443 A1	7/2005	Linder et al.	2008/0294234 A1	11/2008	Hartley et al.
2005/0182486 A1	8/2005	Gabbay	2009/0005863 A1	1/2009	Goetz et al.
2005/0197695 A1	9/2005	Stacchino et al.	2009/0054969 A1	2/2009	Salahieh et al.
2005/0203549 A1	9/2005	Realyvasquez	2009/0099650 A1	4/2009	Bolduc et al.
2005/0216079 A1	9/2005	MaCoviak	2009/0112159 A1	4/2009	Slattery et al.
2005/0234508 A1	10/2005	Cummins et al.	2009/0171363 A1	7/2009	Chocron
2005/0240200 A1	10/2005	Bergheim	2009/0177278 A1	7/2009	Spence
2005/0251251 A1	11/2005	Cribier	2009/0210052 A1	8/2009	Forster et al.
2005/0267573 A9	12/2005	Macoviak et al.	2009/0222081 A1	9/2009	Linder et al.
2006/0015171 A1	1/2006	Armstrong	2009/0241656 A1	10/2009	Jacquemin
2006/0020333 A1	1/2006	Lashinski et al.	2009/0264994 A1	10/2009	Saadat
2006/0047297 A1	3/2006	Case	2009/0287304 A1	11/2009	Dahlgren et al.
2006/0089627 A1	4/2006	Burnett et al.	2009/0299449 A1	12/2009	Styrc
2006/0135964 A1	6/2006	Vesely	2009/0306768 A1	12/2009	Quadri
2006/0178700 A1	8/2006	Quinn	2009/0319037 A1	12/2009	Rowe et al.
2006/0178740 A1	8/2006	Stacchino et al.	2010/0023117 A1	1/2010	Yoganathan et al.
2006/0190036 A1	8/2006	Wendel et al.	2010/0036479 A1	2/2010	Hill et al.
2006/0190038 A1	8/2006	Carley et al.	2010/0076548 A1	3/2010	Konno
2006/0195183 A1	8/2006	Navia et al.	2010/0114299 A1	5/2010	Muvhar et al.
2006/0195184 A1	8/2006	Lane et al.	2010/0131054 A1	5/2010	Tuval et al.
2006/0201519 A1	9/2006	Frazier et al.	2010/0137979 A1	6/2010	Tuval et al.
2006/0212111 A1	9/2006	Case et al.	2010/0160958 A1	6/2010	Clark
2006/0241656 A1	10/2006	Starksen et al.	2010/0161036 A1	6/2010	Pintor et al.
2006/0241748 A1	10/2006	Lee et al.	2010/0161042 A1	6/2010	Maisano et al.
2006/0247680 A1	11/2006	Amplatz et al.	2010/0174363 A1	7/2010	Castro
2006/0253191 A1	11/2006	Salahieh et al.	2010/0179643 A1	7/2010	Shalev
2006/0259136 A1	11/2006	Nguyen et al.	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	2011/0282439	A1	11/2011	Thill et al.
2010/0249908	A1	9/2010	Chau et al.	2011/0282440	A1	11/2011	Cao et al.
2010/0249917	A1	9/2010	Zhang	2011/0283514	A1	11/2011	Fogarty et al.
2010/0262232	A1	10/2010	Annest	2011/0288634	A1	11/2011	Tuval et al.
2010/0280603	A1	11/2010	Maisano et al.	2011/0295363	A1	12/2011	Girard et al.
2010/0280606	A1	11/2010	Naor	2011/0301688	A1	12/2011	Dolan
2010/0324595	A1	12/2010	Linder et al.	2011/0301701	A1	12/2011	Padala et al.
2011/0004296	A1	1/2011	Lutter et al.	2011/0301702	A1	12/2011	Rust et al.
2011/0015729	A1	1/2011	Jimenez et al.	2011/0313452	A1	12/2011	Carley et al.
2011/0015731	A1	1/2011	Carpentier et al.	2011/0319989	A1	12/2011	Lane et al.
2011/0022165	A1	1/2011	Oba et al.	2011/0319991	A1	12/2011	Hariton et al.
2011/0040374	A1	2/2011	Goetz et al.	2012/0010694	A1	1/2012	Lutter et al.
2011/0040375	A1	2/2011	Letac et al.	2012/0022633	A1	1/2012	Olson et al.
2011/0046662	A1	2/2011	Moszner et al.	2012/0022637	A1	1/2012	Ben-Muvhar
2011/0054466	A1	3/2011	Rothstein et al.	2012/0022639	A1	1/2012	Hacohen et al.
2011/0054596	A1	3/2011	Taylor	2012/0022640	A1	1/2012	Gross et al.
2011/0054598	A1	3/2011	Johnson	2012/0035703	A1	2/2012	Lutter et al.
2011/0071626	A1	3/2011	Wright et al.	2012/0035713	A1	2/2012	Lutter et al.
2011/0077730	A1	3/2011	Fenster	2012/0035722	A1	2/2012	Tuval
2011/0082538	A1	4/2011	Dahlgren et al.	2012/0041547	A1	2/2012	Duffy et al.
2011/0087322	A1	4/2011	Letac et al.	2012/0041551	A1	2/2012	Spenser et al.
2011/0093063	A1	4/2011	Schreck	2012/0046738	A1	2/2012	Lau et al.
2011/0098525	A1	4/2011	Kermode et al.	2012/0046742	A1	2/2012	Tuval et al.
2011/0106247	A1	5/2011	Miller et al.	2012/0053682	A1	3/2012	Kovalsky et al.
2011/0112625	A1	5/2011	Ben-Muvhar et al.	2012/0053688	A1	3/2012	Fogarty et al.
2011/0112632	A1	5/2011	Chau et al.	2012/0059454	A1	3/2012	Millwee et al.
2011/0118830	A1	5/2011	Liddicoat et al.	2012/0078353	A1	3/2012	Quadri et al.
2011/0125257	A1	5/2011	Seguin et al.	2012/0078357	A1	3/2012	Conklin
2011/0125258	A1	5/2011	Centola	2012/0083832	A1	4/2012	Delaloye et al.
2011/0137326	A1	6/2011	Bachman	2012/0083839	A1	4/2012	Letac et al.
2011/0137397	A1	6/2011	Chau et al.	2012/0083879	A1	4/2012	Eberhardt et al.
2011/0137409	A1	6/2011	Yang et al.	2012/0089223	A1	4/2012	Nguyen et al.
2011/0137410	A1	6/2011	Hacohen	2012/0101570	A1	4/2012	Tuval et al.
2011/0166636	A1	7/2011	Rowe	2012/0101572	A1	4/2012	Kovalsky et al.
2011/0172784	A1	7/2011	Richter et al.	2012/0123511	A1	5/2012	Brown
2011/0178597	A9	7/2011	Navia et al.	2012/0123530	A1	5/2012	Carpentier et al.
2011/0184510	A1	7/2011	Maisano et al.	2012/0130473	A1	5/2012	Norris et al.
2011/0190877	A1	8/2011	Lane et al.	2012/0130474	A1	5/2012	Buckley
2011/0190879	A1	8/2011	Bobo et al.	2012/0130475	A1	5/2012	Shaw
2011/0202076	A1	8/2011	Richter	2012/0136434	A1	5/2012	Carpentier et al.
2011/0208283	A1	8/2011	Rust	2012/0150218	A1	6/2012	Sandgren et al.
2011/0208293	A1	8/2011	Tabor	2012/0165915	A1	6/2012	Melsheimer et al.
2011/0208298	A1	8/2011	Tuval et al.	2012/0179244	A1	7/2012	Schankereli et al.
2011/0213461	A1	9/2011	Seguin et al.	2012/0197292	A1	8/2012	Chin-Chen et al.
2011/0218619	A1	9/2011	Benichou et al.	2012/0283824	A1	11/2012	Lutter et al.
2011/0218620	A1	9/2011	Meiri et al.	2012/0290062	A1	11/2012	McNamara et al.
2011/0224785	A1	9/2011	Hacohen	2012/0296360	A1	11/2012	Norris et al.
2011/0238159	A1	9/2011	Guyenot et al.	2012/0310328	A1	12/2012	Olson et al.
2011/0245911	A1	10/2011	Quill et al.	2012/0323316	A1	12/2012	Chau et al.
2011/0245917	A1	10/2011	Savage et al.	2012/0330408	A1	12/2012	Hillukka et al.
2011/0251675	A1	10/2011	Dwork	2013/0006347	A1	1/2013	McHugo
2011/0251676	A1	10/2011	Sweeney et al.	2013/0018450	A1	1/2013	Hunt
2011/0251678	A1	10/2011	Eidenschink et al.	2013/0035759	A1	2/2013	Gross et al.
2011/0251679	A1	10/2011	Wiemeyer et al.	2013/0041451	A1	2/2013	Patterson et al.
2011/0251680	A1	10/2011	Tran et al.	2013/0116780	A1	5/2013	Miller et al.
2011/0251682	A1	10/2011	Murray, III et al.	2013/0123896	A1	5/2013	Bloss et al.
2011/0251683	A1	10/2011	Tabor	2013/0123900	A1	5/2013	Eblacas et al.
2011/0257721	A1	10/2011	Tabor	2013/0150945	A1	6/2013	Crawford et al.
2011/0257729	A1	10/2011	Spenser et al.	2013/0158647	A1	6/2013	Norris et al.
2011/0257736	A1	10/2011	Marquez et al.	2013/0166017	A1	6/2013	Cartledge et al.
2011/0257737	A1	10/2011	Fogarty et al.	2013/0166022	A1	6/2013	Conklin
2011/0264191	A1	10/2011	Rothstein	2013/0172978	A1	7/2013	Vidlund et al.
2011/0264196	A1*	10/2011	Savage A61F 2/2418 623/1.26	2013/0172992	A1	7/2013	Gross et al.
2011/0264198	A1	10/2011	Murray, III et al.	2013/0211501	A1	8/2013	Buckley et al.
2011/0264199	A1	10/2011	Tran et al.	2013/0245742	A1	9/2013	Norris
2011/0264200	A1	10/2011	Tran et al.	2013/0261737	A1	10/2013	Costello
2011/0264201	A1	10/2011	Yeung et al.	2013/0297013	A1	11/2013	Klima et al.
2011/0264202	A1	10/2011	Murray, III et al.	2013/0304197	A1	11/2013	Buchbinder et al.
2011/0264203	A1	10/2011	Dwork et al.	2013/0310928	A1	11/2013	Morriss et al.
2011/0264206	A1	10/2011	Tabor	2013/0325114	A1	12/2013	McLean et al.
2011/0264208	A1	10/2011	Duffy et al.	2013/0331929	A1	12/2013	Mitra et al.
2011/0270276	A1	11/2011	Rothstein et al.	2014/0005778	A1	1/2014	Buchbinder et al.
2011/0271967	A1	11/2011	Mortier et al.	2014/0018911	A1	1/2014	Zhou et al.
2011/0282438	A1	11/2011	Drews 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 Stenosis 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 technique 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.pconline.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

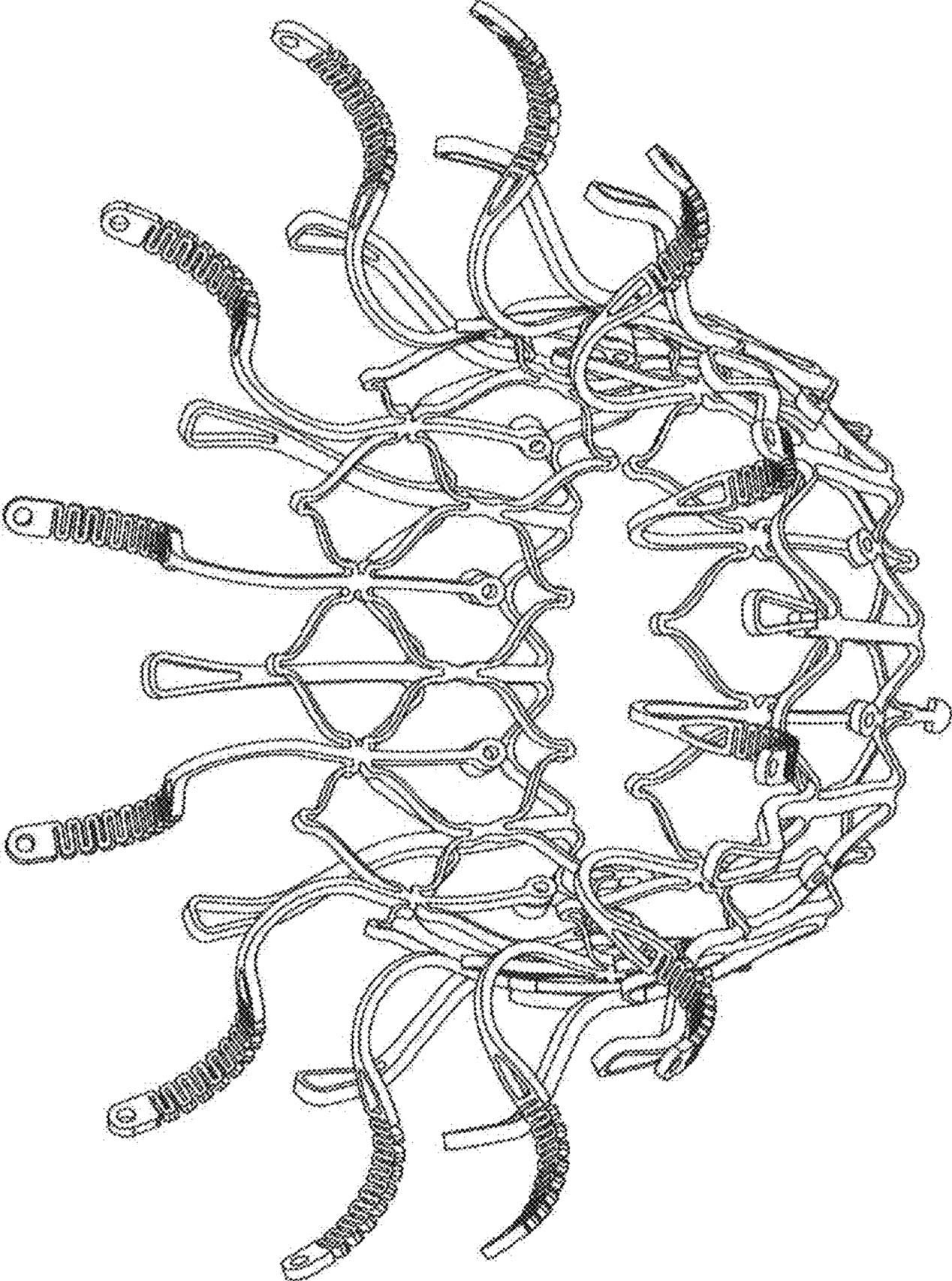


FIG. 1

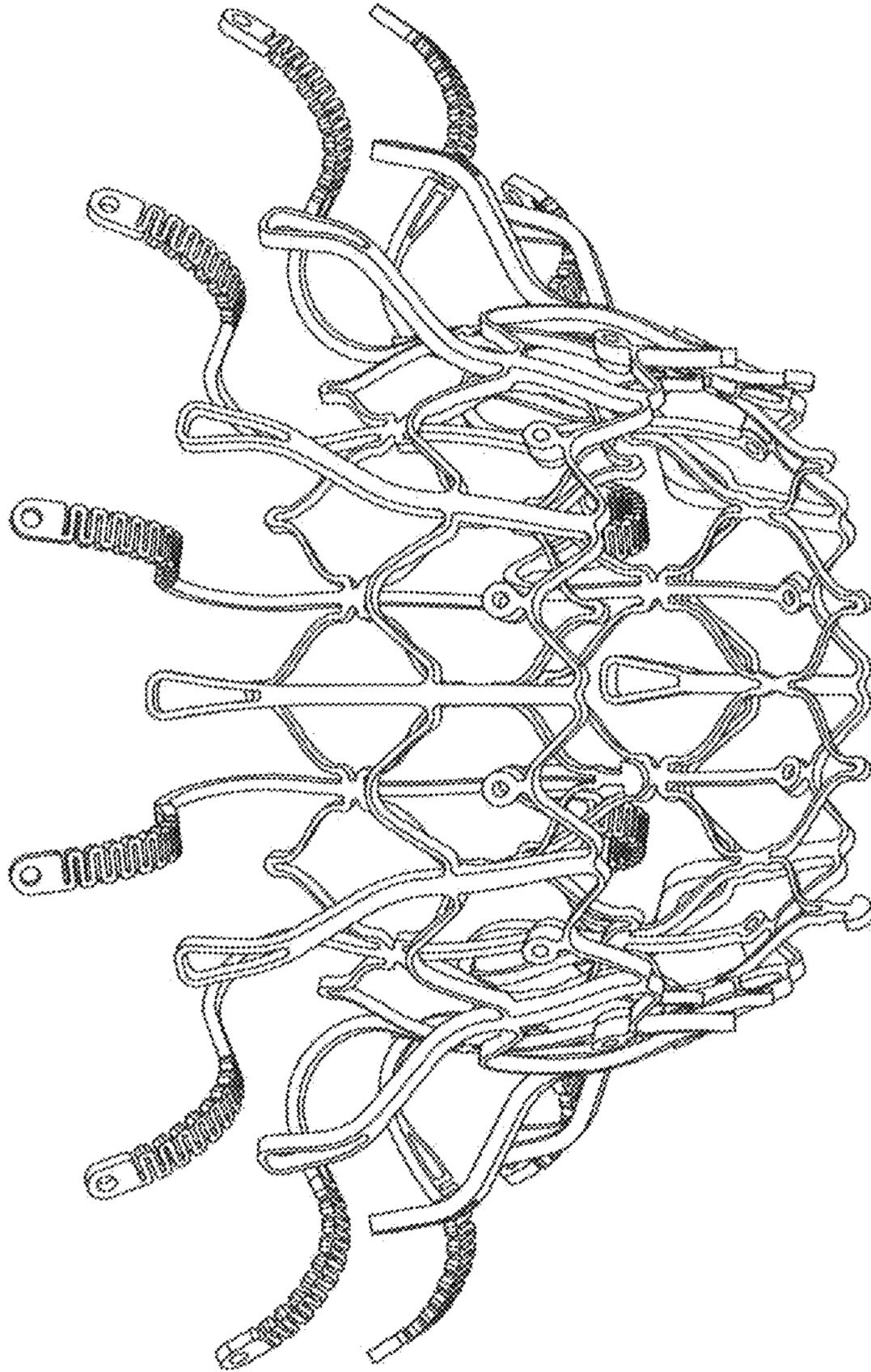


FIG. 2

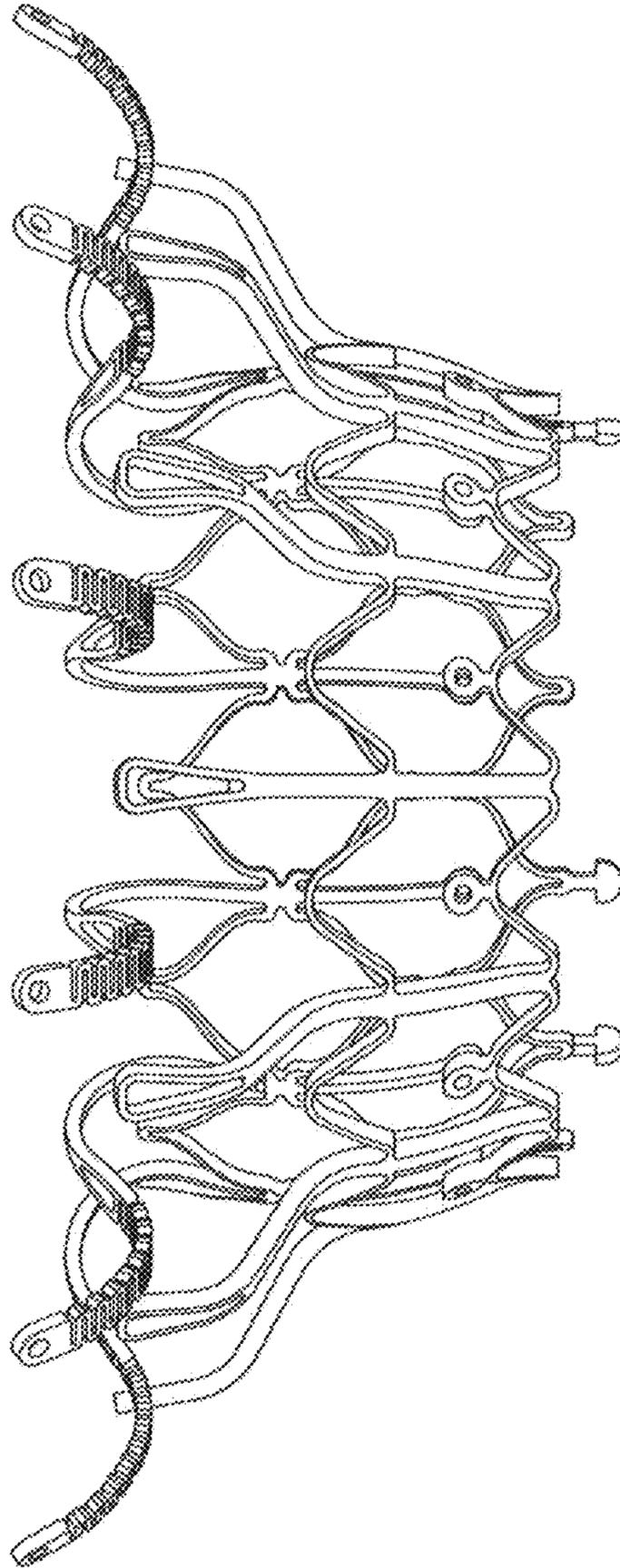


FIG. 3

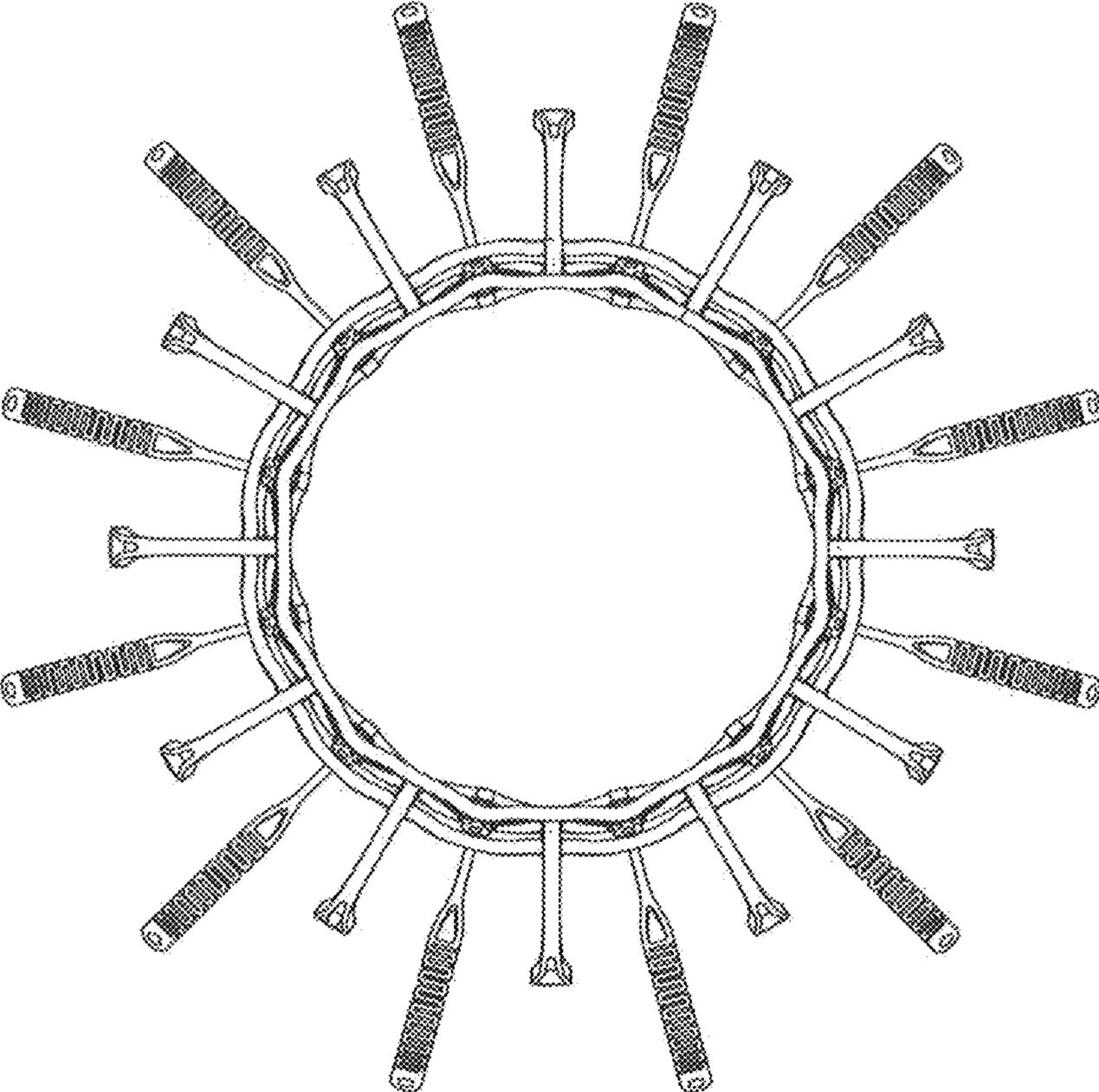


FIG. 4

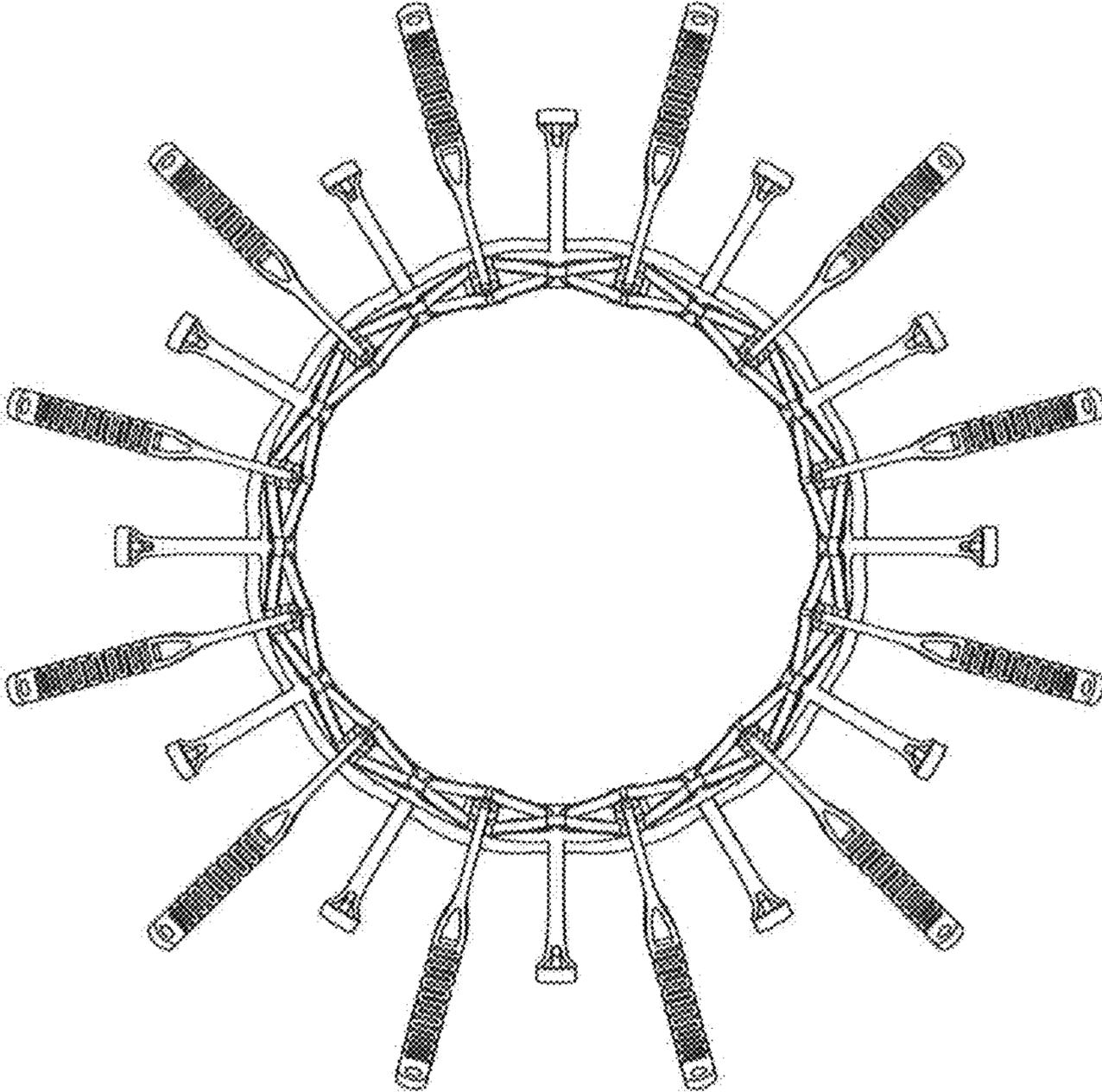


FIG. 5