

US00D672467S

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

(10) **Patent No.:** **US D672,467 S**
(45) **Date of Patent:** **** Dec. 11, 2012**

(54) **ROTATABLE SAMPLE PROCESSING DISK**

(75) Inventors: **Jeffrey D. Smith**, Marine on St. Croix, MN (US); **Peter D. Ludowise**, Cottage Grove, MN (US)

(73) Assignee: **3M Innovative Properties Company**, St. Paul, MN (US)

(**) Term: **14 Years**

(21) Appl. No.: **29/392,223**

(22) Filed: **May 18, 2011**

(51) **LOC (9) Cl.** **24-01**

(52) **U.S. Cl.** **D24/216**

(58) **Field of Classification Search** D24/216, D24/217, 219, 225, 231, 232, 107, 169, 186; D10/81; 422/500, 547, 62-65, 67, 72; 435/287.1, 435/287.3; 436/43, 45, 47; 356/246; 494/16
See application file for complete search history.

D271,993 S 12/1983 Swartz
4,456,581 A 6/1984 Edelman et al.
D274,553 S * 7/1984 Perry D24/226
4,476,733 A 10/1984 Chlosta et al.
4,488,810 A 12/1984 Hatanaka et al.
4,498,896 A 2/1985 Leis
D277,891 S * 3/1985 Uffenheimer et al. D24/226
4,554,436 A 11/1985 Chlosta et al.
4,580,896 A 4/1986 Brickus et al.
4,632,908 A 12/1986 Schultz
D287,634 S * 1/1987 Carr et al. D24/230
D288,124 S 2/1987 Brickus et al.
4,695,430 A 9/1987 Coville et al.
4,766,078 A 8/1988 Gang
4,814,279 A 3/1989 Sugaya

(Continued)

FOREIGN PATENT DOCUMENTS

CA 2130013 3/1999

(Continued)

OTHER PUBLICATIONS

U.S. Appl. No. 60/237,151, filed Oct. 2, 2000.

(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,555,284 A 1/1971 Anderson
3,595,386 A 7/1971 Hradel
3,713,124 A 1/1973 Durland et al.
3,795,451 A 3/1974 Mailen
3,798,459 A 3/1974 Anderson et al.
3,856,470 A 12/1974 Cullis et al.
3,873,217 A 3/1975 Anderson et al.
3,912,799 A 10/1975 Chisholm
3,964,867 A 6/1976 Berry
4,030,834 A 6/1977 Bauer et al.
4,046,511 A 9/1977 Stabile
4,111,304 A 9/1978 Lucas
4,123,173 A 10/1978 Bullock et al.
4,244,916 A 1/1981 Guigan
4,252,538 A 2/1981 Barr
4,256,696 A 3/1981 Soodak
4,284,602 A 8/1981 Kelton
4,298,570 A 11/1981 Lillig et al.
4,390,499 A 6/1983 Curtis et al.

Primary Examiner — Anhdao Doan

(74) *Attorney, Agent, or Firm* — Nicole J. Einerson

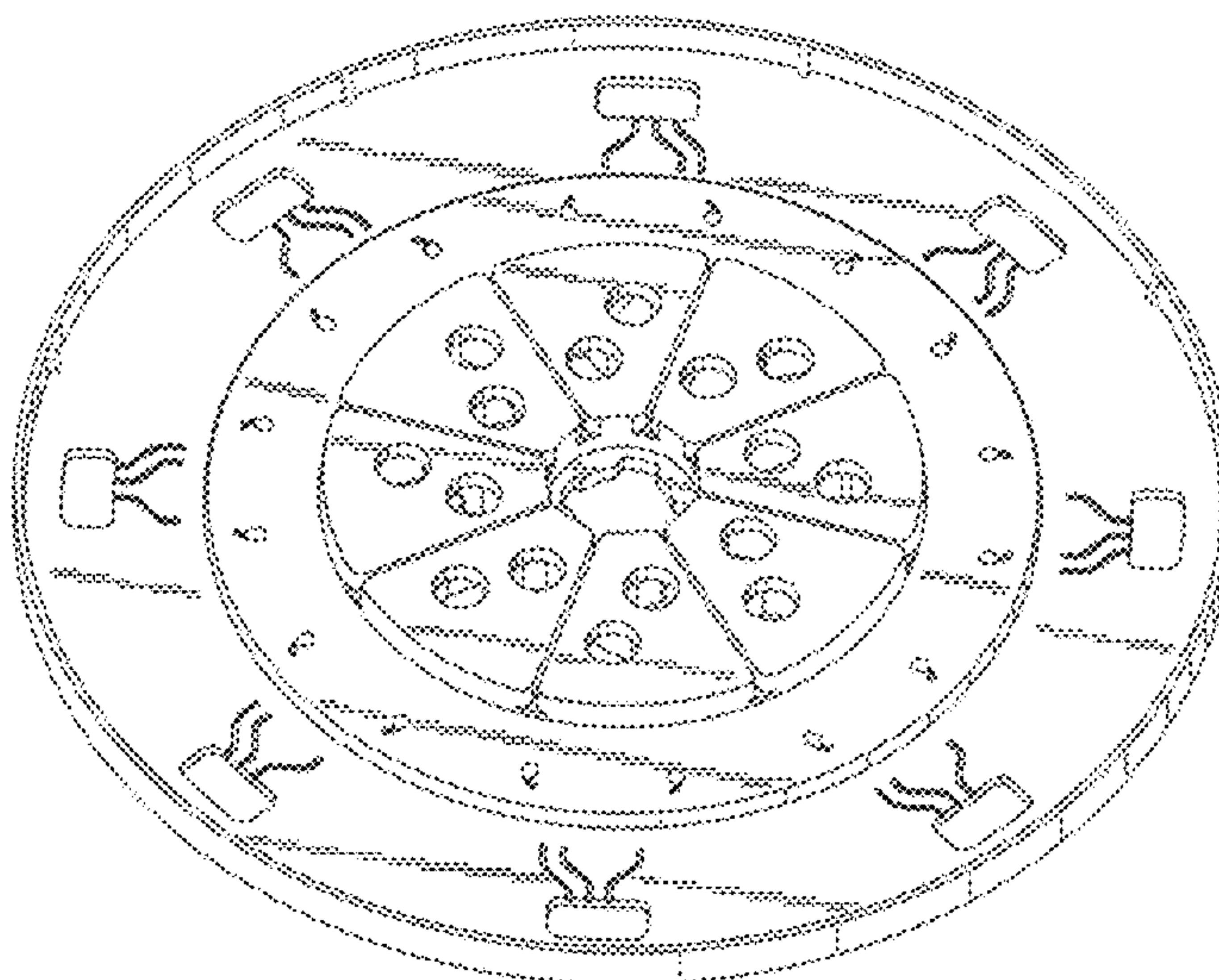
(57) **CLAIM**

The ornamental design for a rotatable sample processing disk, as shown and described.

DESCRIPTION

FIG. 1 is a top perspective view of a rotatable sample processing disk, showing the new design.
FIG. 2 is a bottom perspective view thereof;
FIG. 3 is a top plan view thereof;
FIG. 4 is a bottom plan view thereof; and,
FIG. 5 is a side elevational view thereof.

1 Claim, 4 Drawing Sheets



US D672,467 S

Page 2

| U.S. PATENT DOCUMENTS | | | | | |
|-----------------------|-----|-----------------------------------|--------------|------|--------------------------------------|
| 4,906,432 | A | 3/1990 Geiselman | 6,720,187 | B2 | 4/2004 Bedingham et al. |
| 4,990,075 | A | 2/1991 Wogoman | 6,734,401 | B2 | 5/2004 Bedingham et al. |
| D321,057 | S * | 10/1991 Holen D24/224 | 6,752,961 | B2 | 6/2004 Kopf-Sill |
| D329,024 | S | 9/1992 Marks | 6,814,935 | B2 | 11/2004 Harms et al. |
| 5,149,505 | A | 9/1992 English et al. | 6,846,455 | B1 * | 1/2005 Carney et al. 422/64 |
| 5,160,702 | A | 11/1992 Kopf-Sill | 6,889,468 | B2 | 5/2005 Bedingham et al. |
| 5,182,083 | A | 1/1993 Barker et al. | 6,972,113 | B1 | 12/2005 Ramshaw |
| 5,207,987 | A | 5/1993 Kureshy et al. | 6,987,253 | B2 | 1/2006 Bedingham et al. |
| 5,219,526 | A | 6/1993 Long | 7,026,168 | B2 | 4/2006 Bedingham et al. |
| 5,229,297 | A | 7/1993 Schnipelsky et al. | 7,164,107 | B2 | 1/2007 Bedingham et al. |
| 5,256,376 | A * | 10/1993 Callan et al. 422/72 | 7,192,560 | B2 | 3/2007 Parthasarathy et al. |
| 5,258,163 | A | 11/1993 Krause et al. | 7,273,591 | B2 | 9/2007 Sellers et al. |
| 5,278,377 | A | 1/1994 Tsai | D557,425 | S | 12/2007 Nakamura et al. |
| 5,281,516 | A | 1/1994 Stapleton et al. | D559,993 | S | 1/2008 Nagakubo et al. |
| 5,310,523 | A | 5/1994 Smethers et al. | D559,994 | S | 1/2008 Nagakubo et al. |
| 5,320,808 | A * | 6/1994 Holen et al. 422/64 | D560,284 | S | 1/2008 Nagakubo et al. |
| 5,336,467 | A | 8/1994 Heidt et al. | 7,322,254 | B2 | 1/2008 Bedingham et al. |
| 5,411,065 | A | 5/1995 Meador et al. | 7,323,660 | B2 | 1/2008 Bedingham et al. |
| 5,415,839 | A | 5/1995 Zaun et al. | 7,332,326 | B1 | 2/2008 Kellogg et al. |
| 5,438,128 | A | 8/1995 Nieuwkerk et al. | D564,667 | S * | 3/2008 Bedingham et al. D24/216 |
| 5,496,518 | A | 3/1996 Arai et al. | 7,396,508 | B1 | 7/2008 Richards et al. |
| 5,496,520 | A | 3/1996 Kelton et al. | 7,435,933 | B2 | 10/2008 Bedingham et al. |
| 5,571,410 | A | 11/1996 Swedberg et al. | 7,445,752 | B2 | 11/2008 Harms |
| 5,578,270 | A | 11/1996 Reichler et al. | 7,507,575 | B2 | 3/2009 Bedingham |
| 5,593,838 | A | 1/1997 Zanzucchi et al. | 7,527,763 | B2 | 5/2009 Bedingham |
| 5,599,501 | A | 2/1997 Carey et al. | 7,569,186 | B2 | 8/2009 Bedingham et al. |
| 5,601,141 | A | 2/1997 Gordon et al. | D600,722 | S | 9/2009 Yabe et al. |
| 5,604,130 | A | 2/1997 Warner et al. | 7,595,200 | B2 | 9/2009 Bedingham |
| 5,616,301 | A | 4/1997 Moser et al. | D605,206 | S | 12/2009 Yabe et al. |
| 5,639,428 | A | 6/1997 Cottingham | 7,628,954 | B2 | 12/2009 Gomm et al. |
| 5,653,940 | A * | 8/1997 Carey et al. 422/64 | 7,678,334 | B2 | 3/2010 Bedingham |
| 5,693,233 | A | 12/1997 Schembri | 7,709,249 | B2 | 5/2010 Bedingham |
| RE35,716 | E | 1/1998 Stapleton et al. | 7,754,474 | B2 | 7/2010 Aysta et al. |
| 5,795,547 | A | 8/1998 Moser et al. | 7,763,210 | B2 | 7/2010 Bedingham et al. |
| 5,804,141 | A | 9/1998 Chianese | 7,767,937 | B2 | 8/2010 Bedingham et al. |
| 5,819,842 | A | 10/1998 Potter et al. | 7,837,947 | B2 | 11/2010 Bedingham |
| 5,856,194 | A | 1/1999 Arnquist et al. | 7,855,083 | B2 | 12/2010 Bedingham |
| 5,863,502 | A | 1/1999 Southgate et al. | 7,867,767 | B2 | 1/2011 Bedingham |
| 5,869,002 | A | 2/1999 Limon et al. | 7,871,827 | B2 | 1/2011 Parthasarathy |
| 5,886,863 | A | 3/1999 Nagasaki et al. | D638,550 | S | 5/2011 Bedingham |
| 5,922,617 | A | 7/1999 Wang et al. | D638,951 | S | 5/2011 Bedingham |
| 6,013,513 | A | 1/2000 Reber et al. | 2002/0047003 | A1 | 4/2002 Bedingham et al. |
| 6,015,674 | A | 1/2000 Woudenberg | 2002/0048533 | A1 | 4/2002 Harms et al. |
| 6,030,581 | A | 2/2000 Virtanen | 2002/0064885 | A1 | 5/2002 Bedingham et al. |
| 6,063,589 | A | 5/2000 Kellogg et al. | 2002/0076354 | A1 | 6/2002 Cohen |
| 6,068,751 | A | 5/2000 Neukermans | 2002/0097632 | A1 | 7/2002 Kellogg |
| 6,103,199 | A | 8/2000 Bjornson et al. | 2003/0017567 | A1 | 1/2003 Parthasarathy et al. |
| 6,143,248 | A | 11/2000 Kellogg et al. | 2003/0032173 | A1 * | 2/2003 Farina et al. 435/288.2 |
| 6,153,012 | A | 11/2000 Rupp et al. | 2003/0044322 | A1 | 3/2003 Andersson et al. |
| 6,168,759 | B1 | 1/2001 Green et al. | 2003/0053934 | A1 | 3/2003 Andersson et al. |
| 6,168,948 | B1 | 1/2001 Anderson et al. | 2003/0118804 | A1 | 6/2003 Bedingham et al. |
| 6,183,693 | B1 | 2/2001 Bogen et al. | 2003/0120062 | A1 | 6/2003 Parthasarathy et al. |
| 6,190,617 | B1 | 2/2001 Clark et al. | 2003/0124506 | A1 | 7/2003 Bedingham et al. |
| 6,197,595 | B1 | 3/2001 Anderson et al. | 2003/0138779 | A1 | 7/2003 Parthasarathy et al. |
| D441,873 | S * | 5/2001 Kohler D24/219 | 2003/0152491 | A1 | 8/2003 Kellogg et al. |
| 6,235,531 | B1 | 5/2001 Kopf-Sill | 2003/0152994 | A1 | 8/2003 Woudenberg et al. |
| 6,265,168 | B1 | 7/2001 Gjerde et al. | 2004/0007275 | A1 | 1/2004 Hui Liu |
| 6,284,113 | B1 | 9/2001 Bjornson et al. | 2004/0018117 | A1 | 1/2004 Desmond et al. |
| 6,296,809 | B1 | 10/2001 Richards et al. | 2004/0053290 | A1 | 3/2004 Terbrueggen |
| 6,302,134 | B1 | 10/2001 Kellogg et al. | 2004/0121471 | A1 | 6/2004 Dufresne et al. |
| 6,306,273 | B1 | 10/2001 Wainright et al. | 2004/0179974 | A1 | 9/2004 Bedingham et al. |
| 6,319,469 | B1 | 11/2001 Mian et al. | 2004/0191125 | A1 | 9/2004 Kellogg |
| 6,344,326 | B1 | 2/2002 Nelson et al. | 2004/0209258 | A1 | 10/2004 Parthasarathy et al. |
| 6,375,898 | B1 | 4/2002 Ulrich et al. | 2005/0036911 | A1 | 2/2005 Sellers et al. |
| 6,391,264 | B2 | 5/2002 Hammer et al. | 2005/0109396 | A1 | 5/2005 Zucchelli et al. |
| 6,440,725 | B1 | 8/2002 Pourahmadi et al. | 2005/0126312 | A1 | 6/2005 Bedingham et al. |
| 6,461,287 | B1 | 10/2002 Glater | 2005/0129583 | A1 | 6/2005 Bedingham et al. |
| 6,465,225 | B1 | 10/2002 Fuhr et al. | 2005/0130177 | A1 | 6/2005 Bedingham et al. |
| 6,527,432 | B2 | 3/2003 Kellogg et al. | 2005/0142570 | A1 | 6/2005 Parthasarathy et al. |
| 6,532,997 | B1 | 3/2003 Bedingham et al. | 2005/0142571 | A1 | 6/2005 Parthasarathy et al. |
| 6,548,788 | B2 | 4/2003 Kellogg et al. | 2005/0142663 | A1 | 6/2005 Parthasarathy et al. |
| 6,582,662 | B1 | 6/2003 Kellogg et al. | 2005/0180890 | A1 | 8/2005 Bedingham et al. |
| 6,593,143 | B1 | 7/2003 Gordon | 2005/0224337 | A1 | 10/2005 Iwasaki et al. |
| 6,627,159 | B1 | 9/2003 Bedingham et al. | 2005/0277195 | A1 | 12/2005 Holmquist et al. |
| 6,632,399 | B1 | 10/2003 Kellogg et al. | 2005/0282290 | A1 | 12/2005 Fujimoto |
| 6,660,147 | B1 | 12/2003 Woudenberg et al. | 2006/0013732 | A1 | 1/2006 Parthasarathy et al. |
| 6,706,519 | B1 | 3/2004 Kellogg et al. | 2006/0040273 | A1 | 2/2006 Chaiken et al. |
| 6,709,869 | B2 | 3/2004 Mian | 2006/0076346 | A1 | 4/2006 Bedingham et al. |
| | | | 2006/0228811 | A1 | 10/2006 Bedingham |

US D672,467 S

| | | | | | | |
|--------------|-----|---------|-------------------------|----|----------------|---------|
| 2007/0007270 | A1 | 1/2007 | Bedingham et al. | JP | 2005-514014 | 5/2005 |
| 2007/0009382 | A1 | 1/2007 | Bedingham | JP | 2005-274241 | 10/2005 |
| 2007/0009383 | A1 | 1/2007 | Bedingham | JP | 2009-216395 | 9/2009 |
| 2007/0009391 | A1 | 1/2007 | Bedingham et al. | WO | WO 91/19567 | 12/1991 |
| 2007/0010007 | A1 | 1/2007 | Aysta et al. | WO | WO 97/21090 | 6/1997 |
| 2007/0132723 | A1 | 6/2007 | Lurz et al. | WO | WO 98/07019 | 2/1998 |
| 2007/0142780 | A1 | 6/2007 | Van Lue | WO | WO 98/49340 | 11/1998 |
| 2007/0160504 | A1 | 7/2007 | Parthasarathy | WO | WO 98/53311 | 11/1998 |
| 2008/0050276 | A1 | 2/2008 | Bedingham et al. | WO | WO 99/09394 | 2/1999 |
| 2008/0056949 | A1 | 3/2008 | Lee | WO | WO 99/55827 | 11/1999 |
| 2008/0058991 | A1 | 3/2008 | Lee | WO | WO 99/58245 | 11/1999 |
| 2008/0149190 | A1 | 6/2008 | Bedingham | WO | WO 00/05582 | 2/2000 |
| 2008/0152546 | A1 | 6/2008 | Bedingham et al. | WO | WO 00/35583 | 6/2000 |
| 2008/0314895 | A1 | 12/2008 | Bedingham | WO | WO 00/40750 | 7/2000 |
| 2009/0068062 | A1 | 3/2009 | Jafari et al. | WO | WO 00/69560 | 11/2000 |
| 2009/0143250 | A1 | 6/2009 | Lee | WO | WO 00/78455 | 12/2000 |
| 2009/0263280 | A1 | 10/2009 | Bedingham et al. | WO | WO 00/79285 | 12/2000 |
| 2010/0050751 | A1 | 3/2010 | Lee | WO | WO 01/06228 | 1/2001 |
| 2010/0129878 | A1 | 5/2010 | Parthasarathy | WO | WO 01/30995 | 5/2001 |
| 2010/0167304 | A1 | 7/2010 | Bedingham | WO | WO 02/00347 | 1/2002 |
| 2010/0175994 | A1* | 7/2010 | Lee et al. 204/416 | WO | WO 03/054509 | 7/2003 |
| 2010/0240124 | A1 | 9/2010 | Aysta | WO | WO 03/054510 | 7/2003 |
| 2010/0266456 | A1 | 10/2010 | Bedingham | WO | WO 03/058224 | 7/2003 |
| 2011/0027904 | A1 | 2/2011 | Bedingham | WO | WO 03/058253 | 7/2003 |
| 2011/0053785 | A1 | 3/2011 | Bedingham | WO | WO 03/093836 | 11/2003 |
| 2011/0117607 | A1 | 5/2011 | Bedingham | WO | WO 2004/010760 | 2/2004 |
| 2011/0117656 | A1 | 5/2011 | Robole | WO | WO 2004/011142 | 2/2004 |
| 2011/0124132 | A1 | 5/2011 | Kim | WO | WO 2004/011143 | 2/2004 |

FOREIGN PATENT DOCUMENTS

| | | |
|----|-------------|---------|
| DE | 3712624 | 11/1988 |
| EP | 0169306 | 5/1990 |
| EP | 0693560 | 1/1996 |
| EP | 0807468 | 11/1997 |
| EP | 1010979 | 6/2000 |
| EP | 1681553 | 7/2006 |
| JP | 60-57259 | 4/1985 |
| JP | 60-238745 | 11/1985 |
| JP | 2292720 | 12/1990 |
| JP | 3-048770 | 3/1991 |
| JP | 5-093729 | 4/1993 |
| JP | 5-507878 | 11/1993 |
| JP | 6-050981 | 2/1994 |
| JP | 9-72912 | 3/1997 |
| JP | 9-189704 | 7/1997 |
| JP | 10-019884 | 1/1998 |
| JP | 2003-504637 | 2/2003 |
| JP | 2004-525339 | 8/2004 |

| | | |
|----|----------------|---------|
| WO | WO 2004/011147 | 2/2004 |
| WO | WO 2004/011148 | 2/2004 |
| WO | WO 2004/011365 | 2/2004 |
| WO | WO 2004/011681 | 2/2004 |
| WO | WO 2004/094672 | 11/2004 |
| WO | WO 2005/005045 | 1/2005 |
| WO | WO 2005/028096 | 3/2005 |
| WO | WO 2007/005810 | 1/2007 |
| WO | WO 2007/005853 | 1/2007 |
| WO | WO 2007/057788 | 5/2007 |
| WO | WO 2008/080046 | 7/2008 |
| WO | WO 2008/134470 | 11/2008 |
| WO | WO 2009/085884 | 7/2009 |

OTHER PUBLICATIONS

Leu et al., "Pressure Barrier of Capillary Stop Valves in Micro Sample Separators", Sensors and Actuators A 115 (2004) 508-515.

* cited by examiner

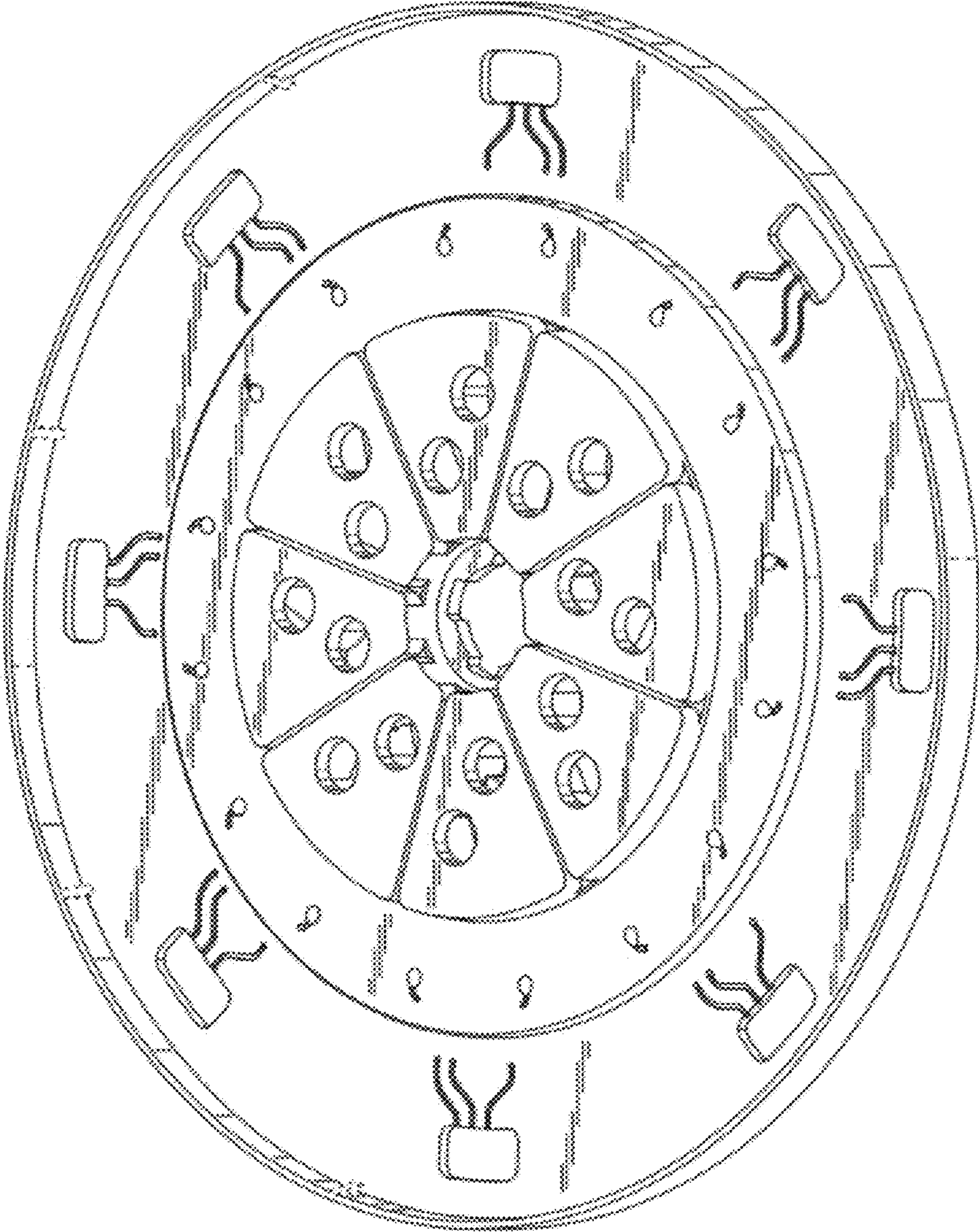


Fig. 1

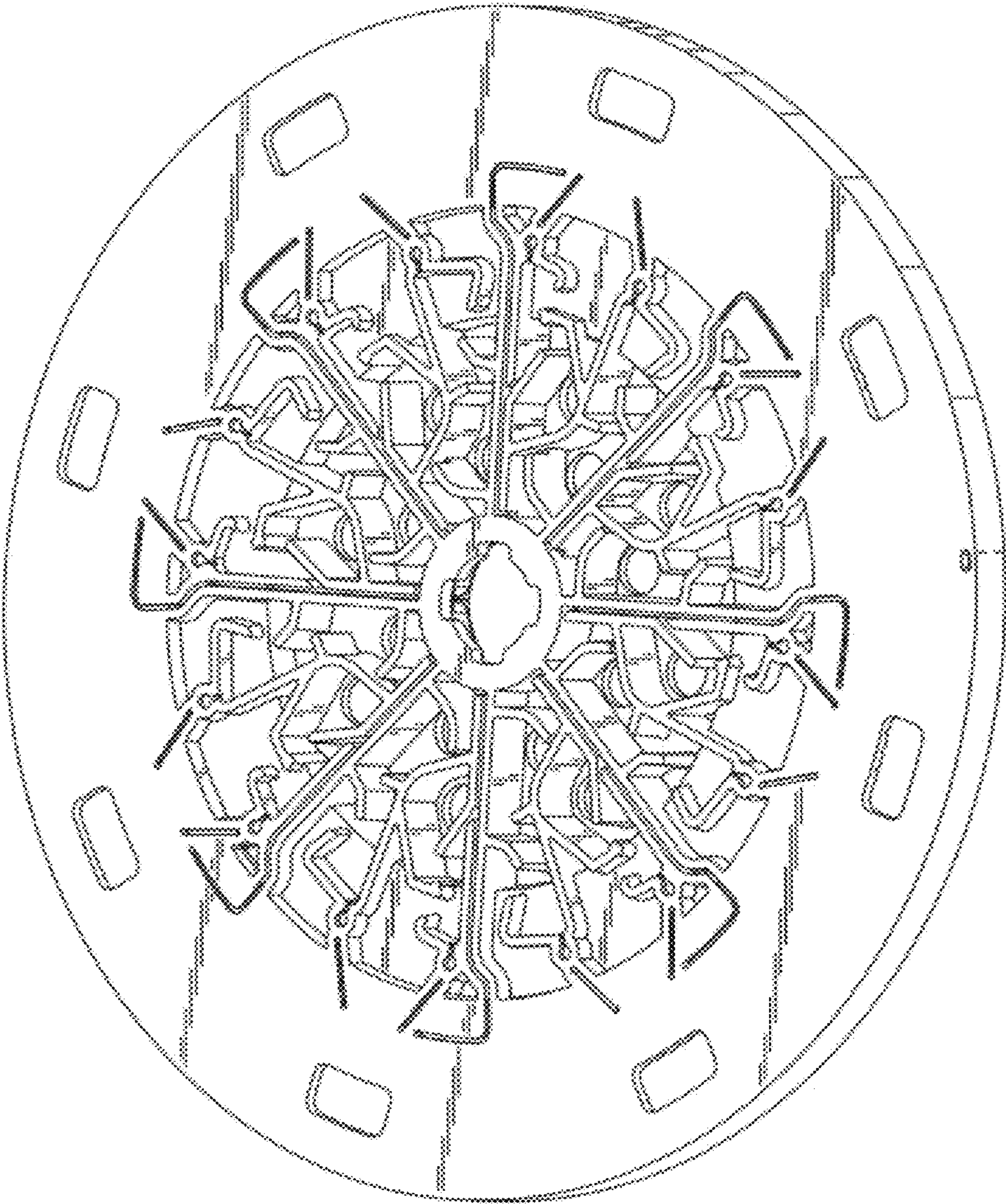


Fig. 2

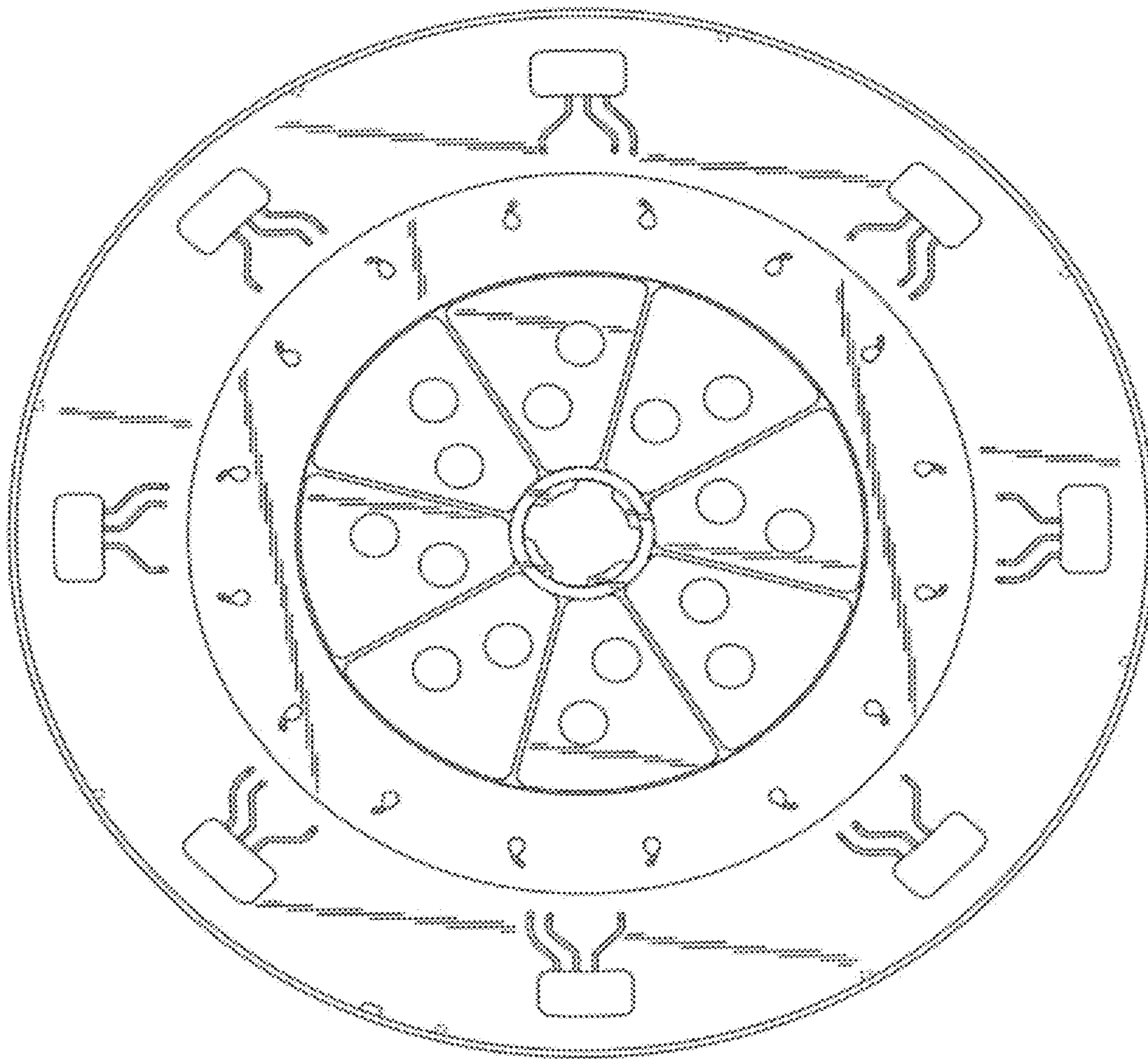


Fig. 3

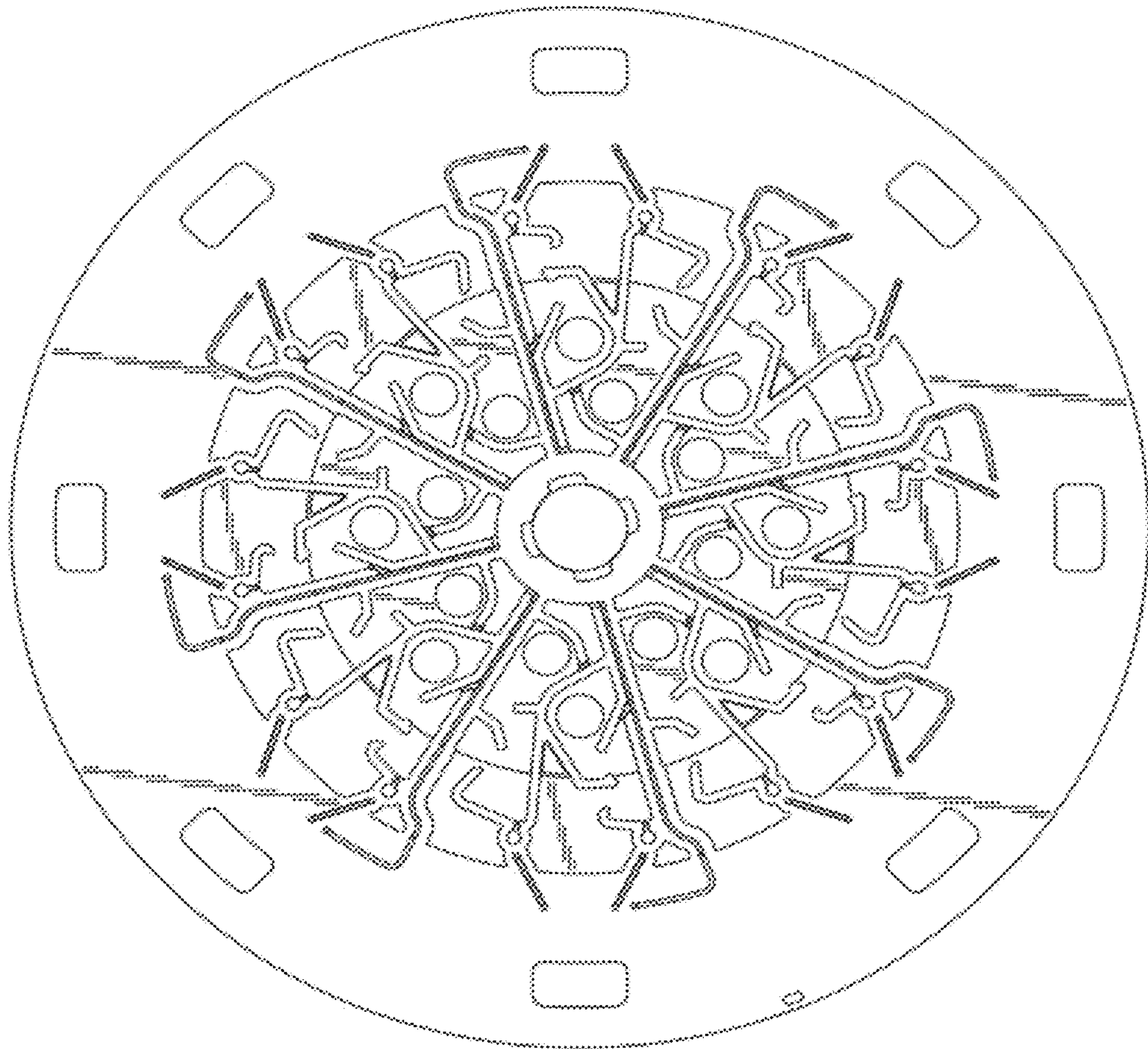


Fig. 4

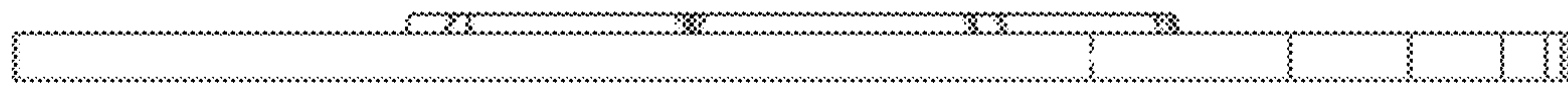


Fig. 5