



**United States Patent** [19]  
**Huynh et al.**

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[45] **Date of Patent:** **Jul. 27, 1999**

[54] **TISSUE HEART VALVES** 5,326,370 7/1994 Love et al. .  
 5,326,371 7/1994 Love et al. .  
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 Anaheim; **Hung Ly Lam**, Norco;  
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 of Calif. 5,376,112 12/1994 Duran .  
 5,423,887 6/1995 Love et al. .  
 5,425,741 6/1995 Lemp et al. .  
 5,449,384 9/1995 Johnson .  
 5,449,385 9/1995 Religa et al. .  
 5,469,868 11/1995 Reger .  
 5,488,789 2/1996 Religa et al. .  
 5,489,297 2/1996 Duran .  
 5,489,298 2/1996 Love et al. .  
 5,500,016 3/1996 Fisher .  
 5,562,729 10/1996 Purdy et al. .... 623/2  
 5,800,527 9/1998 Jansen et al. .... 623/2

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[51] **Int. Cl.<sup>6</sup>** ..... **A61F 2/24**  
[52] **U.S. Cl.** ..... **623/2; 623/900**  
[58] **Field of Search** ..... 623/2, 900

**FOREIGN PATENT DOCUMENTS**

0 071 610 B1 9/1982 European Pat. Off. .  
 0 084 395 B1 8/1986 European Pat. Off. .  
 0 096 721 B1 12/1987 European Pat. Off. .  
 0 125 393 B1 12/1987 European Pat. Off. .  
 0 179 562 B1 7/1989 European Pat. Off. .  
 2 056 023 3/1981 United Kingdom .  
 2 069 843 9/1981 United Kingdom ..... 623/2  
 2 279 134 12/1994 United Kingdom .  
 89/00840 2/1989 WIPO .  
 91/15167 10/1991 WIPO .  
 92/12690 8/1992 WIPO .  
 92/19184 11/1992 WIPO .  
 92/19185 11/1992 WIPO .  
 95/28899 11/1995 WIPO .

[56] **References Cited**

**U.S. PATENT DOCUMENTS**

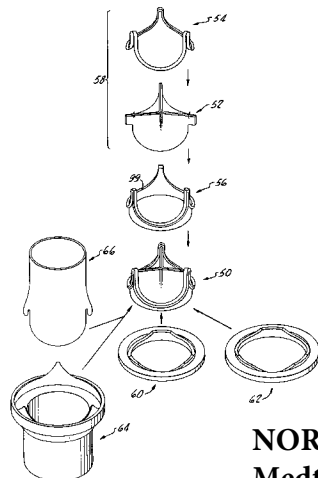
Re. 30,912 4/1982 Hancock .  
 3,755,823 9/1973 Hancock .  
 4,078,468 3/1978 Civitello .  
 4,084,268 4/1978 Ionescu et al. .  
 4,106,129 8/1978 Carpentier et al. .  
 4,172,295 10/1979 Batten .  
 4,218,782 8/1980 Rygg .  
 4,259,753 4/1981 Liotta et al. .  
 4,343,048 8/1982 Ross et al. .  
 4,364,126 12/1982 Rosen et al. .  
 4,388,735 6/1983 Ionescu et al. .  
 4,441,216 4/1984 Ionescu et al. .  
 4,470,157 9/1984 Love .  
 4,501,030 2/1985 Lane .  
 4,506,394 3/1985 Bedard .  
 4,605,407 8/1986 Black et al. .... 623/2  
 4,626,255 12/1986 Reichart et al. .  
 4,629,459 12/1986 Ionescu et al. .  
 4,731,074 3/1988 Rousseau et al. .  
 4,778,461 10/1988 Pietsch et al. .  
 4,851,000 7/1989 Gupta .  
 4,888,009 12/1989 Lederman et al. .  
 5,037,434 8/1991 Lane .  
 5,147,391 9/1992 Lane .  
 5,163,955 11/1992 Love et al. .  
 5,258,023 11/1993 Reger .

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[57] **ABSTRACT**

Improved, adaptable tissue-type heart valves and methods for their manufacture are disclosed wherein a dimensionally stable, pre-aligned tissue leaflet subassembly is formed and its peripheral edge clamped between and attached to an upper shaped wireform and a lower support stent. A variety of adaptable structural interfaces including suture rings, flanges, and conduits may be attached to the support stent with or without an outlet conduit disposed about the wireform to provide a tissue-type heart valve adaptable for use in either a natural heart or in mechanical pumping devices.

**47 Claims, 16 Drawing Sheets**



**NORRED EXHIBIT 2207 - Page 1**  
**Medtronic, Inc., Medtronic Vascular, Inc.,**

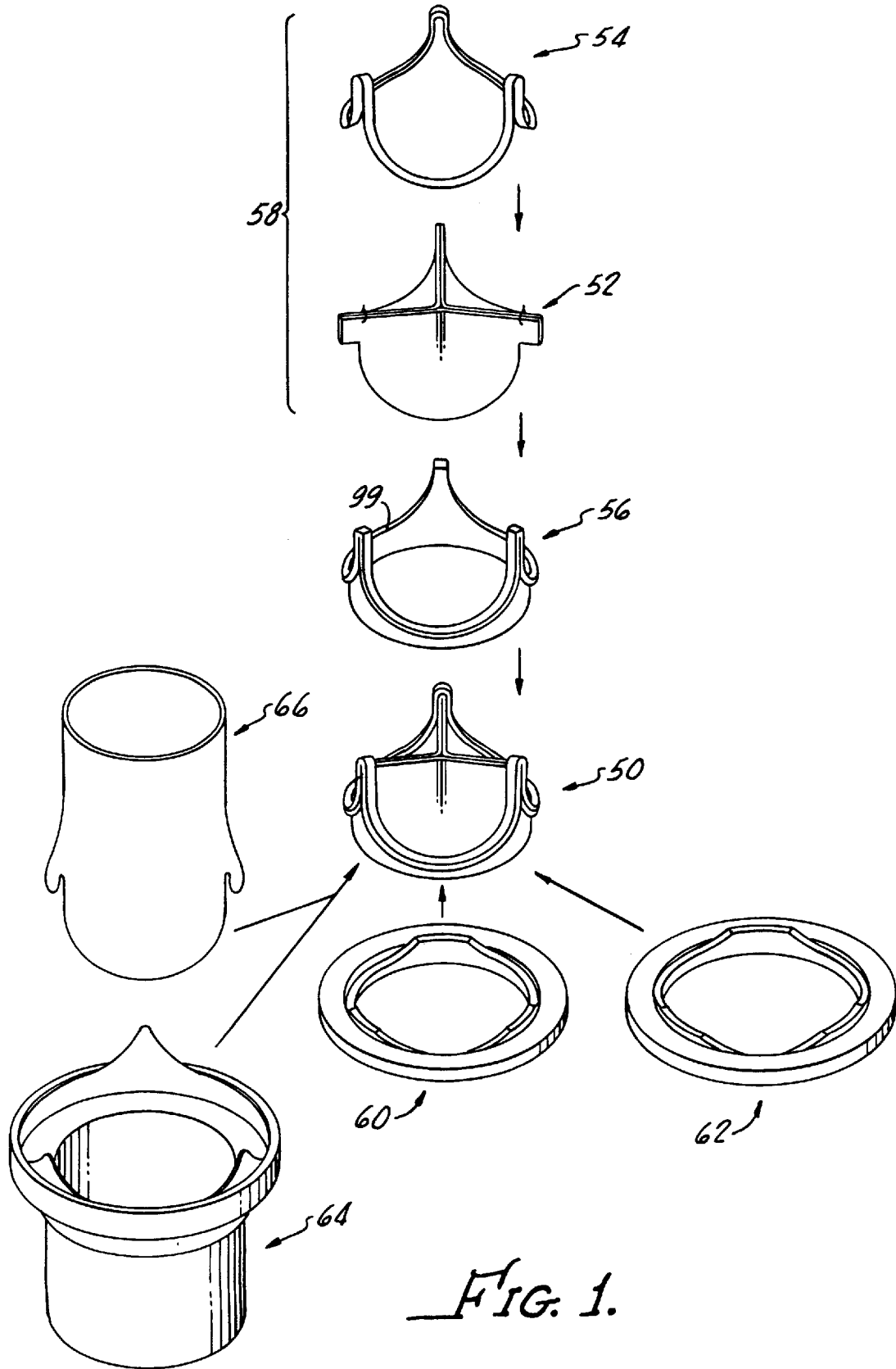


FIG. 1.

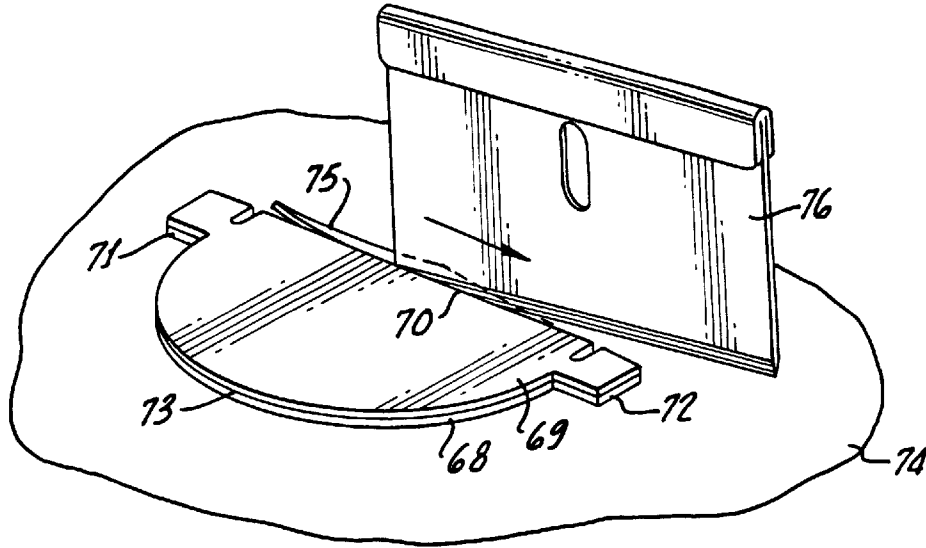


FIG. 2.

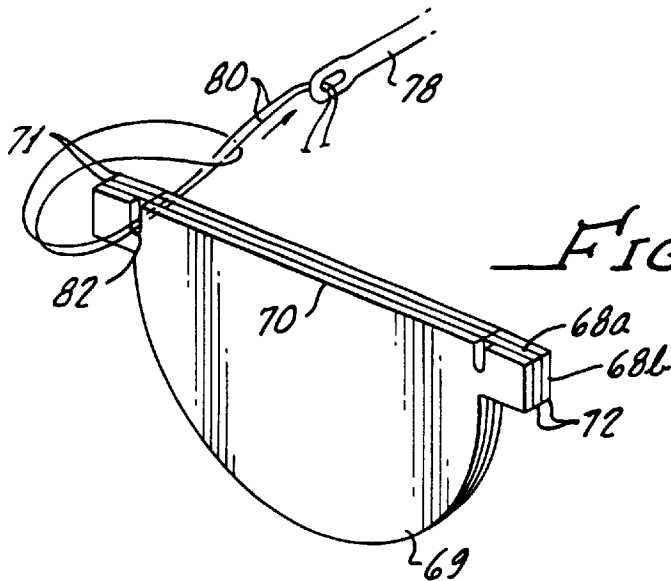


FIG. 3.

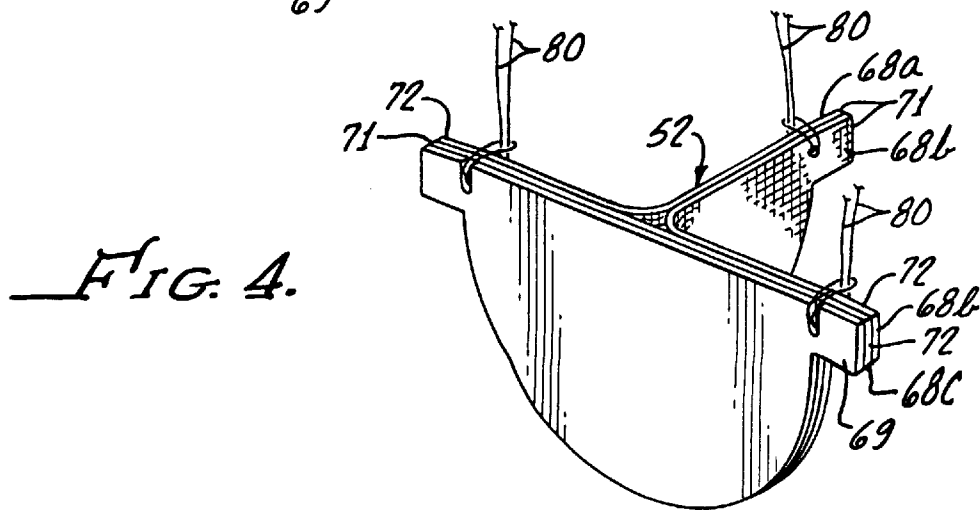


FIG. 4.

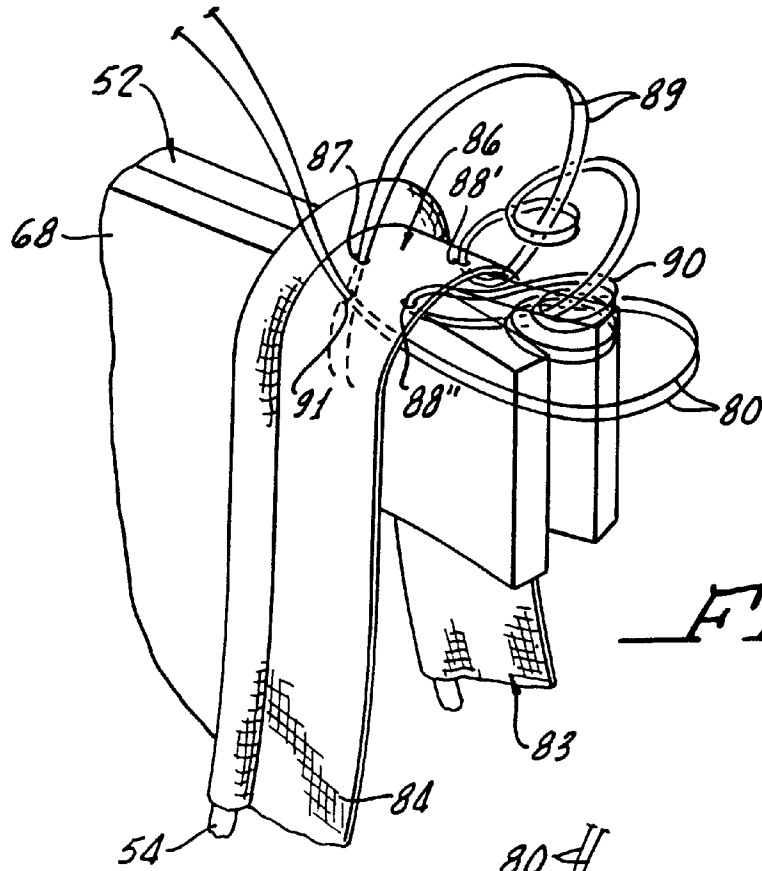


FIG. 5.

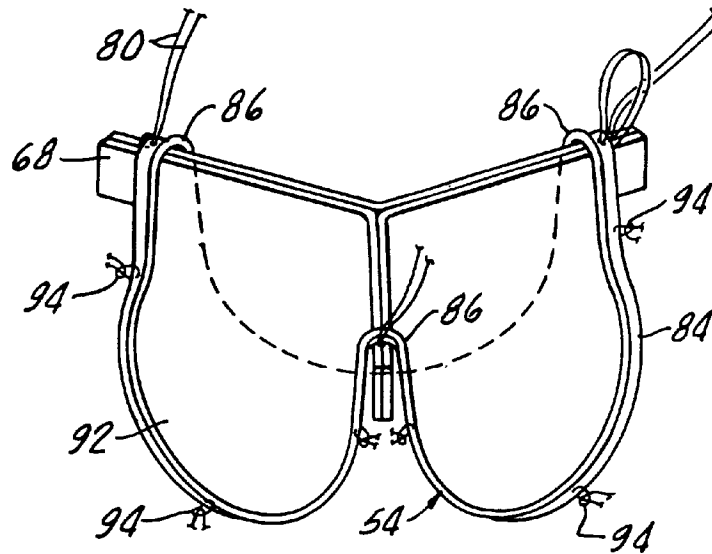


FIG. 6.

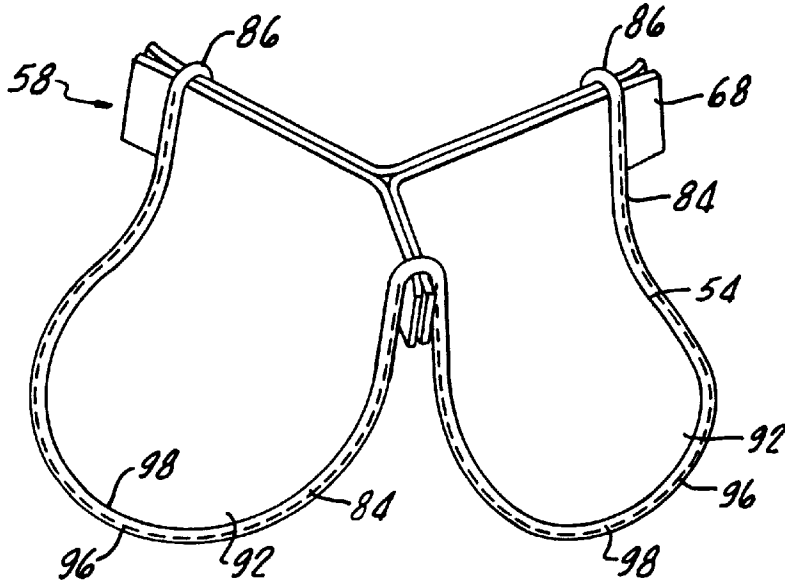


FIG. 7.

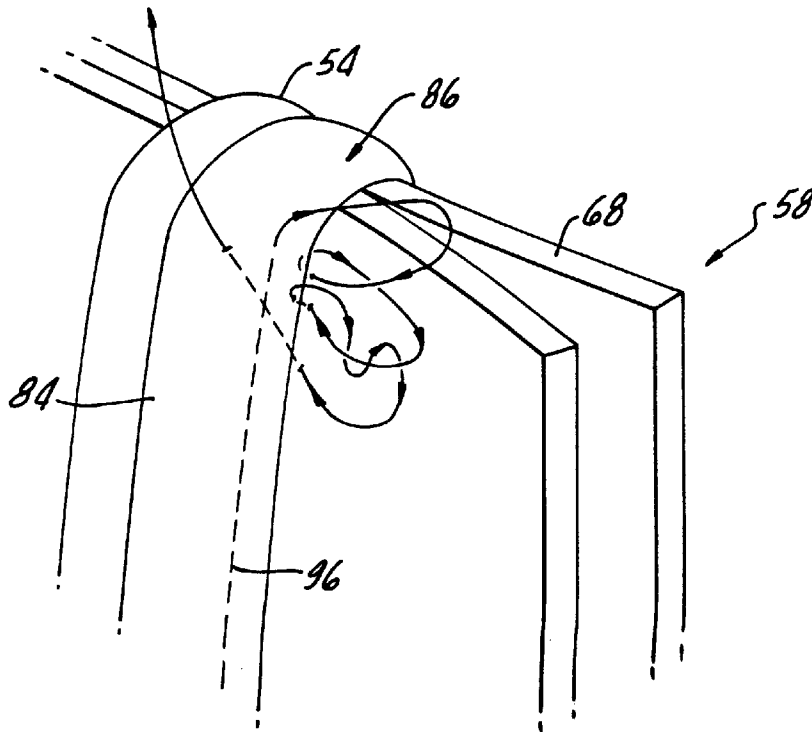


FIG. 8.

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