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(56) **References Cited**

U.S. PATENT DOCUMENTS


| | | | | |
|---|---|---|---|---|
| 3,938,198 | A | 2/1976 | Kahn et al. | 3/1.912 |
| 3,982,281 | A | 9/1976 | Giliberty | 3/1.913 |
| 3,987,499 | A | 10/1976 | Scharbach et al. | 3/1.91 |
| 4,203,444 | A | 5/1980 | Bonnell et al. | 128/276 |
| 4,340,978 | A | 7/1982 | Buechel et al. | 3/1.911 |
| 4,368,040 | A | 1/1983 | Weissman | 433/36 |
| 4,501,266 | A | 2/1985 | McDaniel | 128/69 |
| 4,601,290 | A | 7/1986 | Effron et al. | 128/305 |
| 4,627,853 | A | 12/1986 | Campbell et al. | 623/16 |
| 4,715,860 | A | 12/1987 | Amstutz et al. | 623/22 |
| 4,721,104 | A | 1/1988 | Kaufman et al. | 128/92 |
| 4,759,350 | A | 7/1988 | Dunn et al. | 128/92 VW |
| 4,841,975 | A | 6/1989 | Woolson | 128/653 |
| 4,886,258 | A | 12/1989 | Scott | 269/328 |
| 4,936,862 | A | 6/1990 | Walker et al. | 623/23 |
| 4,979,949 | A | 12/1990 | Matsen, III et al. | 606/53 |
| 5,002,547 | A | 3/1991 | Poggie et al. | 606/88 |
| 5,007,936 | A * | 4/1991 | Woolson | 128/898 |
| 5,053,039 | A | 10/1991 | Hofmann et al. | 606/87 |
| 5,108,452 | A | 4/1992 | Fallin | 623/23 |
| 5,122,144 | A | 6/1992 | Bert et al. | 606/88 |
| 5,129,908 | A | 7/1992 | Peterson | 606/88 |
| 5,154,717 | A | 10/1992 | Matsen, III et al. | 606/53 |
| 5,234,433 | A | 8/1993 | Bert et al. | 606/88 |
| 5,250,050 | A | 10/1993 | Poggie et al. | 606/79 |
| 5,258,032 | A | 11/1993 | Bertin | 623/20 |
| 5,299,288 | A * | 3/1994 | Glassman et al. | 700/245 |
| 5,303,148 | A | 4/1994 | Mattson et al. | 364/413.01 |
| 5,314,482 | A | 5/1994 | Goodfellow et al. | 623/20 |
| 5,360,446 | A | 11/1994 | Kennedy | 623/16 |
| 5,380,332 | A | 1/1995 | Ferrante | 606/79 |
| 5,387,216 | A | 2/1995 | Thornhill et al. | 606/88 |
| 5,403,319 | A | 4/1995 | Matsen, III et al. | 606/88 |
| 5,437,676 | A | 8/1995 | Bouraly et al. | 606/88 |
| 5,474,559 | A | 12/1995 | Bertin et al. | 606/89 |
| 5,486,180 | A | 1/1996 | Dietz et al. | 606/87 |
| 5,501,687 | A | 3/1996 | Willert et al. | 606/94 |
| 5,503,162 | A | 4/1996 | Athanasiou et al. | 128/774 |
| 5,540,696 | A | 7/1996 | Booth, Jr. et al. | 606/88 |
| 5,542,947 | A | 8/1996 | Treacy | 606/88 |
| 5,571,205 | A | 11/1996 | James | 623/24 |
| 5,575,793 | A | 11/1996 | Carls et al. | 606/80 |
| 5,578,037 | A | 11/1996 | Sanders et al. | 606/80 |
| 5,597,379 | A | 1/1997 | Haines et al. | 606/80 |
| 5,601,563 | A | 2/1997 | Burke et al. | 606/86 |
| 5,613,970 | A | 3/1997 | Houston et al. | 606/88 |
| 5,616,146 | A | 4/1997 | Murray | 606/80 |
| 5,630,820 | A | 5/1997 | Todd | 606/90 |
| 5,658,290 | A | 8/1997 | Techiera | 606/80 |
| 5,681,316 | A | 10/1997 | DeOrio et al. | 606/88 |
| 5,681,354 | A | 10/1997 | Eckhoff | 623/20 |
| 5,682,886 | A | 11/1997 | Delp et al. | 128/653.1 |
| 5,688,282 | A | 11/1997 | Baron et al. | 606/90 |
| 5,690,635 | A | 11/1997 | Matsen, III et al. | 606/88 |
| 5,735,277 | A | 4/1998 | Schuster | 128/653.1 |
| 5,749,876 | A | 5/1998 | Duvillier et al. | 606/88 |
| 5,766,259 | A | 6/1998 | Sammarco | 623/21 |
| 5,768,134 | A | 6/1998 | Swaelens et al. | 364/468.28 |
| 5,769,092 | A | 6/1998 | Williamson, Jr. | 128/898 |
| 5,776,137 | A | 7/1998 | Katz | 606/88 |
| 5,788,701 | A | 8/1998 | McCue | 606/88 |
| 5,795,353 | A | 8/1998 | Felt | 623/18 |
| 5,800,438 | A | 9/1998 | Tuke et al. | 606/90 |
| 5,830,216 | A | 11/1998 | Insall et al. | 606/88 |
| 5,860,981 | A | 1/1999 | Bertin et al. | 606/89 |
| 5,871,018 | A | 2/1999 | Delp et al. | 128/898 |
| 5,880,976 | A | 3/1999 | DiGioia, III et al. | 364/578 |
| 5,885,296 | A | 3/1999 | Masini | 606/86 |
| 5,885,297 | A * | 3/1999 | Matsen, III | 606/87 |
| 5,885,298 | A | 3/1999 | Herrington et al. | 606/88 |
| 5,897,559 | A | 4/1999 | Masini | 606/86 |
| 5,911,723 | A | 6/1999 | Ashby et al. | 606/88 |
| 5,916,220 | A | 6/1999 | Masini | 606/88 |
| 5,961,523 | A | 10/1999 | Masini | 606/86 |
| 5,968,051 | A | 10/1999 | Luckman et al. | 606/88 |
| 5,995,738 | A | 11/1999 | DiGioia, III et al. | 395/500.32 |
| 6,002,859 | A | 12/1999 | DiGioia, III et al. | 395/500.32 |
| 6,007,537 | A | 12/1999 | Burkinshaw et al. | 606/66 |
| 6,010,509 | A | 1/2000 | Delgado et al. | 606/88 |
| 6,046,379 | A | 4/2000 | Stone et al. | 623/11 |
| 6,056,754 | A | 5/2000 | Haines et al. | 606/80 |
| 6,056,756 | A | 5/2000 | Eng et al. | 606/87 |
| 6,077,270 | A | 6/2000 | Katz | 606/88 |
| 6,096,043 | A | 8/2000 | Techiera et al. | 606/88 |
| 6,102,916 | A | 8/2000 | Masini | 606/88 |
| 6,106,529 | A | 8/2000 | Techiera | 606/88 |
| 6,110,209 | A | 8/2000 | Stone | 623/16.11 |
| 6,126,690 | A | 10/2000 | Ateshian et al. | 623/18 |
| 6,156,069 | A | 12/2000 | Amstutz | 623/22.11 |
| 6,161,080 | A | 12/2000 | Aouni-Ateshian et al. | 703/11 |
| 6,187,010 | B1 | 2/2001 | Masini | 606/86 |
| 6,197,064 | B1 | 3/2001 | Haines et al. | 623/20.31 |
| 6,203,546 | B1 | 3/2001 | MacMahon | 606/87 |
| 6,205,411 | B1 * | 3/2001 | DiGioia et al. | 703/11 |
| 6,235,060 | B1 | 5/2001 | Kubein-Meesenburg et al. | 623/20.31 |
| 6,296,646 | B1 | 10/2001 | Williamson | 606/90 |
| 6,344,043 | B1 | 2/2002 | Pappas | 606/96 |
| 6,358,253 | B1 | 3/2002 | Torrie et al. | 606/96 |
| 6,375,658 | B1 | 4/2002 | Hangody et al. | 606/80 |
| 6,379,367 | B1 | 4/2002 | Vibe-Hansen et al. | 606/151 |
| 6,383,228 | B1 | 5/2002 | Schmotzer | 623/23.35 |
| 6,443,988 | B2 | 9/2002 | Felt et al. | 623/17.12 |
| 6,459,948 | B1 | 10/2002 | Ateshian et al. | 700/117 |
| 6,478,799 | B1 | 11/2002 | Williamson | 606/90 |
| 6,510,334 | B1 | 1/2003 | Schuster et al. | 600/407 |
| 6,575,980 | B1 | 6/2003 | Robie et al. | 606/88 |
| 6,620,168 | B1 | 9/2003 | Lombardo et al. | 606/88 |
| 6,626,948 | B2 | 9/2003 | Storer et al. | 623/23.14 |
| 6,632,225 | B2 | 10/2003 | Sanford et al. | 606/87 |
| 6,673,077 | B1 | 1/2004 | Katz | 606/88 |
| 6,673,116 | B2 | 1/2004 | Reiley | 623/21.18 |
| 6,679,917 | B2 | 1/2004 | Ek | 623/20.14 |
| 6,702,821 | B2 | 3/2004 | Bonutti | 606/88 |
| 6,712,856 | B1 | 3/2004 | Carignan et al. | 623/20.35 |
| 6,875,218 | B2 | 4/2005 | Dye et al. | 606/91 |