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Bagoisan et al.

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(54) **ASPIRATION SYSTEM AND METHOD**

FOREIGN PATENT DOCUMENTS

(75) Inventors: **Celso J. Bagoisan**, Union City; **Hung V. Ha**, San Jose; **Mukund R. Patel**, San Jose; **Sivette Lam**, San Jose; **Mir Imran**, Los Altos Hills, all of CA (US)

DE 3804849 A1 2/1988
WO WO/83/01894 6/1983
WO WO/89/01309 2/1989

OTHER PUBLICATIONS

(73) Assignee: **Medtronic PercuSurge, Inc.**, Sunnyvale, CA (US)

“Transluminal Angioplasty for the Treatment of Carotid Artery Stenoses” Freitag, et al., VASA, Band 16, Heft 1, 1987.

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 26 days.

“Percutaneous Angioplasty of Atherosclerotic and Postsurgical Stenosis of Carotid Arteries” J. Theron et al., AJNR,, 6:495-500, May/Jun. 1987.

(21) Appl. No.: **09/591,733**

Primary Examiner—Angela D. Sykes
Assistant Examiner—Cris Rodriguez

(22) Filed: **Jun. 12, 2000**

(74) *Attorney, Agent, or Firm*—Knobbe, Martens, Olson & Bear LLP

Related U.S. Application Data

(60) Division of application No. 09/026,013, filed on Feb. 19, 1998, now Pat. No. 6,152,909, which is a continuation-in-part of application No. 08/813,808, filed on Mar. 6, 1997, now abandoned, and a continuation-in-part of application No. 08/813,807, filed on Mar. 6, 1997, now abandoned, and a continuation-in-part of application No. 08/812,875, filed on Mar. 6, 1997, now Pat. No. 5,833,644, which is a continuation-in-part of application No. 08/650,464, filed on May 20, 1996, now abandoned.

(57) **ABSTRACT**

Aspiration catheters and methods for the treatment of an occlusion in a blood vessel. These catheters and methods are especially useful in the removal of occlusions from saphenous vein grafts, the coronary and carotid arteries, arteries above the aortic arch and even smaller vessels. The catheters of the present invention are provided in either over-the-wire or in single operator form. Radiopaque markers are preferably incorporated into distal ends of the catheters, and visual markers are incorporated into the proximal end of the catheters, to facilitate their positioning within the body. The catheters are provided with varying flexibility along the length of the shaft, such that they are soft and flexible enough to be navigated through the vasculature of a patient without causing damage, but are stiff enough to sustain the axial push required to position the catheter properly and to sustain the aspiration pressures. Support mandrels and support sheaths may also be added to impart additional strength to the length of the catheter.

(51) **Int. Cl.**⁷ **A61M 31/00**
(52) **U.S. Cl.** **604/509; 604/28; 604/101.04**
(58) **Field of Search** 604/509, 35, 28, 604/40, 41, 42, 507, 508, 510, 264, 101.04, 101.05, 523, 528

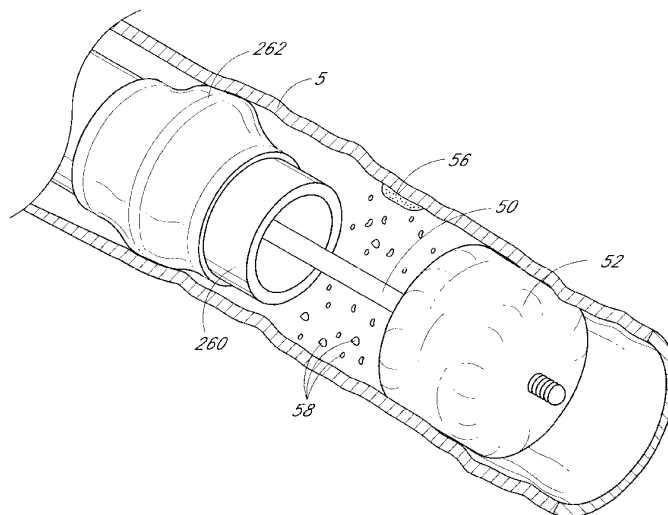
(56) **References Cited**

U.S. PATENT DOCUMENTS

3,144,868 A 8/1964 Jascalevich
4,299,226 A 11/1981 Banka

(List continued on next page.)

7 Claims, 10 Drawing Sheets



US 6,398,773 B1

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U.S. PATENT DOCUMENTS

4,445,892 A	5/1984	Hussein et al.	5,380,284 A	1/1995	Don Michael
4,456,011 A	6/1984	Warnecke	5,403,274 A	4/1995	Cannon
4,468,216 A	8/1984	Muto	5,419,774 A	5/1995	Willard et al.
4,573,966 A	3/1986	Weigl et al.	5,423,742 A	6/1995	Theron
4,589,412 A	5/1986	Kensey	5,462,529 A	10/1995	Simpson et al.
4,610,662 A	9/1986	Weigl et al.	5,476,450 A	12/1995	Ruggio
4,692,139 A	9/1987	Stiles	5,634,897 A	6/1997	Dance et al.
4,771,777 A	9/1988	Horzewski et al.	5,662,671 A	9/1997	Barbut et al.
4,790,812 A	12/1988	Hawkins, Jr. et al.	5,681,336 A	10/1997	Clement et al.
4,790,813 A	12/1988	Kensey	5,688,234 A	11/1997	Frisbie
4,794,928 A	1/1989	Kletschka	5,779,721 A	7/1998	Nash
4,832,028 A	5/1989	Patel	5,823,996 A	10/1998	Sparks
4,911,163 A	3/1990	Fina	5,833,644 A	11/1998	Zadno-Azizi et al.
5,000,743 A	3/1991	Patel	5,833,650 A	11/1998	Imran
5,059,178 A	10/1991	Ya	5,879,361 A	3/1999	Nash
5,135,484 A	8/1992	Wright	5,938,672 A	8/1999	Nash
5,163,905 A	11/1992	Don Michael	5,954,745 A	9/1999	Gertler et al.
5,163,906 A	11/1992	Ahmadi	5,968,064 A	10/1999	Selmon et al.
5,195,955 A	3/1993	Don Michael	6,022,336 A	2/2000	Zadno-Azizi et al.
5,250,060 A	10/1993	Carbo et al.	6,050,972 A	4/2000	Zadno-Azizi et al.
5,263,959 A	11/1993	Fischell	6,068,623 A	5/2000	Zadno-Azizi et al.
5,279,546 A	1/1994	Mische et al.	6,135,991 A	10/2000	Muni et al.
5,281,200 A	1/1994	Corso, Jr. et al.	6,231,588 B1 *	5/2001	Zadno-Azizi 606/200
5,328,471 A	7/1994	Slepian	6,270,477 B1 *	8/2001	Bagoisan et al. 604/96.01
5,342,306 A	8/1994	Don Michael			

* cited by examiner

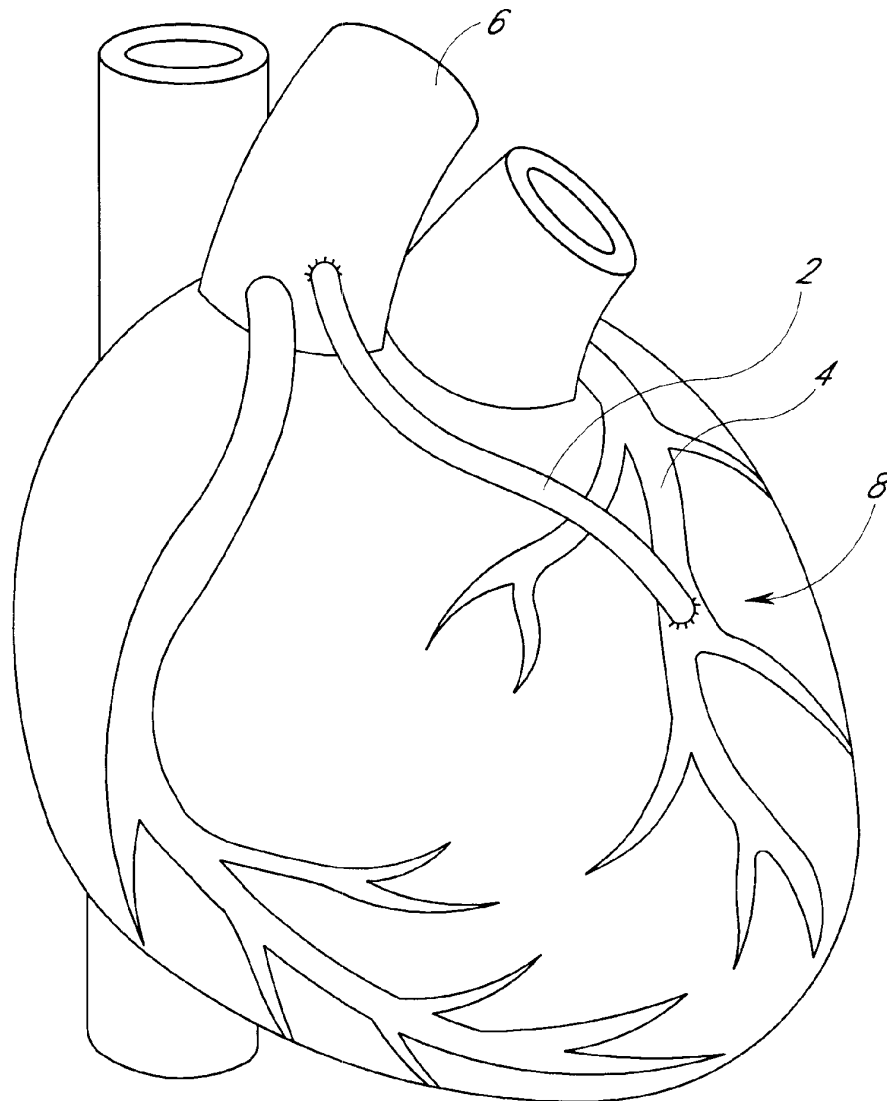


FIG. 1

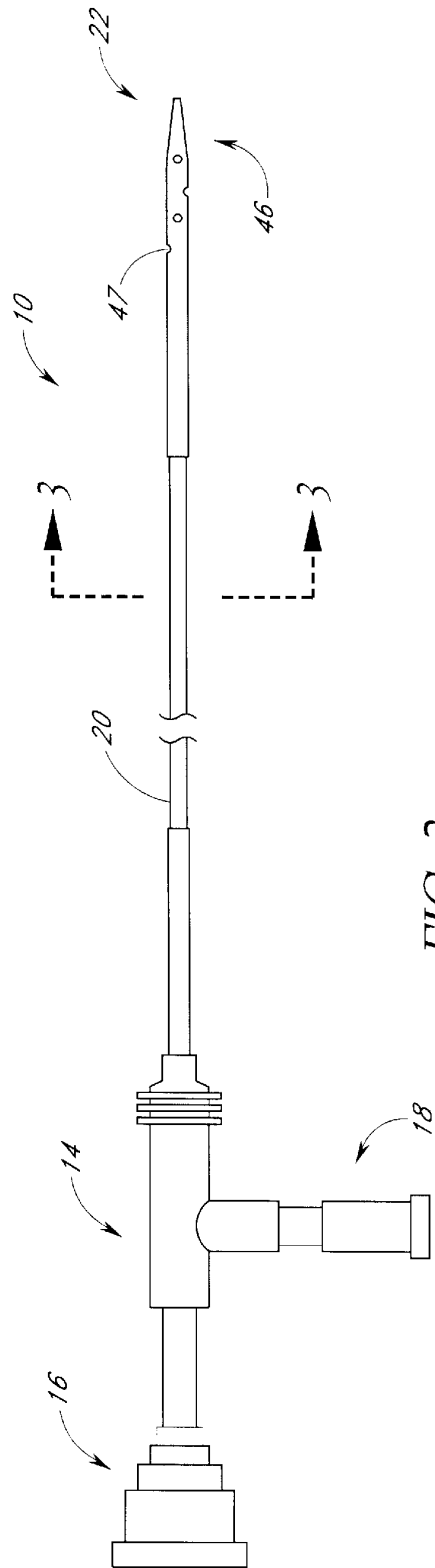


FIG. 2

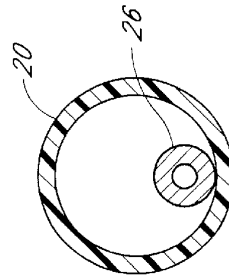


FIG. 4

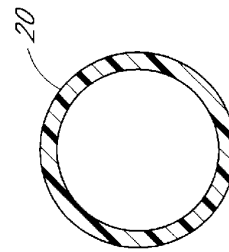


FIG. 3

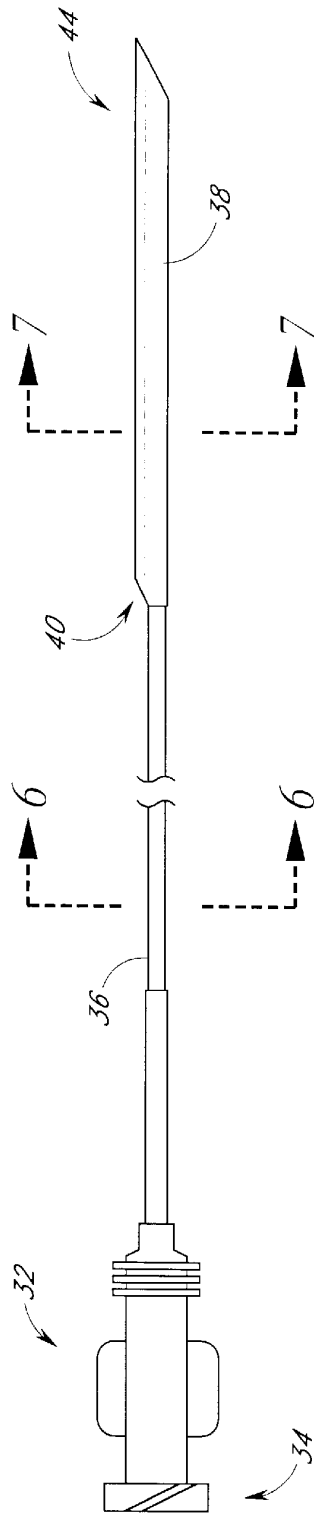


FIG. 5

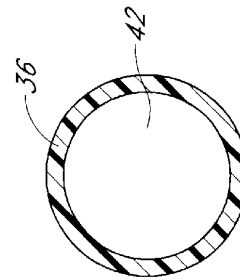


FIG. 6

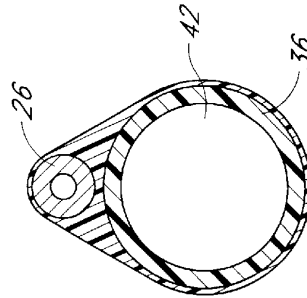


FIG. 7A

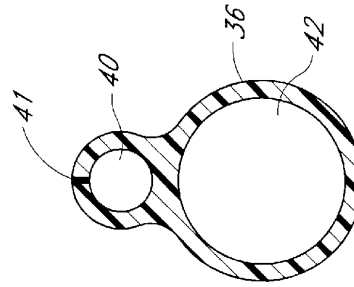


FIG. 7B

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