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Bagoisan et al.

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(54) **ASPIRATION SYSTEM AND METHOD**

FOREIGN PATENT DOCUMENTS

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(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/June. 1987.

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

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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

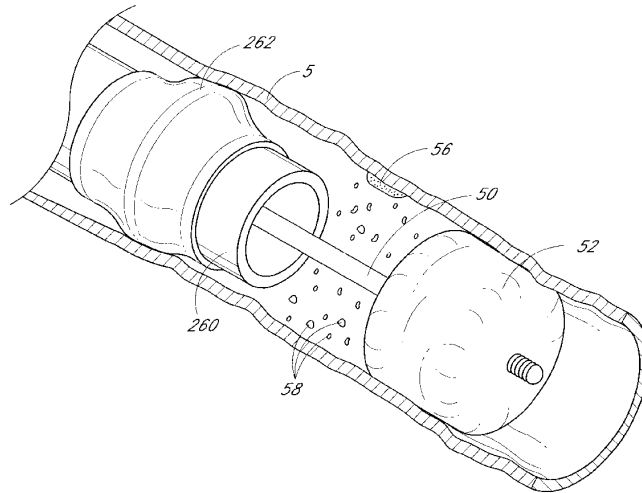
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7 Claims, 10 Drawing Sheets



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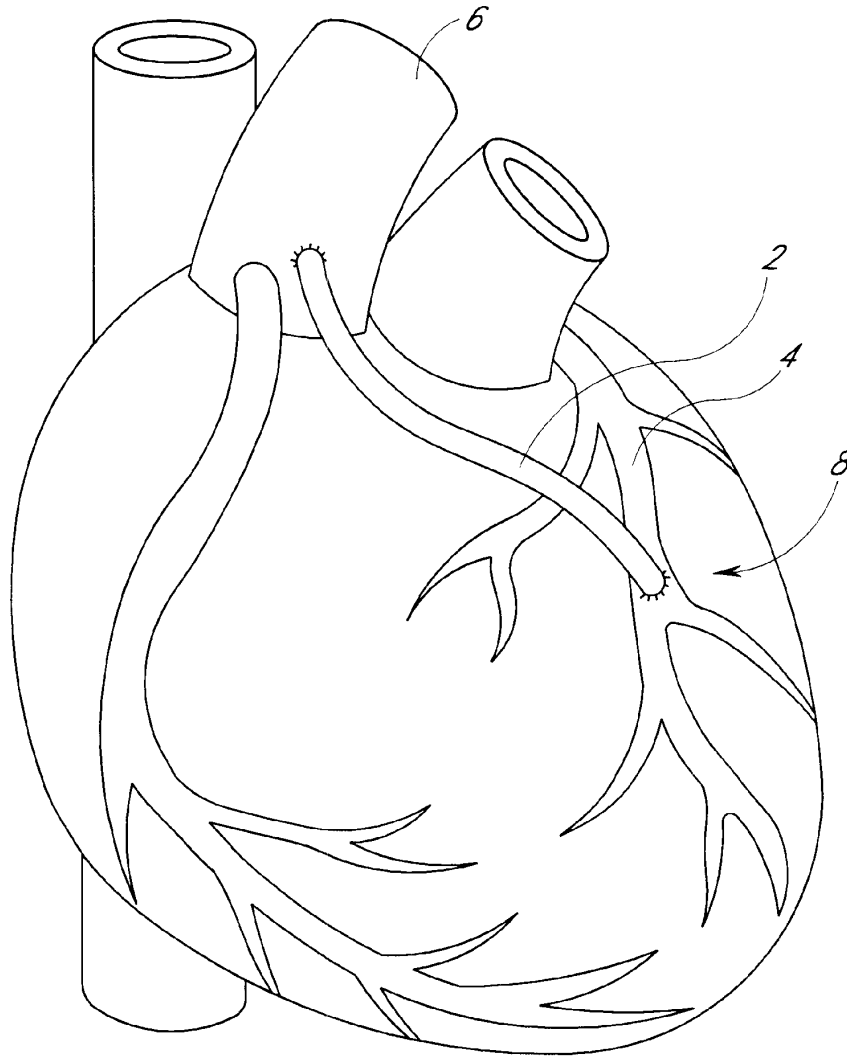


FIG. 1

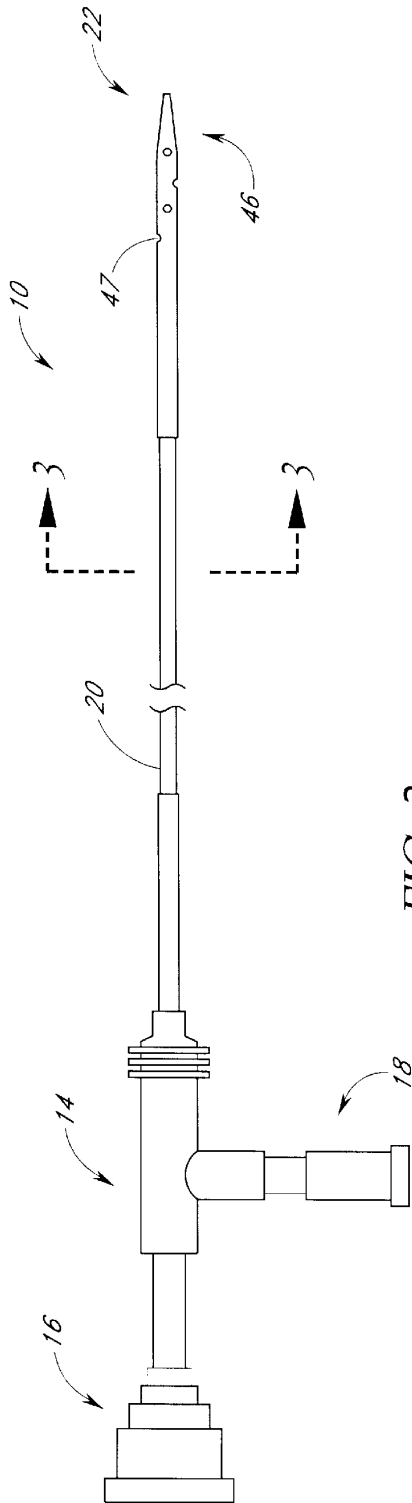


FIG. 2

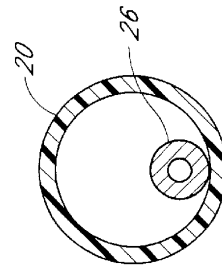


FIG. 4

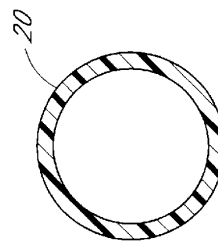


FIG. 3

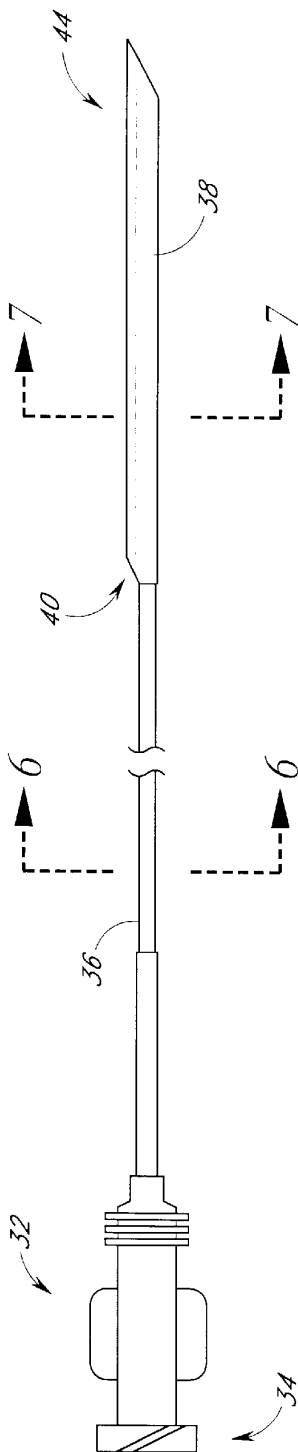


FIG. 5

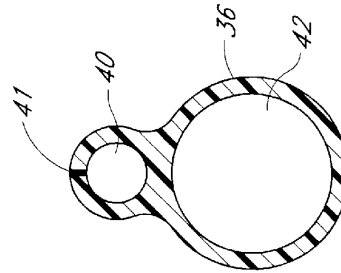


FIG. 7B

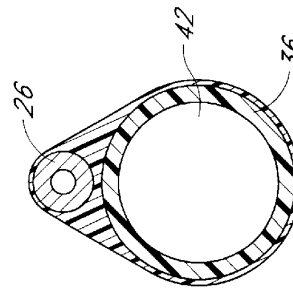


FIG. 7A

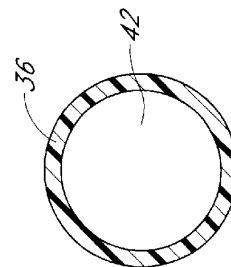


FIG. 6

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