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(12) **United States Patent**  
**Garrison et al.**

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(54) **METHODS AND DEVICES FOR  
IMPLANTING CARDIAC VALVES**

\* cited by examiner

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(57) **ABSTRACT**

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

The valve implantation system has a valve displacer for displacing and holding the native valve leaflets open in a first aspect of the invention. A replacement valve may be attached to the valve displacer before or after introduction and may be positioned independent of the valve displacer. In another aspect of the invention, the valve displacer and valve are in a collapsed condition during introduction and are expanded to deploy the valve displacer and valve. The valve is a tissue valve mounted to an expandable support structure. The support structure may have protrusions for engaging the valve displacer or barbs for anchoring the valve displacer to the heart or blood vessel. A temporary valve mechanism may be used to provide temporary valve functions during and after deployment of the valve displacer.

(21) Appl. No.: **09/248,911**

(22) Filed: **Feb. 10, 1999**

(51) **Int. Cl.**<sup>7</sup> ..... **A61F 2/24**

(52) **U.S. Cl.** ..... **623/2.11**; 623/1.26; 623/2.38; 623/904

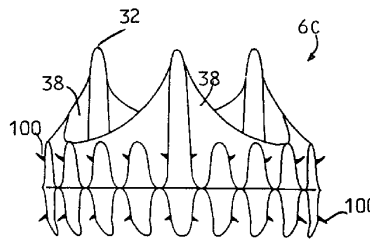
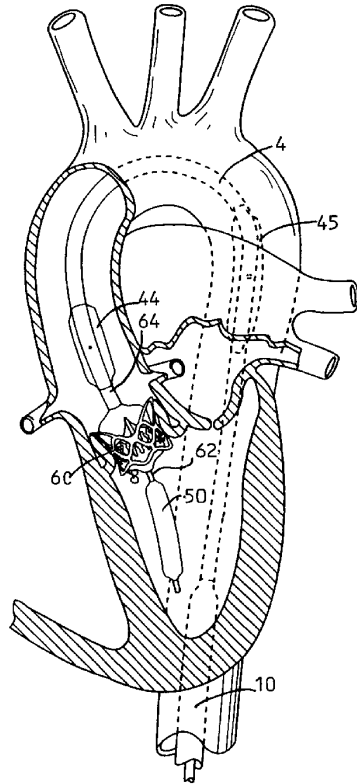
(58) **Field of Search** ..... 623/1.26, 1.24, 623/2.11, 2.1, FOR 101, 2.12–2.19, 2.42, 904, 2.38

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**16 Claims, 23 Drawing Sheets**



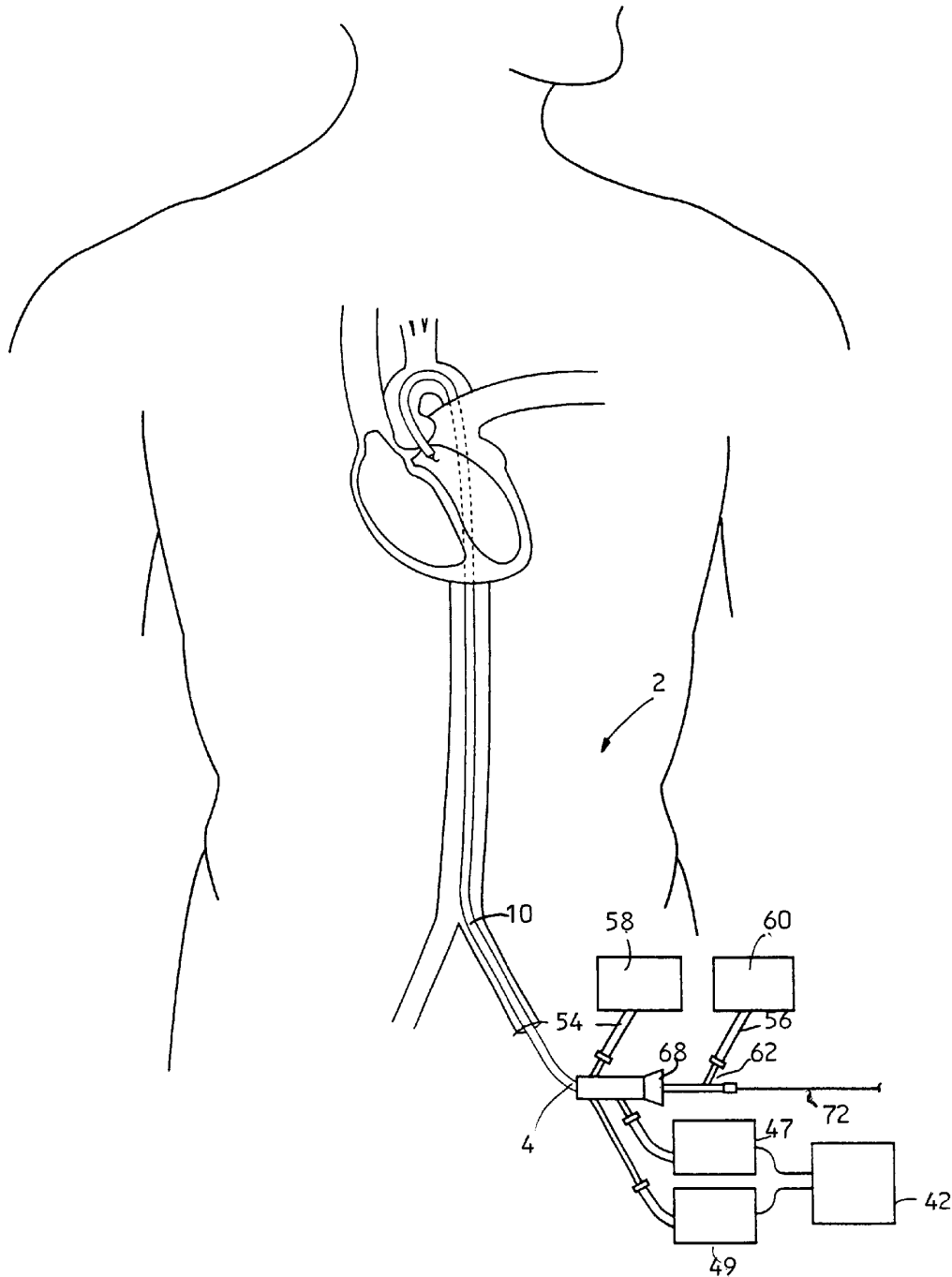
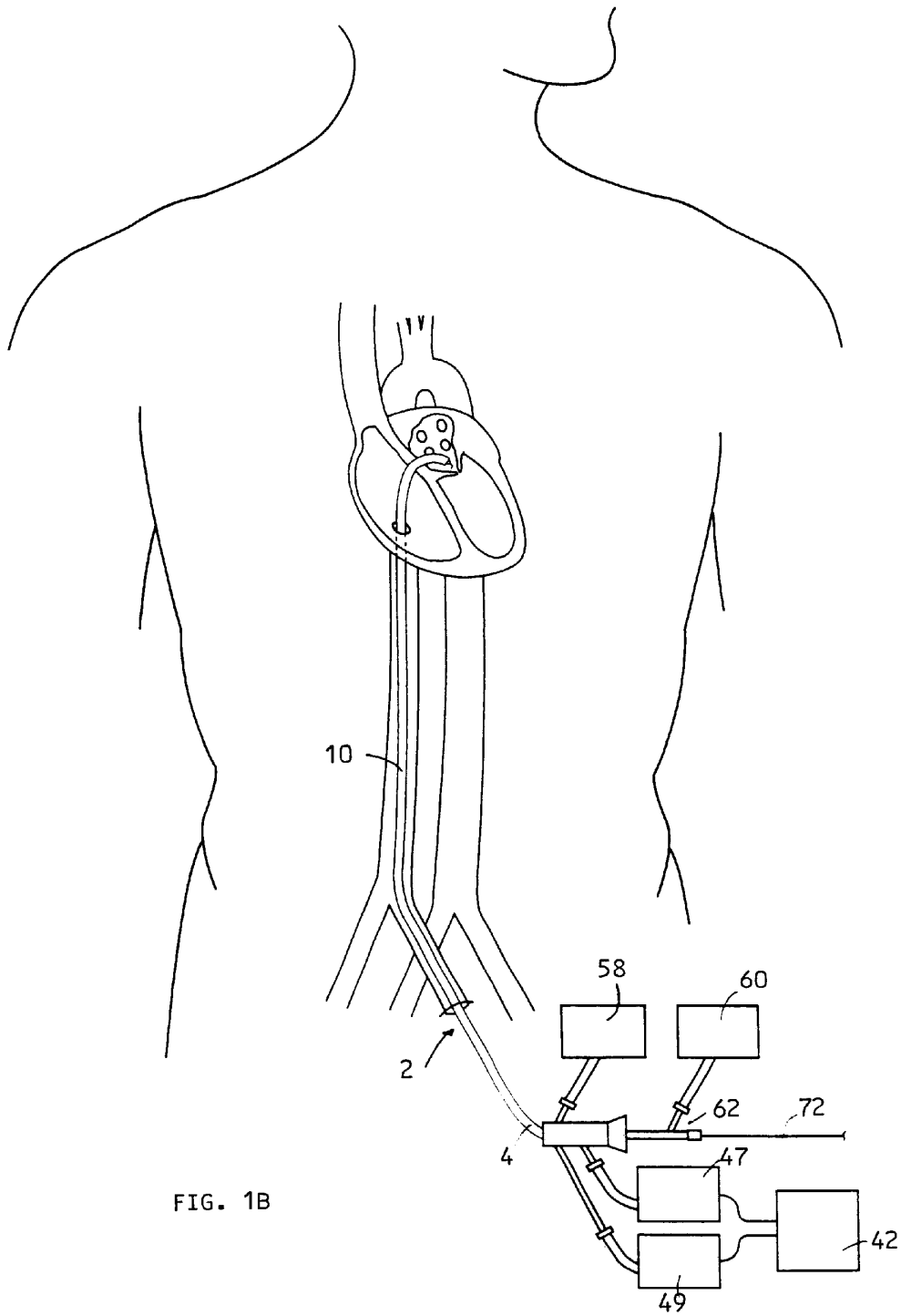


FIG. 1A



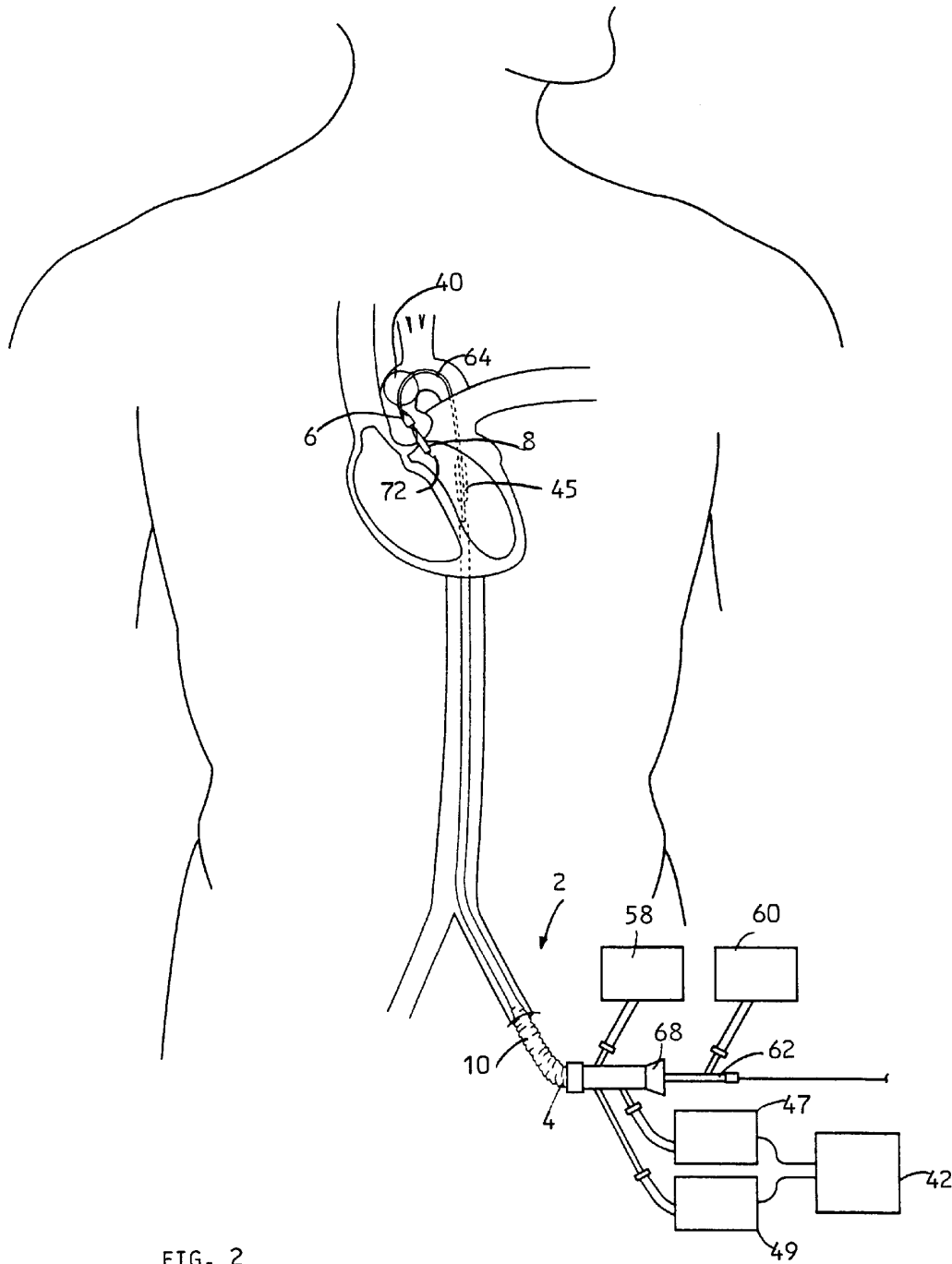


FIG. 2

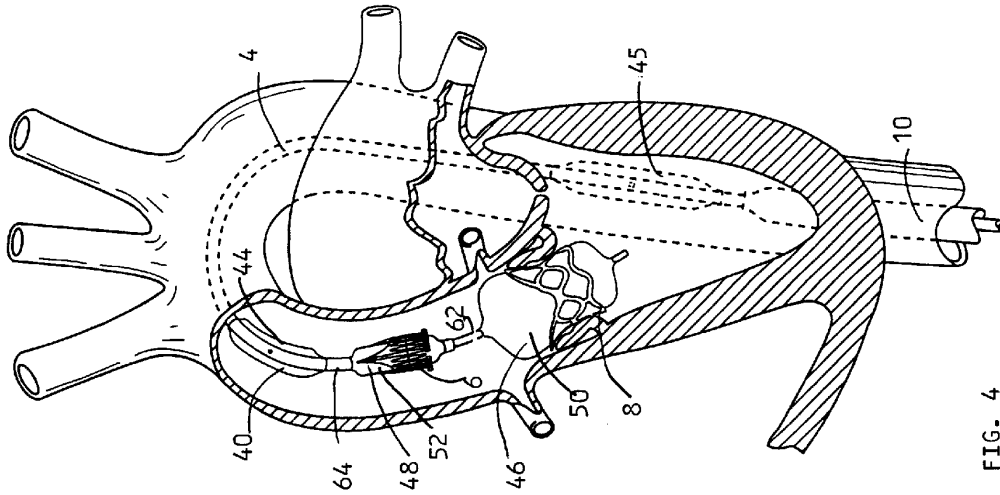


FIG. 4

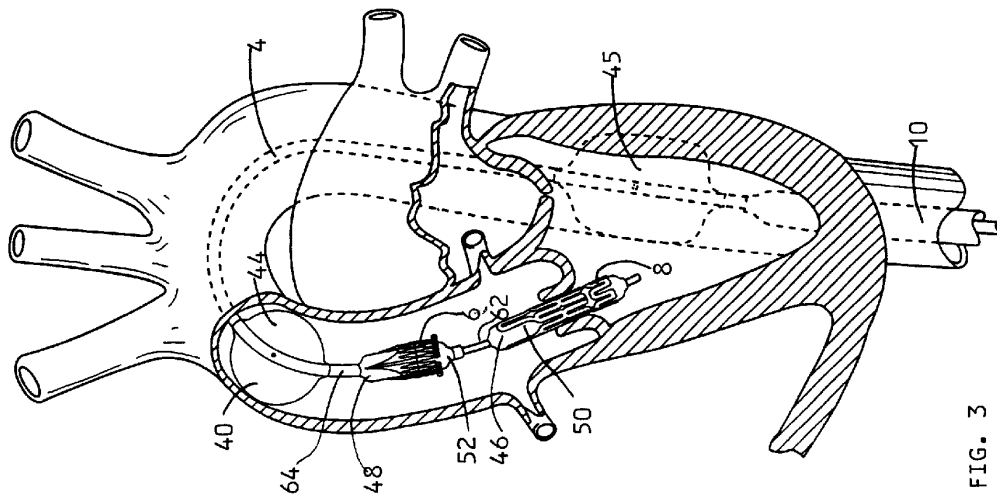


FIG. 3

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