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(12) **United States Patent**
Lattouf

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(45) **Date of Patent:** **Dec. 20, 2005**

(54) **TREATMENT FOR PATIENT WITH CONGESTIVE HEART FAILURE**

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(76) **Inventor:** **Omar M. Lattouf**, 2419 Highland Grove NE., Atlanta, GA (US) 30345

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(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 352 days.

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(65) **Prior Publication Data**

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Related U.S. Application Data

(60) Provisional application No. 60/369,988, filed on Apr. 4, 2002, provisional application No. 60/365,918, filed on Mar. 20, 2002, provisional application No. 60/340,062, filed on Dec. 8, 2001.

(57) **ABSTRACT**

Two minimally invasive therapeutic procedures, particularly for patients with congestive heart failure, may be performed separately or together. One procedure involves providing a valved passageway through the patient's left ventricular wall at the apex of the patient's heart and advancing instruments through the valved passageway to connect the valve leaflets of the patient's heart valve, e.g. the mitral valve. The second procedure involves advancing a pacing lead and a pacing lead implanting device through a trocar in the patient's chest and implanting the pacing lead on an exposed epicardial region of the patient's heart wall. The pacing lead has a penetrating electrode which is secured within the heart wall. Improved devices for these procedures include a minimally invasive grasping device for heart leaflets, a leaflet connector with artificial cordae tendinae and a pacing lead implant instrument.

(51) **Int. Cl.⁷** **A61N 1/36**

(52) **U.S. Cl.** **607/9; 607/3; 128/897; 128/898; 128/899**

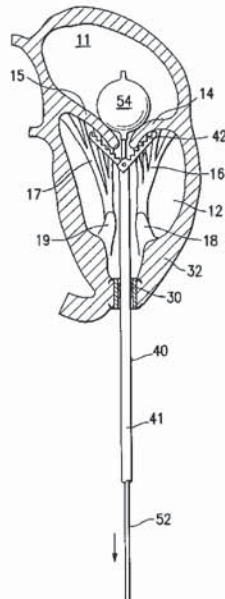
(58) **Field of Search** **607/3, 9-10, 119, 607/126-131; 623/2.1, 2.11, 2.12; 128/897, 128/899; 600/16**

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38 Claims, 17 Drawing Sheets



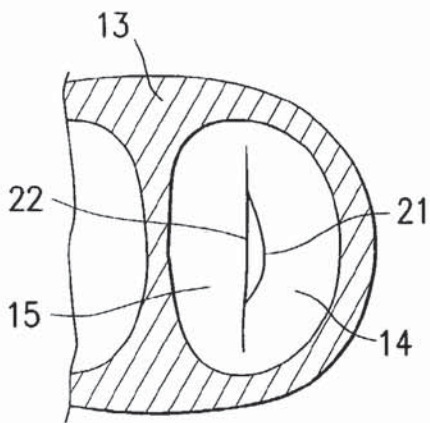


FIG. 2A

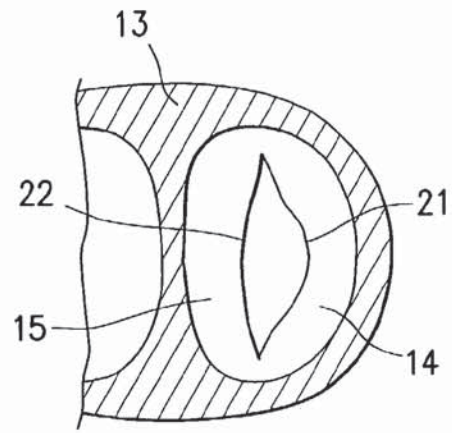


FIG. 2B

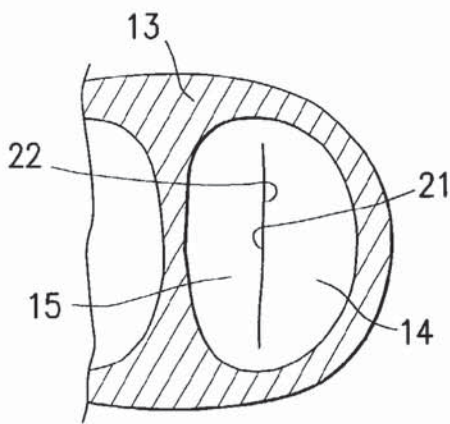


FIG. 3A

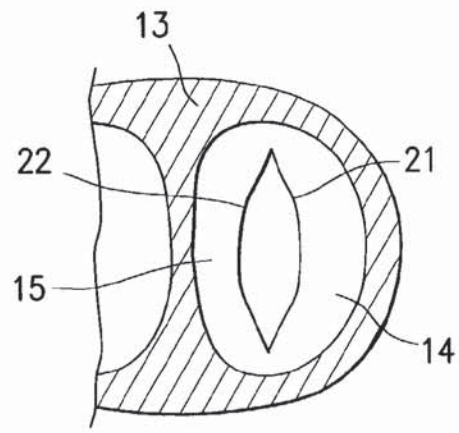


FIG. 3B

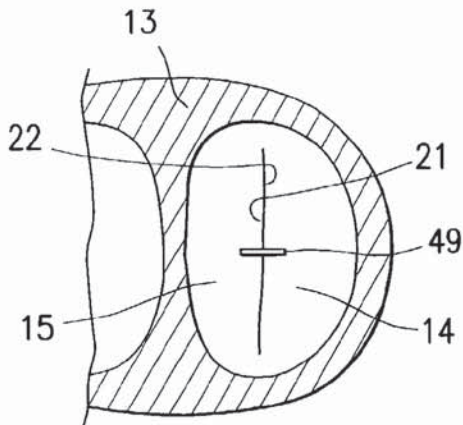


FIG. 4A

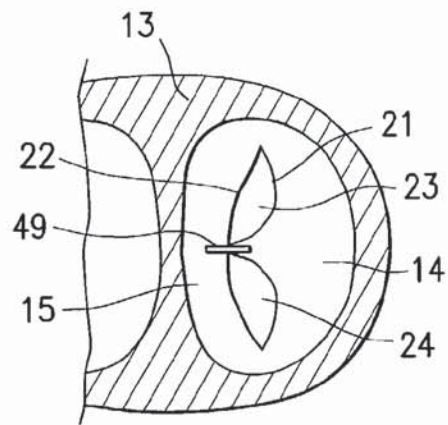


FIG. 4B

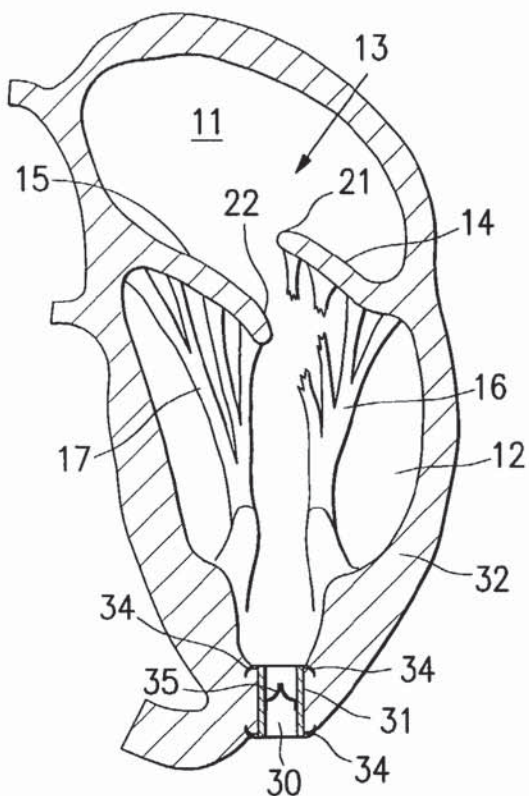


FIG. 5

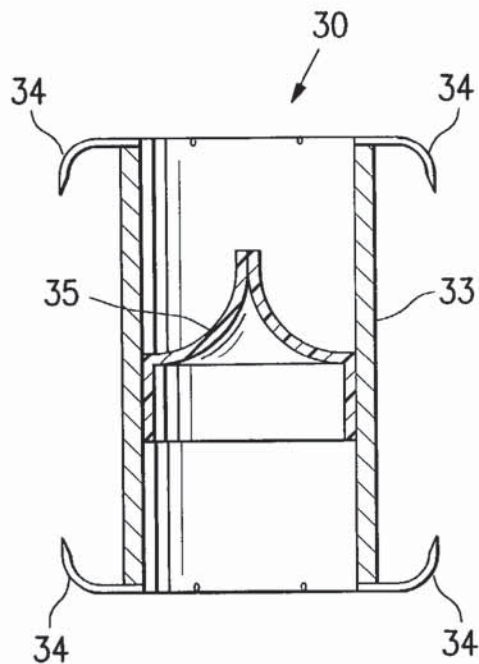


FIG. 7

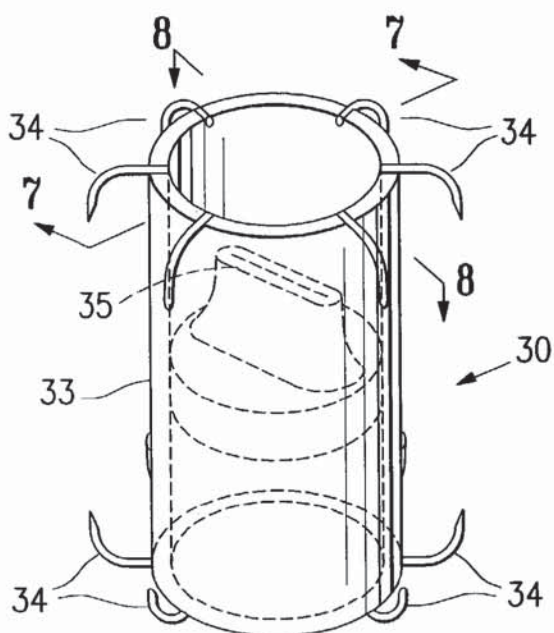


FIG. 6

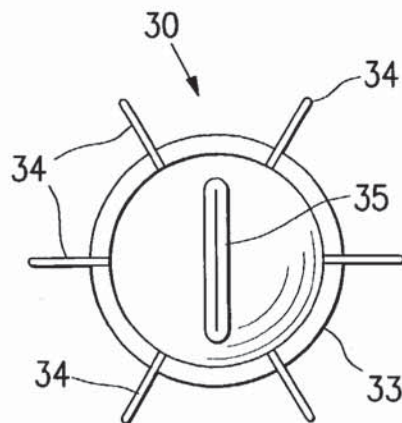


FIG. 8

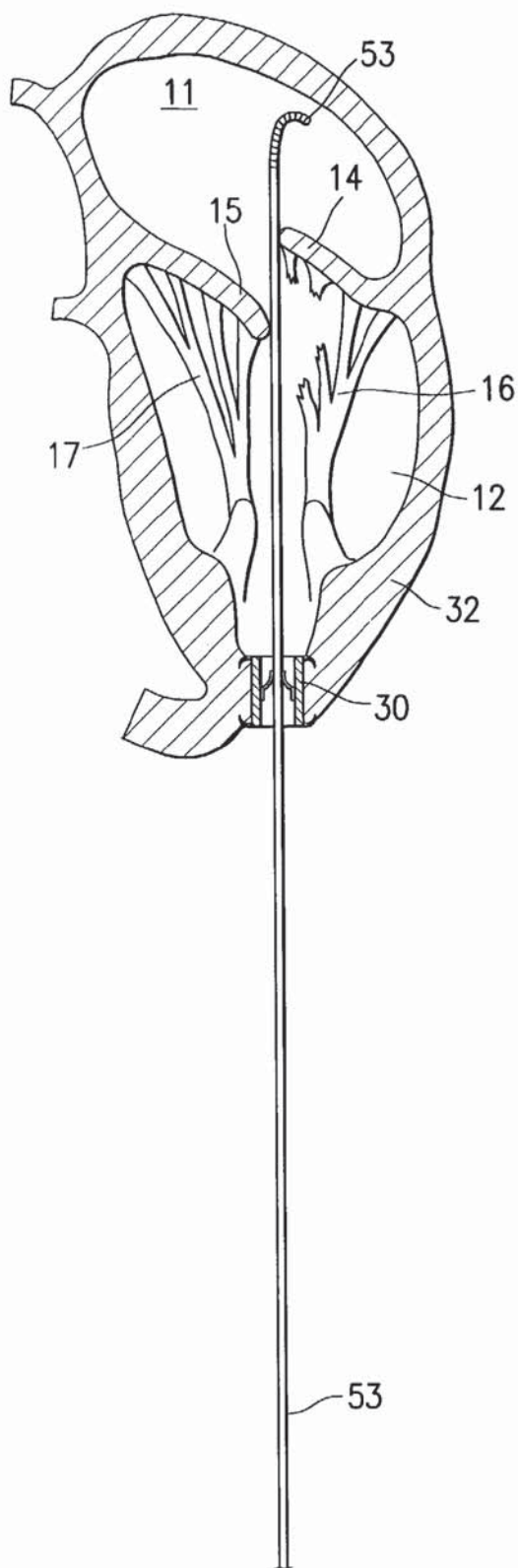


FIG. 9

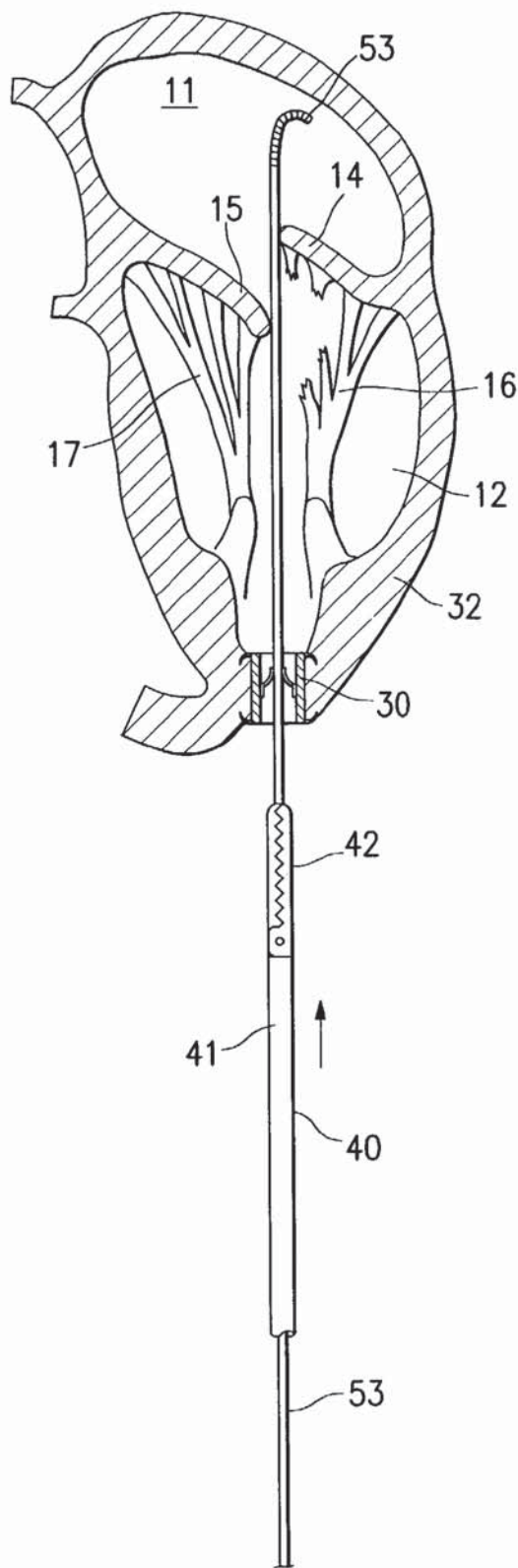


FIG. 10

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