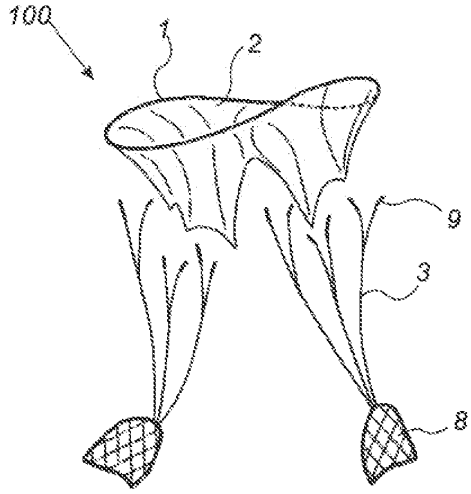


FIG. 1A

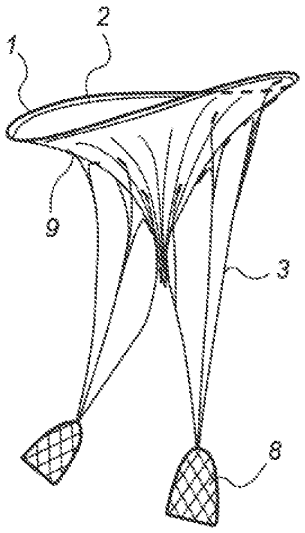


FIG. 1B

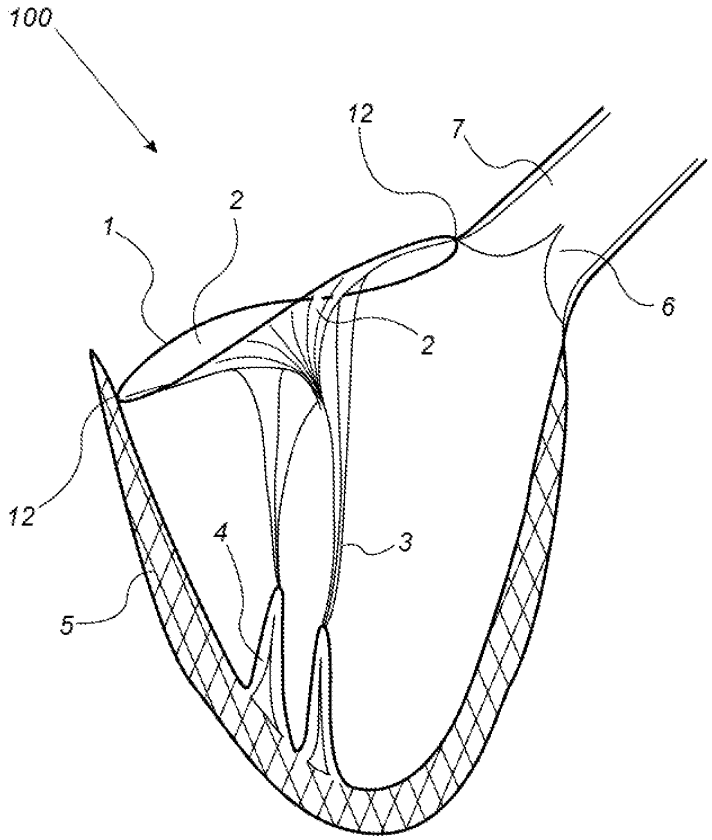


FIG. 2



FIG. 3

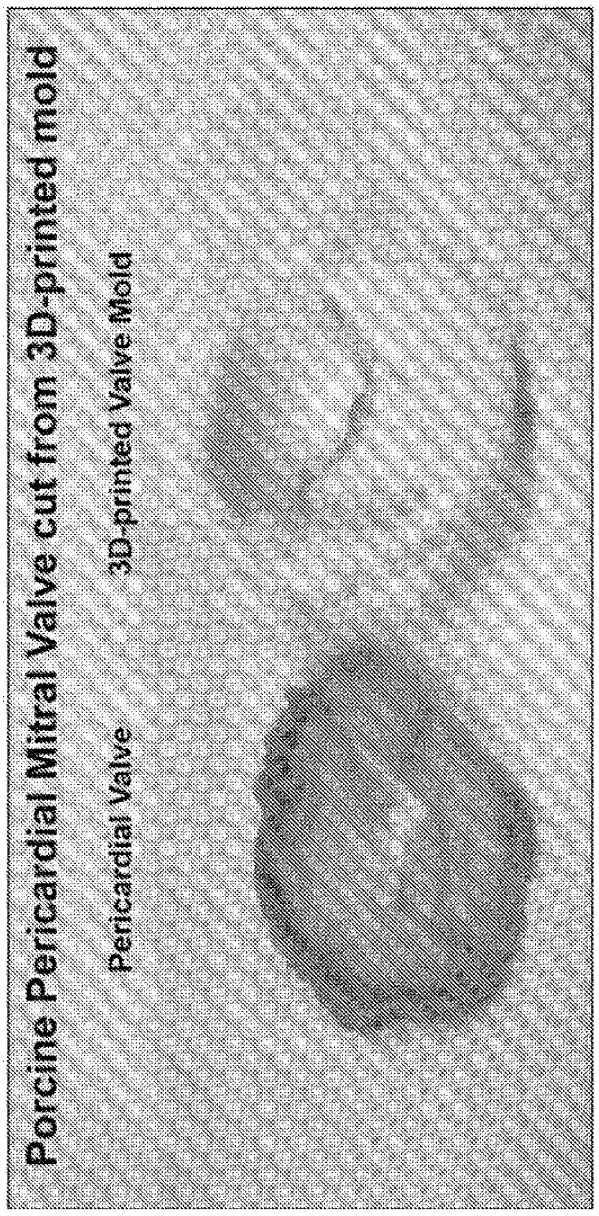

Porcine Pericardial Mitral Valve cut from 3D-printed mold
Pericardial Valve
3D-printed Valve Mold

FIG. 4

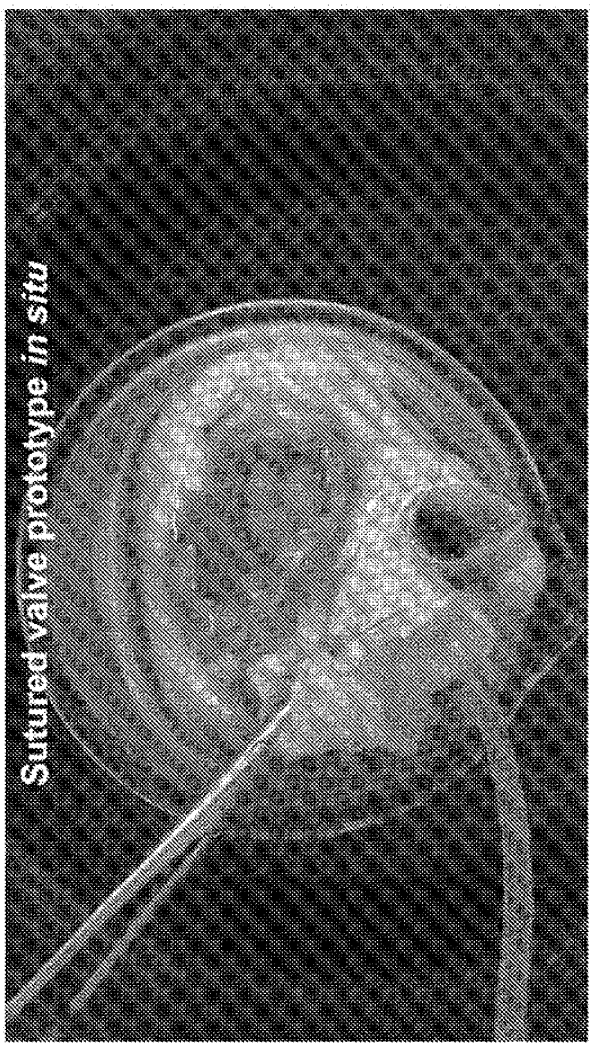


FIG. 5

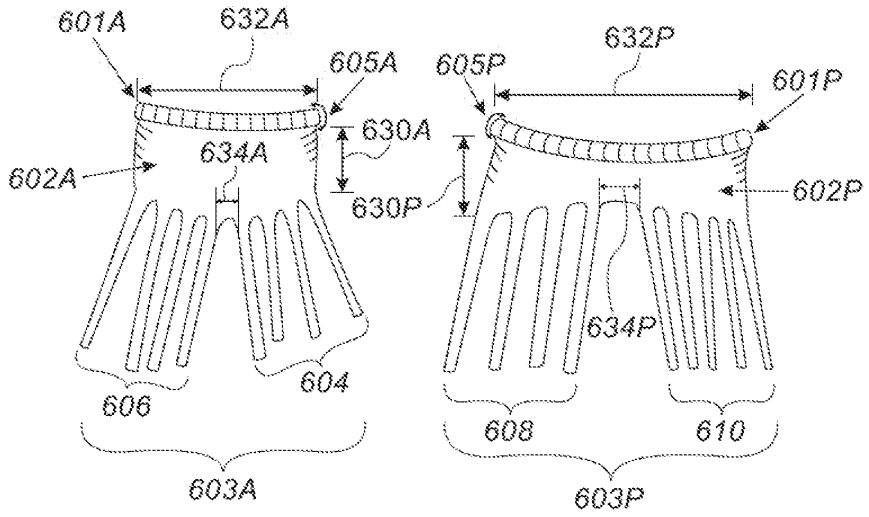

601A
632A
605A
630A
634A
602A
630P
605P
632P
601P
602P
634P
606
604
608
610
603A
603P

FIG. 6A

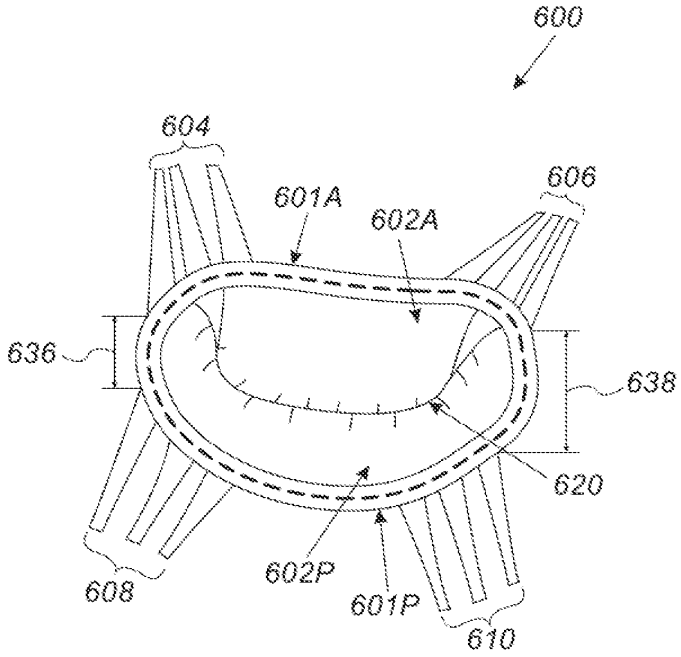

600
604
601A
602A
606
636
638
620
608
602P
601P
610

FIG. 6B

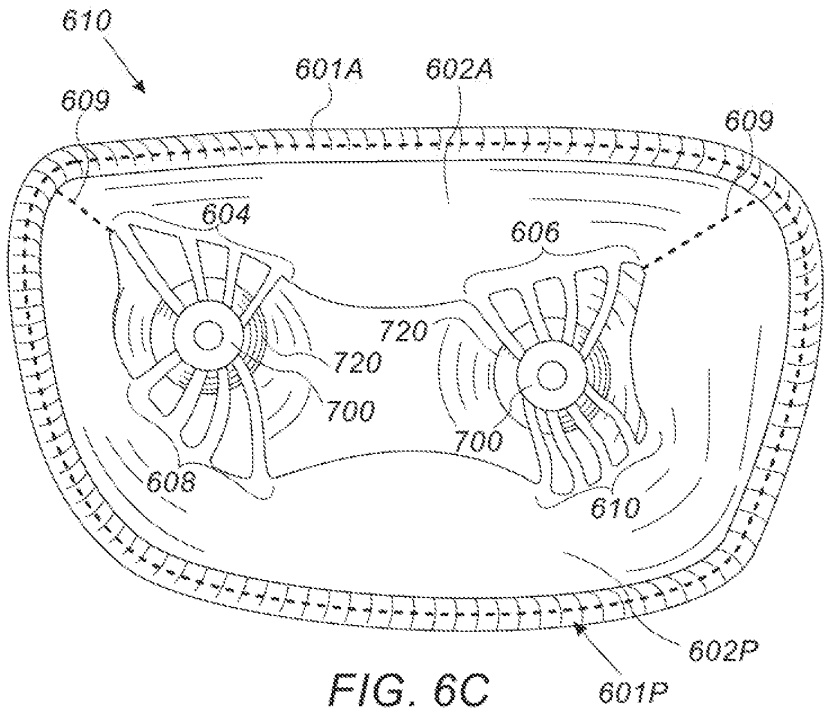

610
601A
602A
609
609
604
606
720
720
700
700
608
610
602P
601P

FIG. 6C

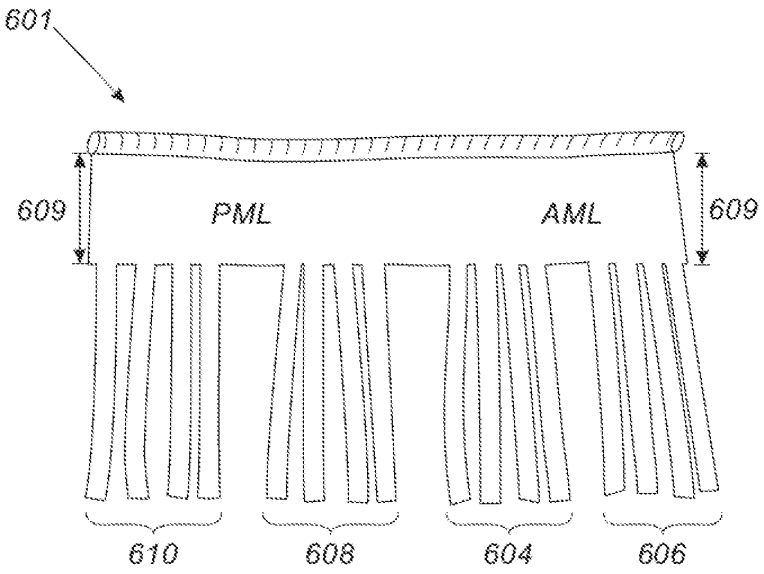

601
609
PML
AML
609
610
608
604
606

FIG. 6D

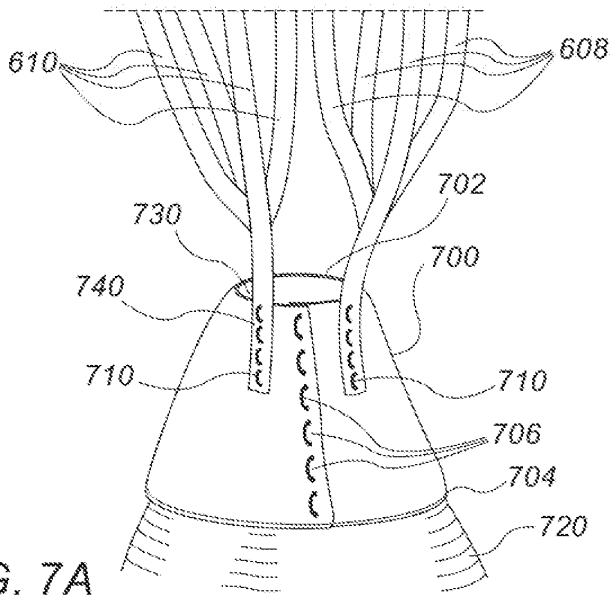

610
608
702
730
700
740
710
710
706
704
720

FIG. 7A

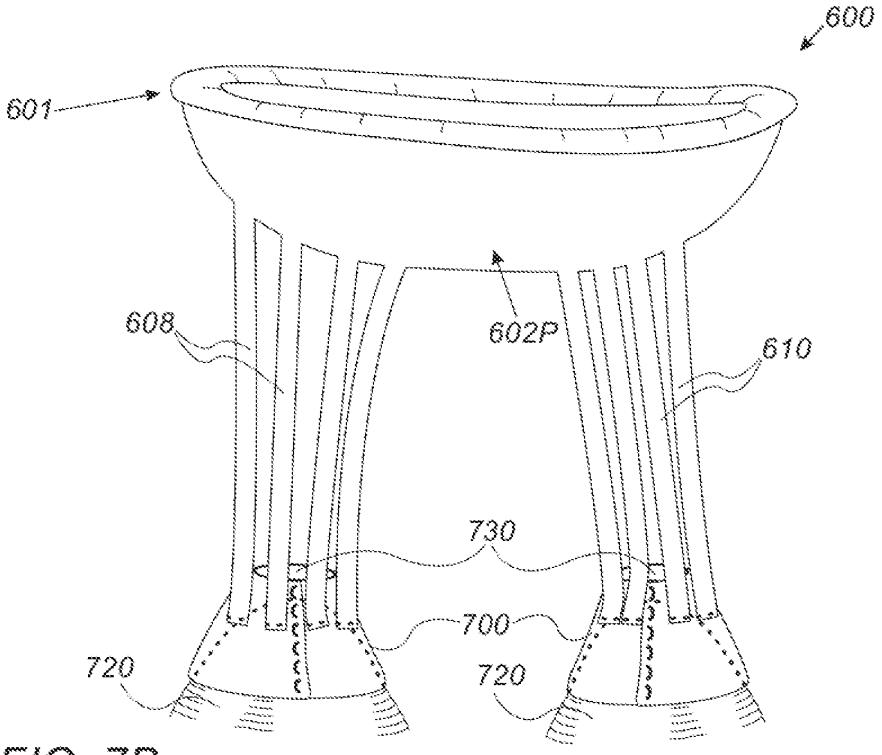

600
601
608
602P
610
730
700
720
720

FIG. 7B

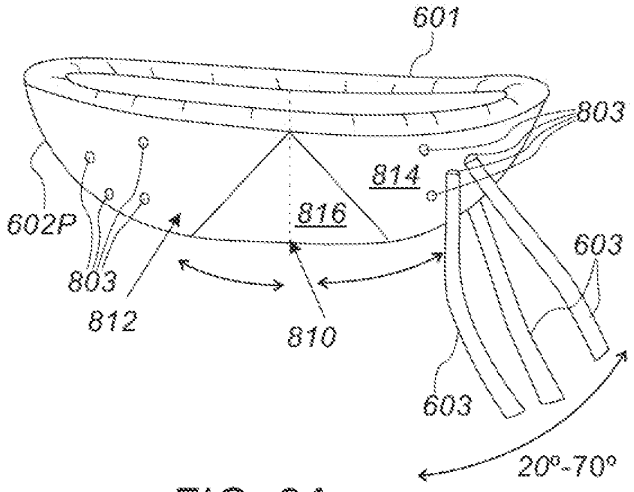

601
803
814
816
602P
603
803
812
810
603
20°-70°

FIG. 8A

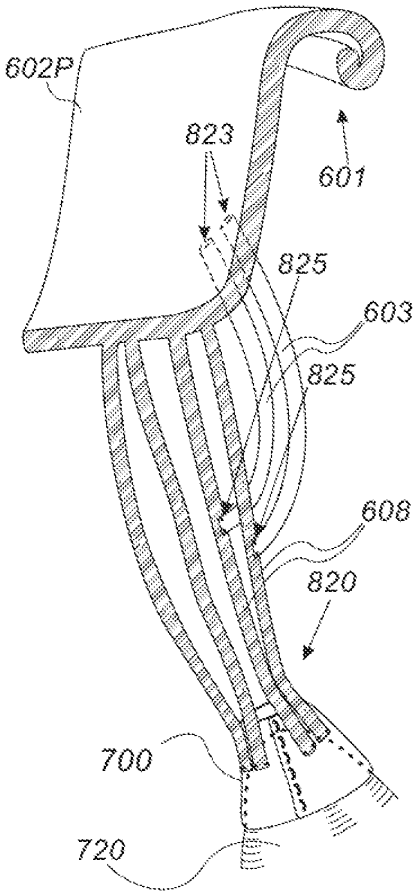

602P
823
601
825
603
825
608
820
700
720

FIG. 8B

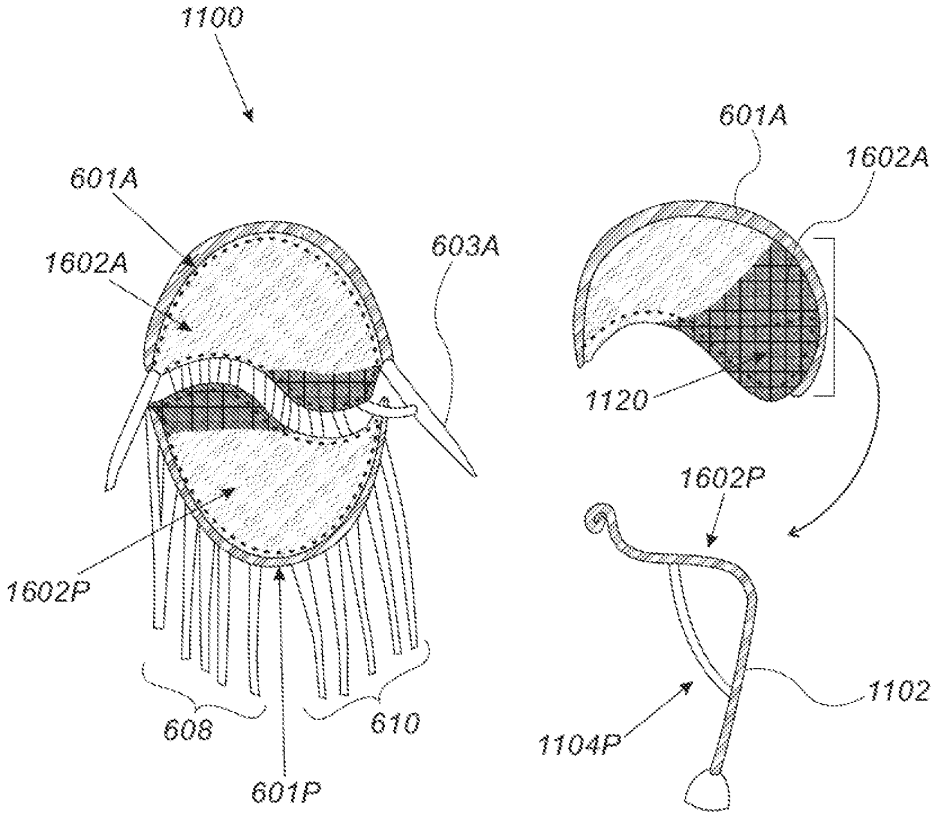

1100
601A
1602A
603A
1602P
608
610
601P
601A
1602A
1120
1602P
1102
1104P

FIG. 9A

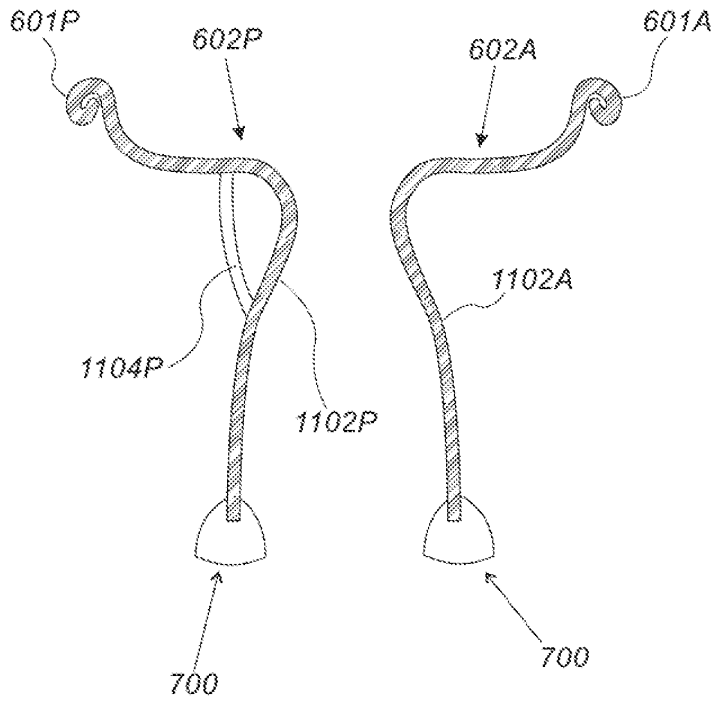


FIG. 9B

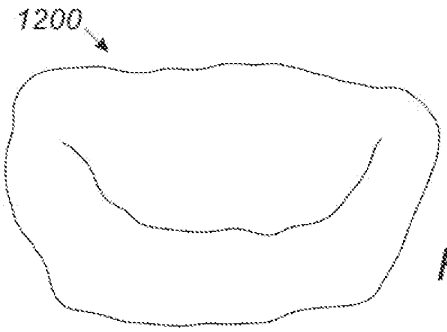


FIG. 10

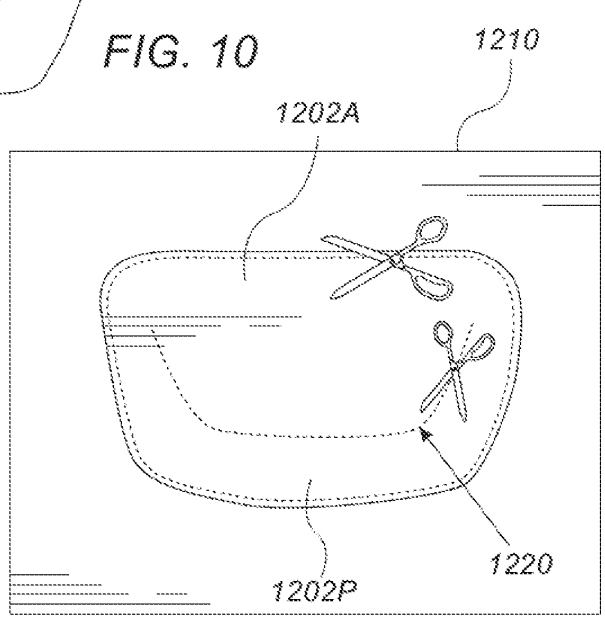


FIG. 11

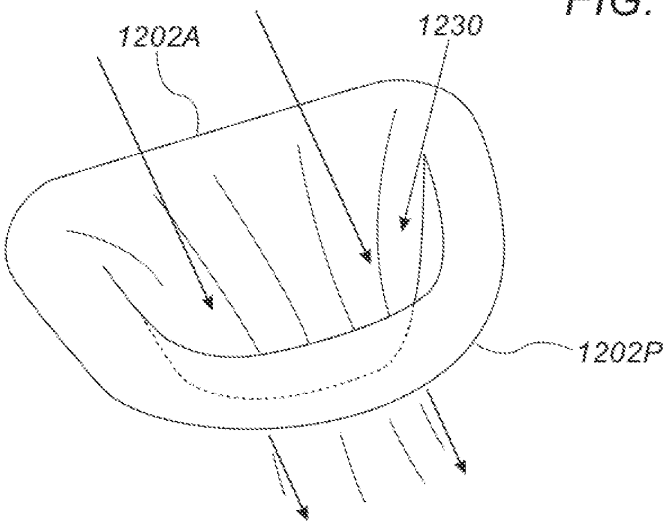


FIG. 12

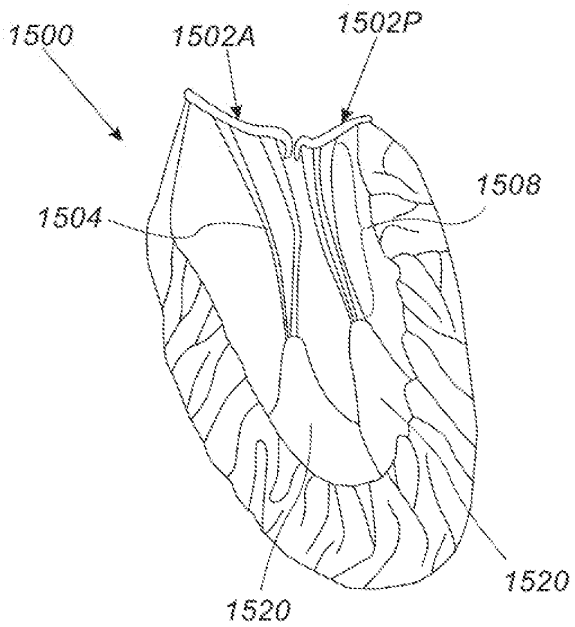


FIG. 13

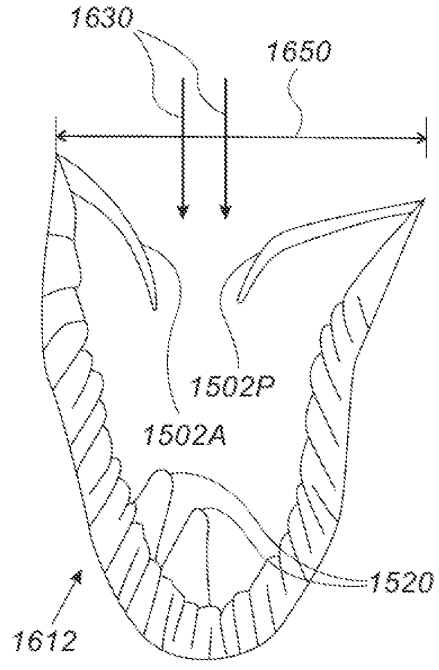


FIG. 14A

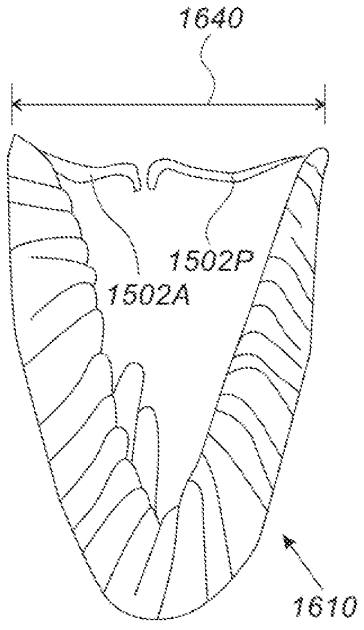


FIG. 14B

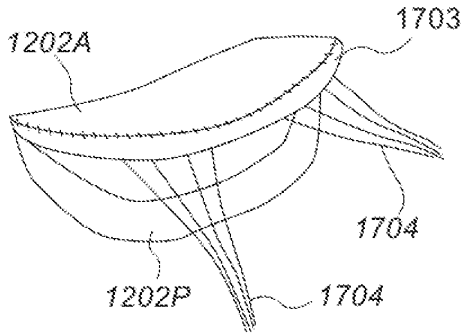


FIG. 15A

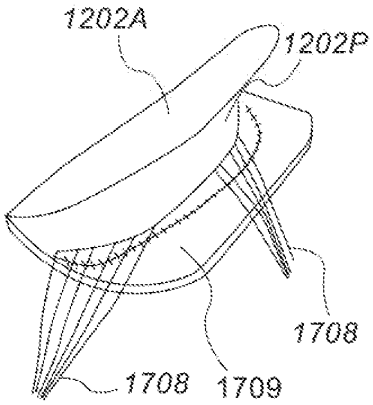


FIG. 15B

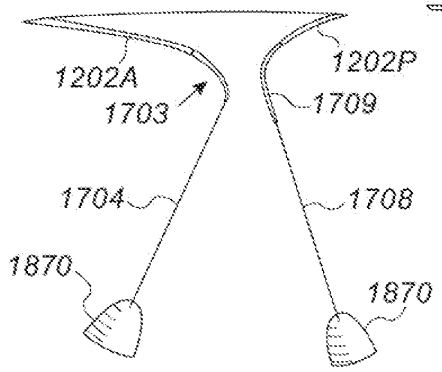


FIG. 16A

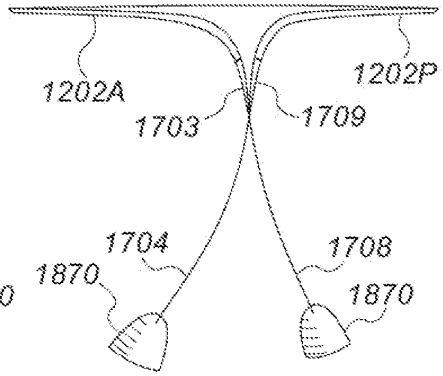


FIG. 16B

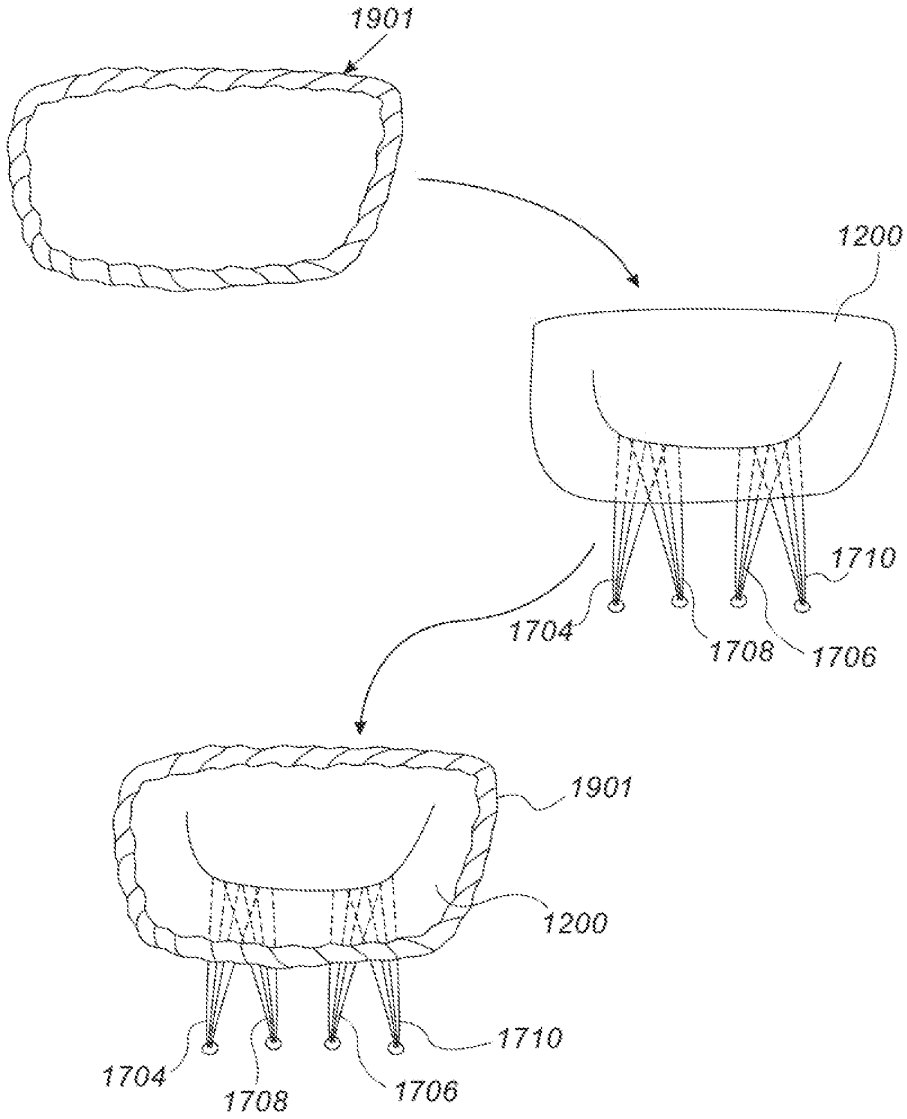


FIG. 17

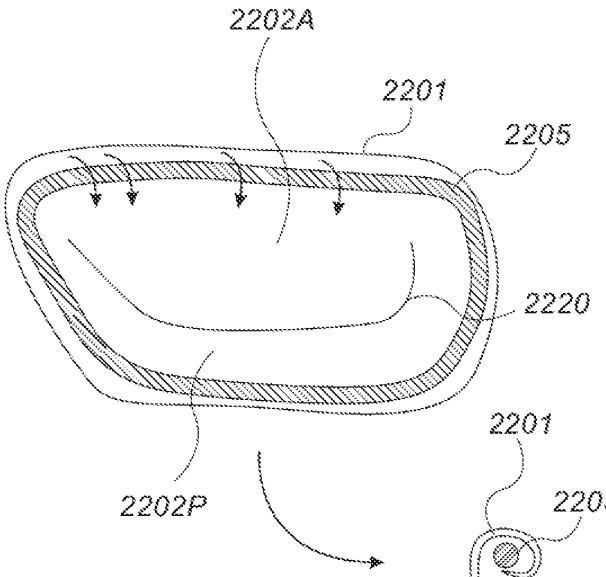


FIG. 18A

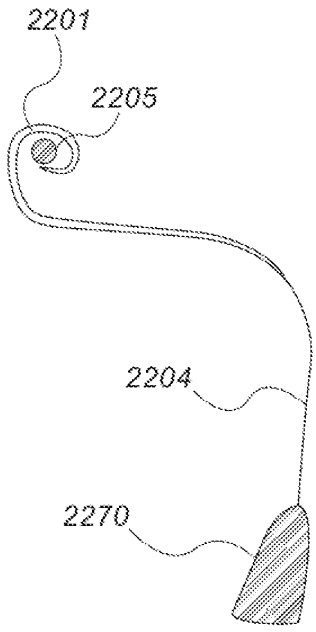


FIG. 18B

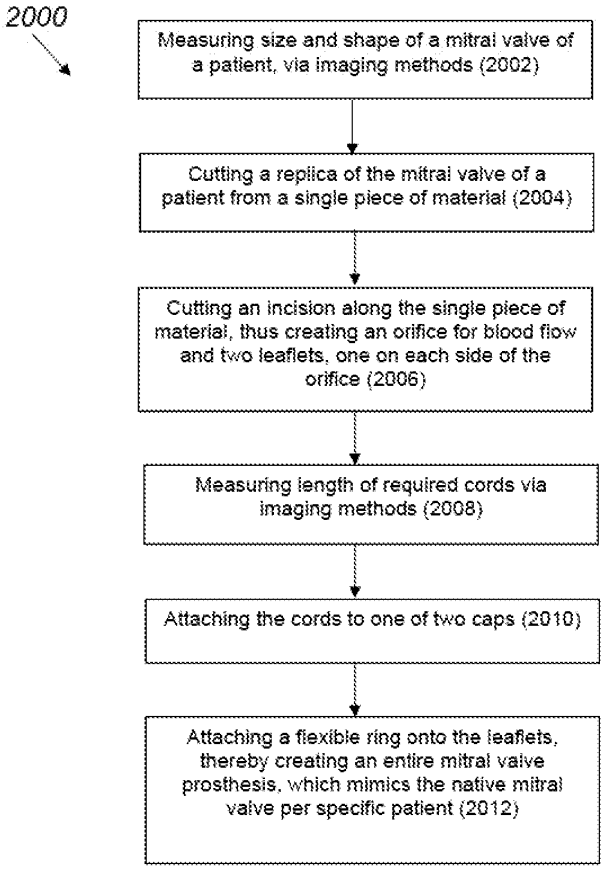

2000
Measuring size and shape of a mitral valve of a patient, via imaging methods (2002)
Cutting a replica of the mitral valve of a patient from a single piece of material (2004)
Cutting an incision along the single piece of material, thus creating an orifice for blood flow and two leaflets, one on each side of the orifice (2006)
Measuring length of required cords via imaging methods (2008)
Attaching the cords to one of two caps (2010)
Attaching a flexible ring onto the leaflets, thereby creating an entire mitral valve prosthesis, which mimics the native mitral valve per specific patient (2012)

FIG. 19

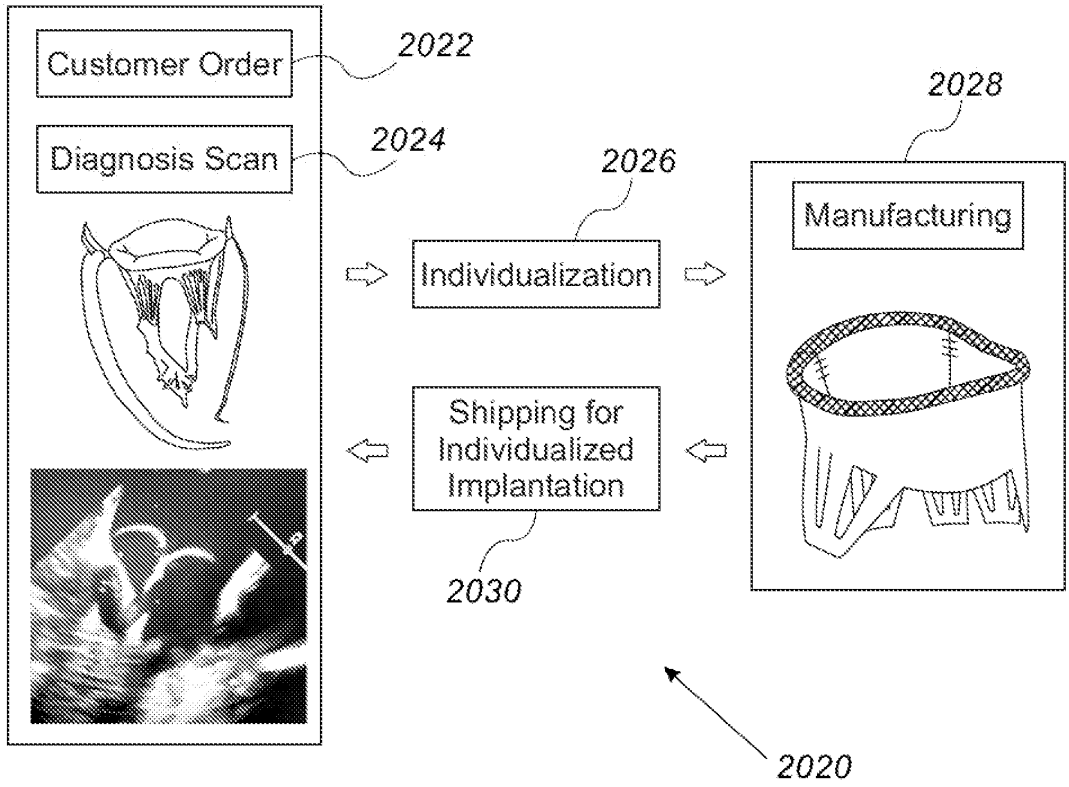


FIG. 20A

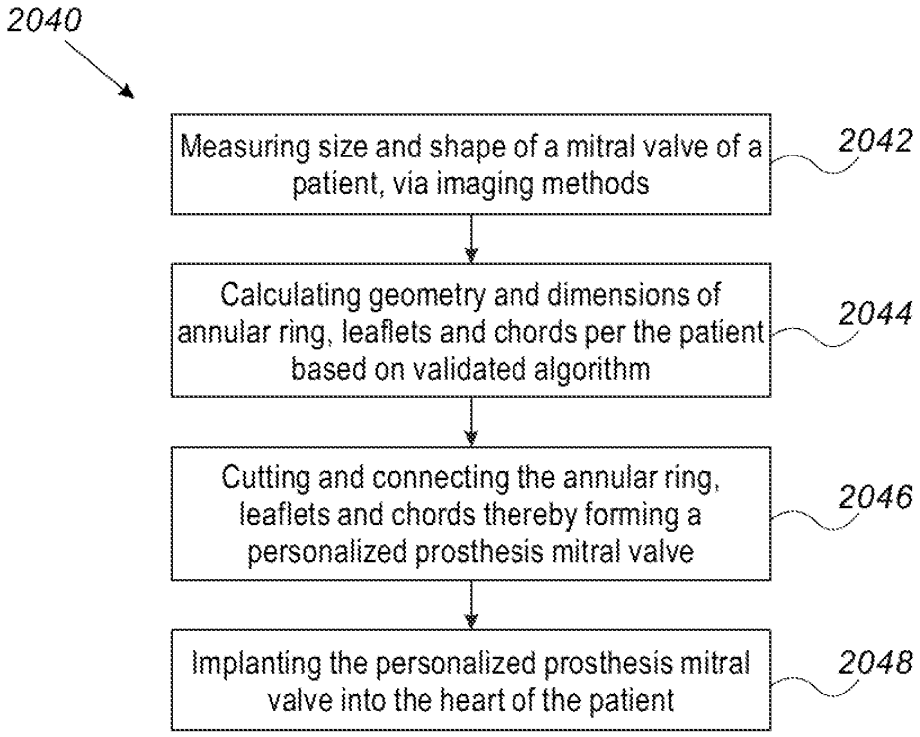


FIG. 20B

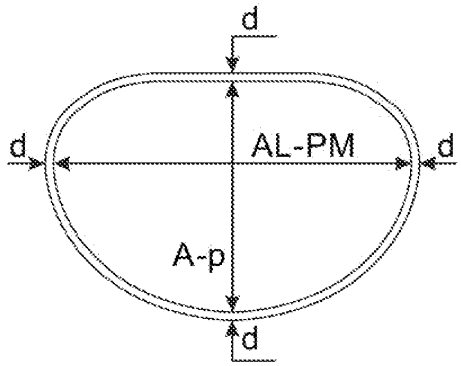


FIG. 21A

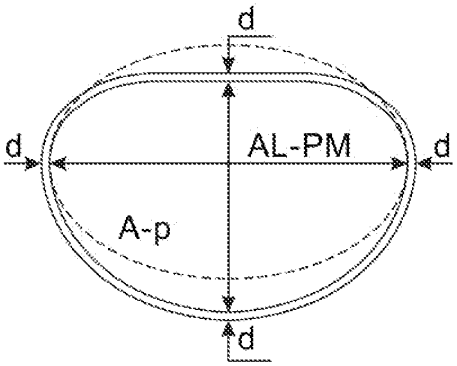


FIG. 21B

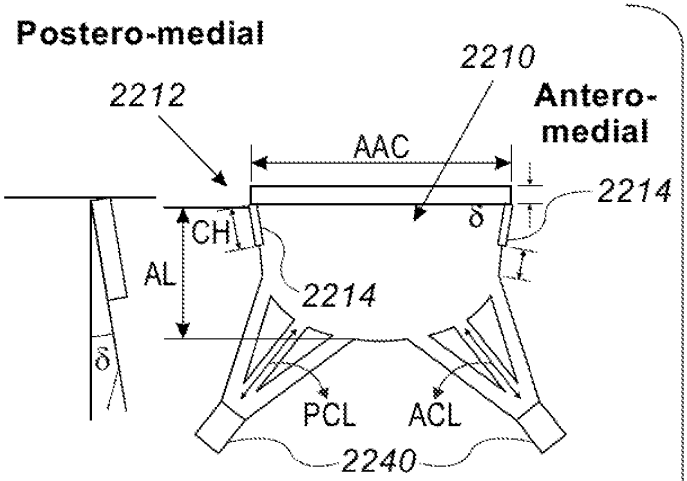


FIG. 22A

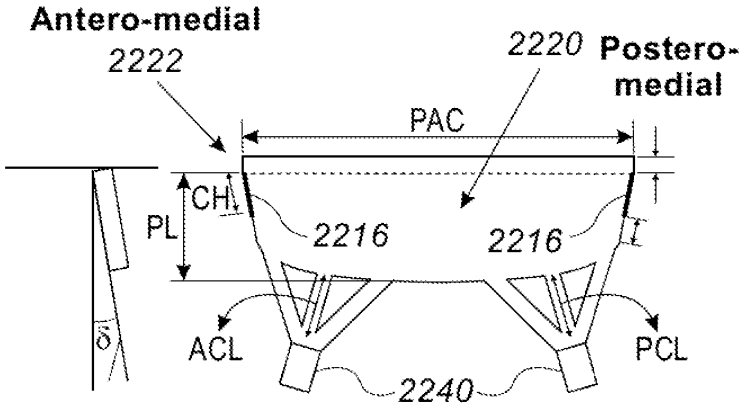


FIG. 22B

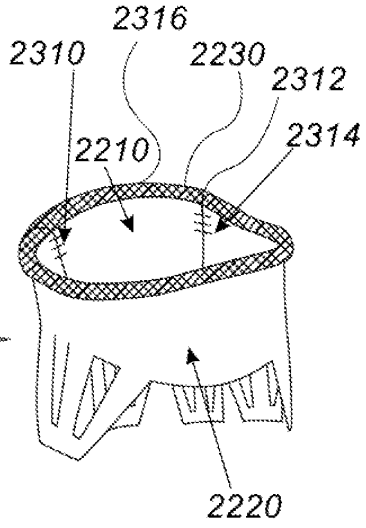


FIG. 22C

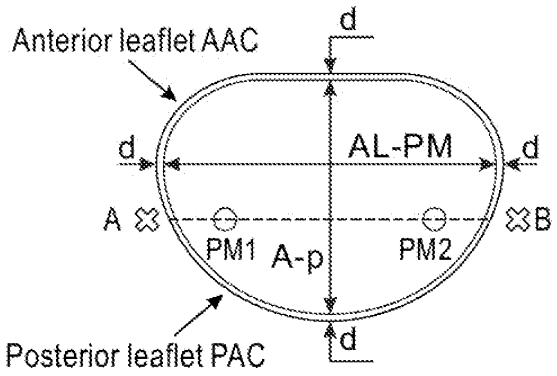


FIG. 22D

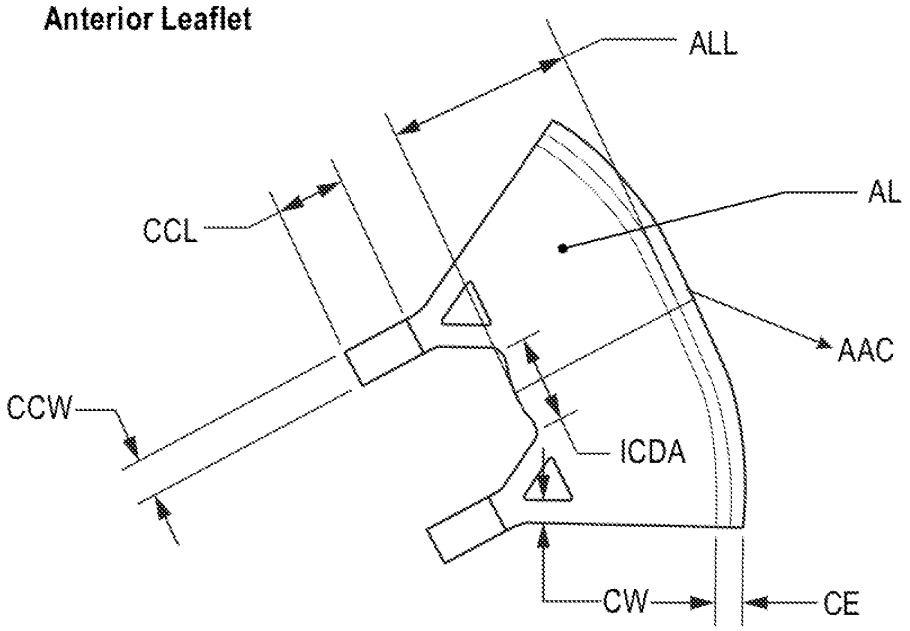


FIG. 22E

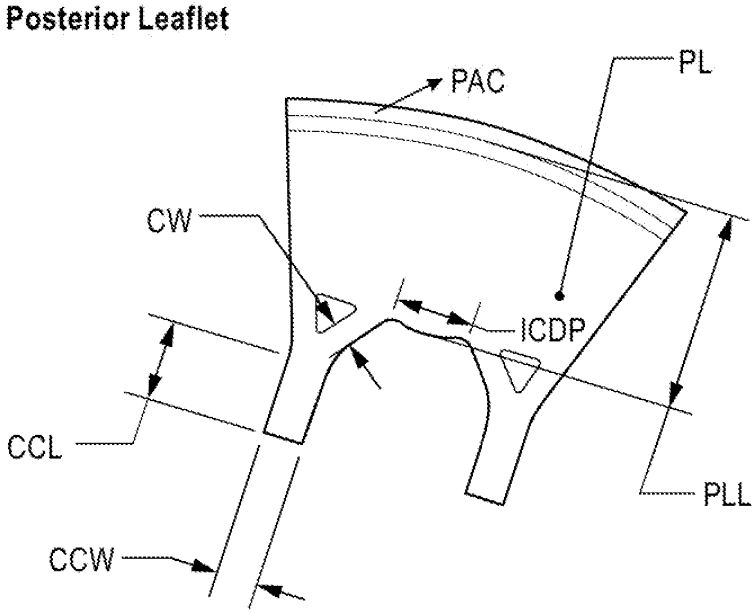


FIG. 22F

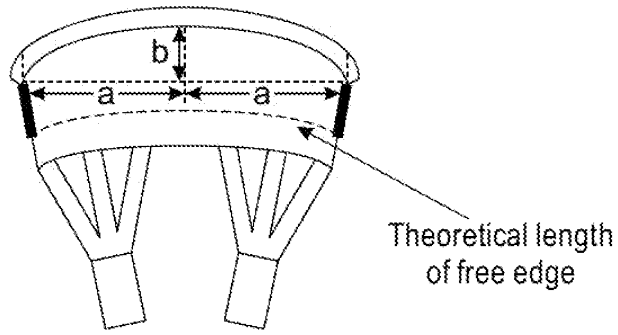


FIG. 23A

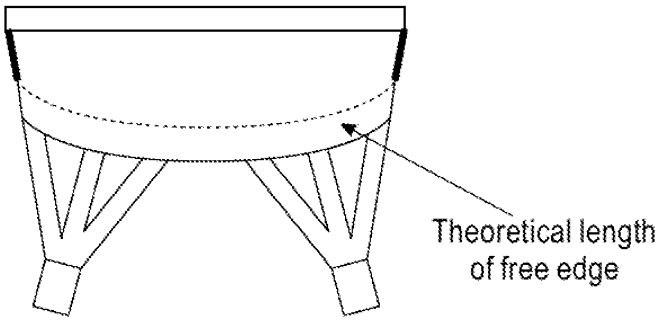


FIG. 23B

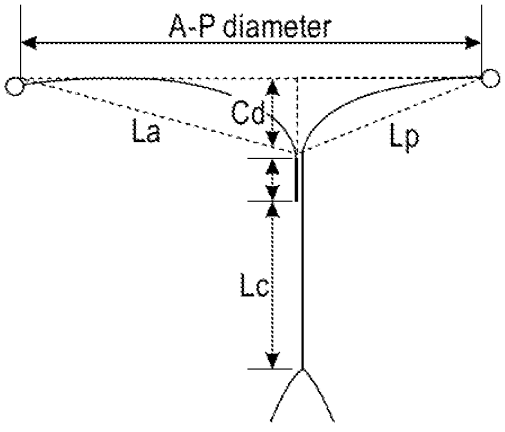


FIG. 23C

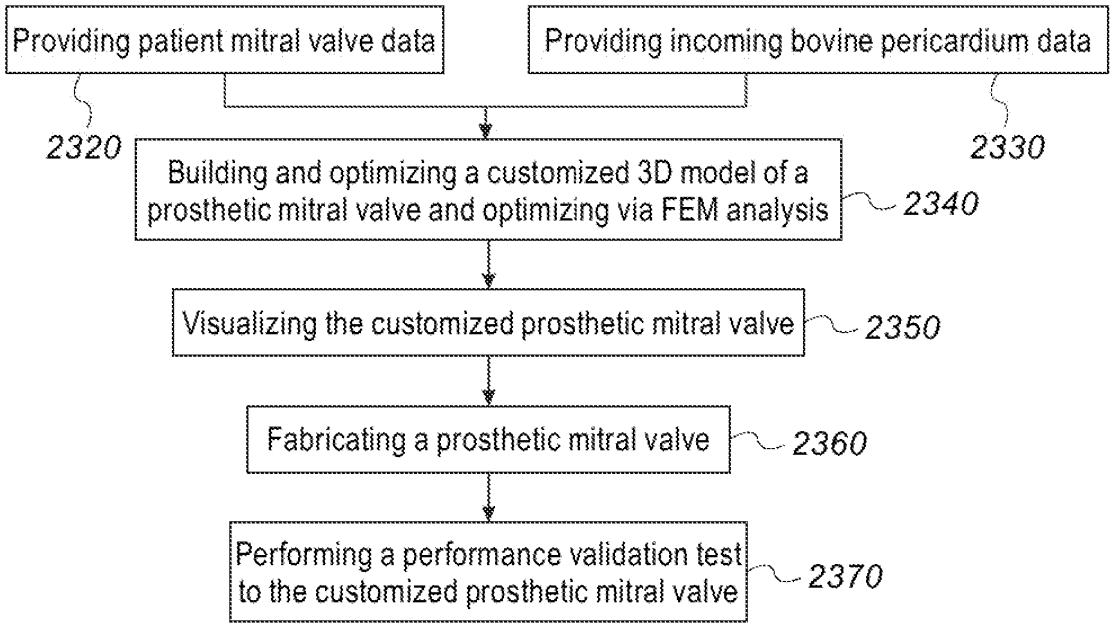

Providing patient mitral valve data
Providing incoming bovine pericardium data
2320
2330
Building and optimizing a customized 3D model of a prosthetic mitral valve and optimizing via FEM analysis
2340
Visualizing the customized prosthetic mitral valve
2350
Fabricating a prosthetic mitral valve
2360
Performing a performance validation test to the customized prosthetic mitral valve
2370

FIG. 23D

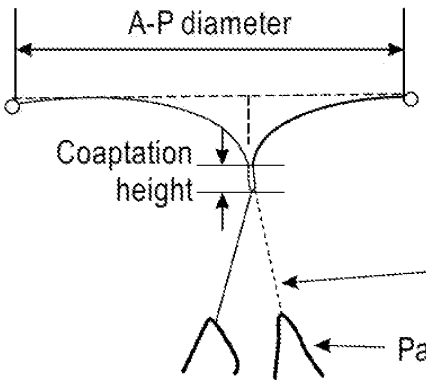


FIG. 24A

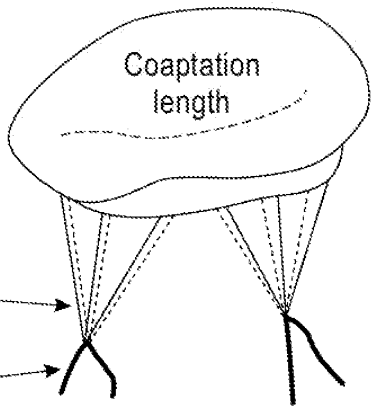


FIG. 24B

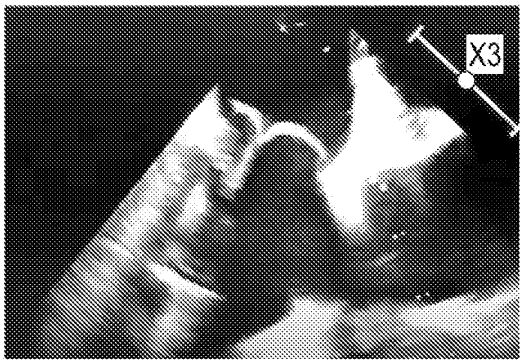


FIG. 25

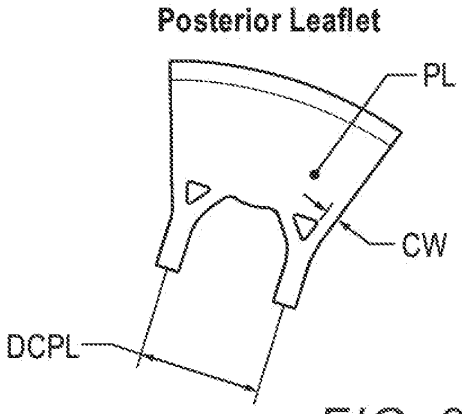


FIG. 26A

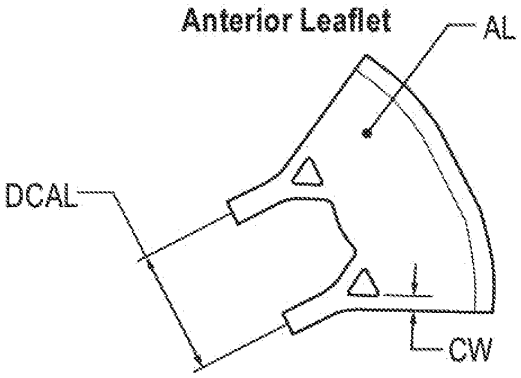


FIG. 26B

FIG. 27

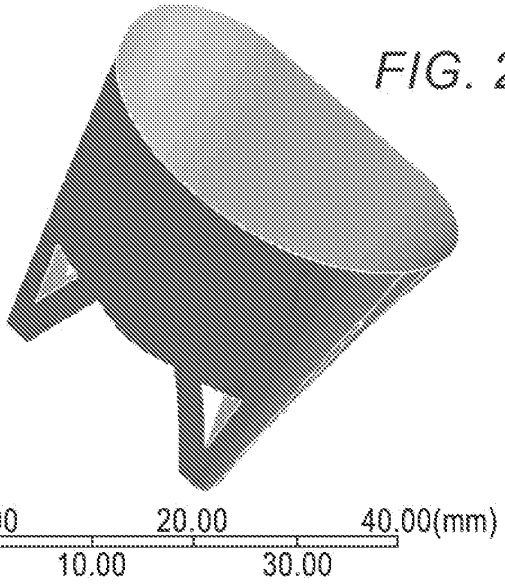
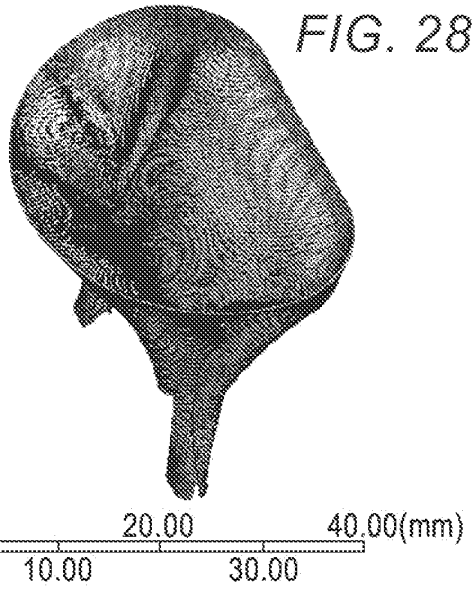


FIG. 28



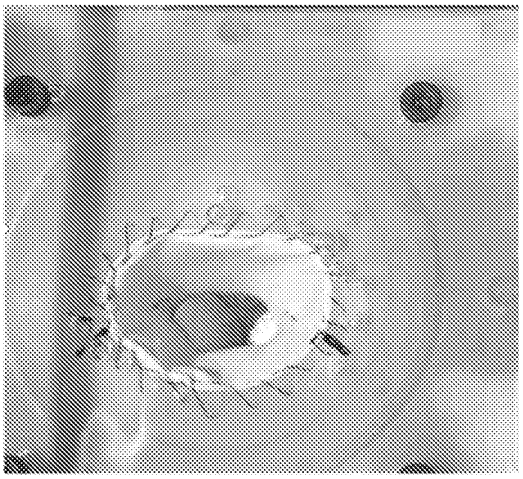


FIG. 29A

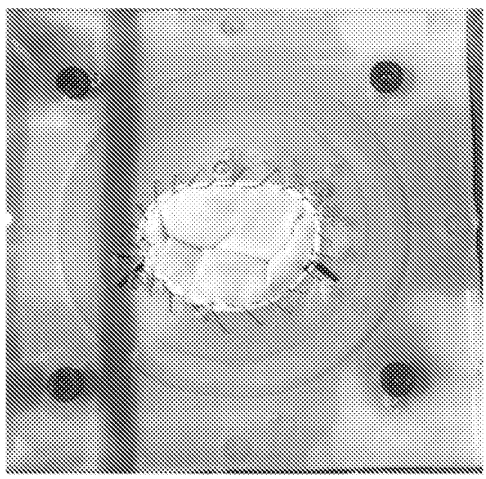


FIG. 29B

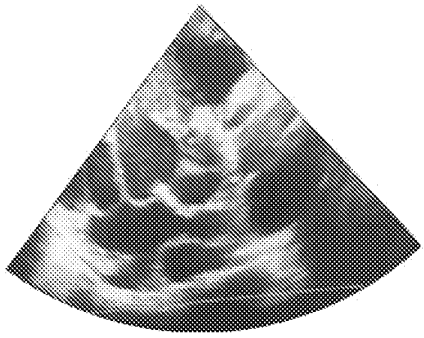


FIG. 30

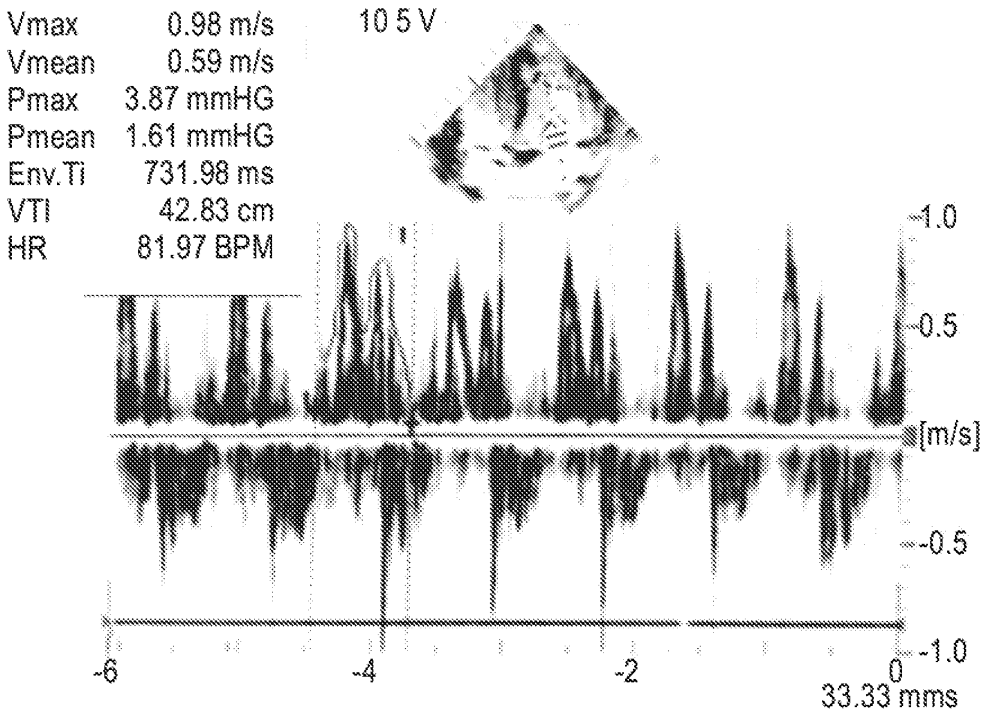

Vmax 0.98 m/s
Vmean 0.59 m/s
Pmax 3.87 mmHG
Pmean 1.61 mmHG
Env.Ti 731.98 ms
VTI 42.83 cm
HR 81.97 BPM
10 5 V
1.0
0.5
[m/s]
-0.5
-1.0
-6
-4
-2
0
33.33 mms

FIG. 31