

FIG. 1A

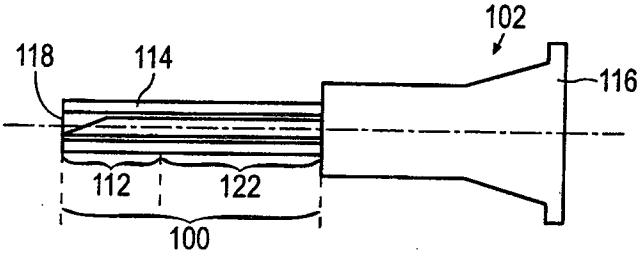


FIG. 1B

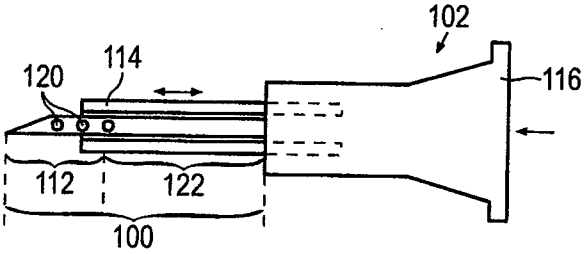


FIG. 1C

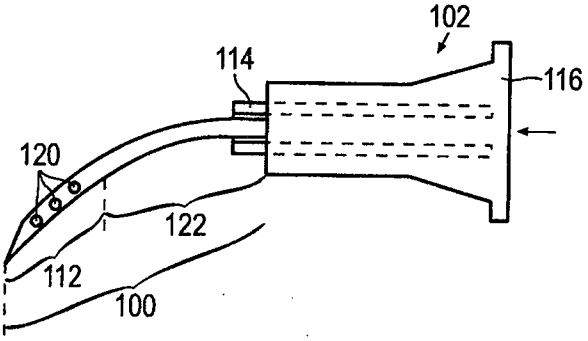


FIG. 1D

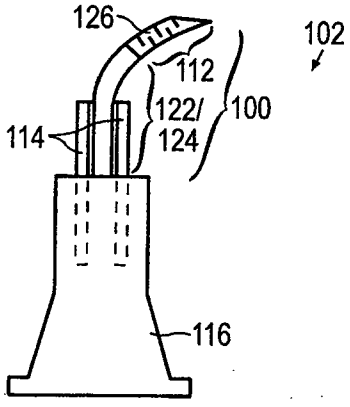


FIG. 1E

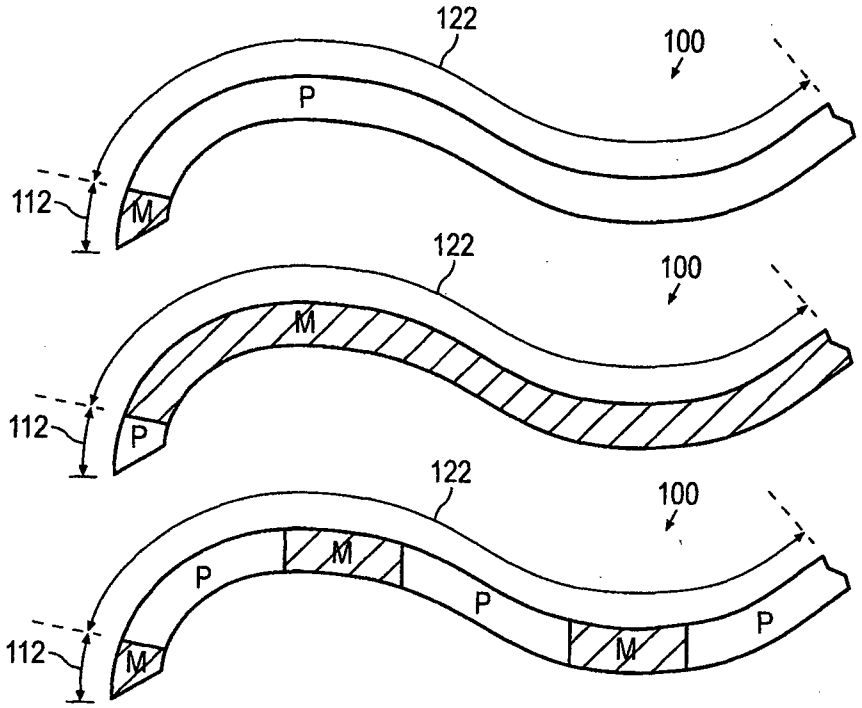

122
100
P
112
M
122
100
M
112
P
122
100
P
M
P
112
M
P
M
P

FIG. 1F

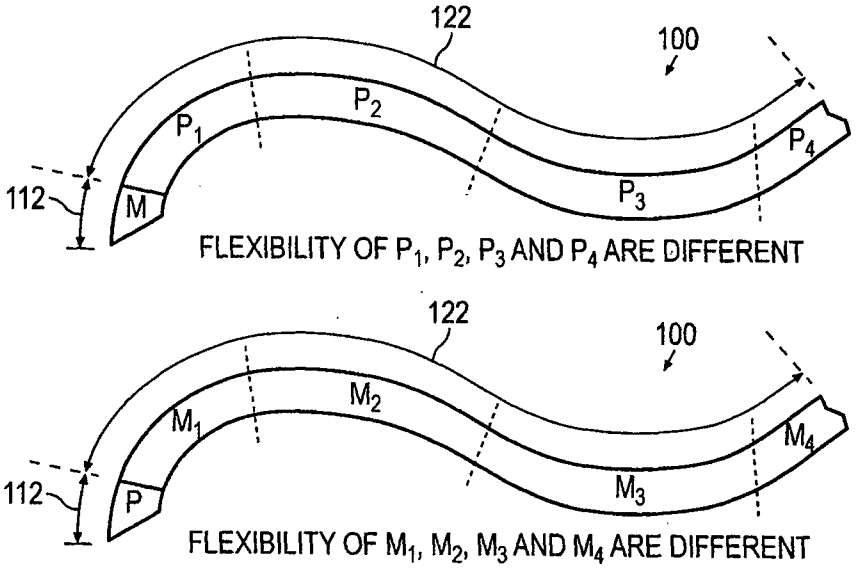

122
100
P1
P2
P4
112
M
P3
FLEXIBILITY OF P1, P2, P3 AND P4 ARE DIFFERENT
122
100
M1
M2
M4
112
P
M3
FLEXIBILITY OF M1, M2, M3 AND M4 ARE DIFFERENT

FIG. 1G

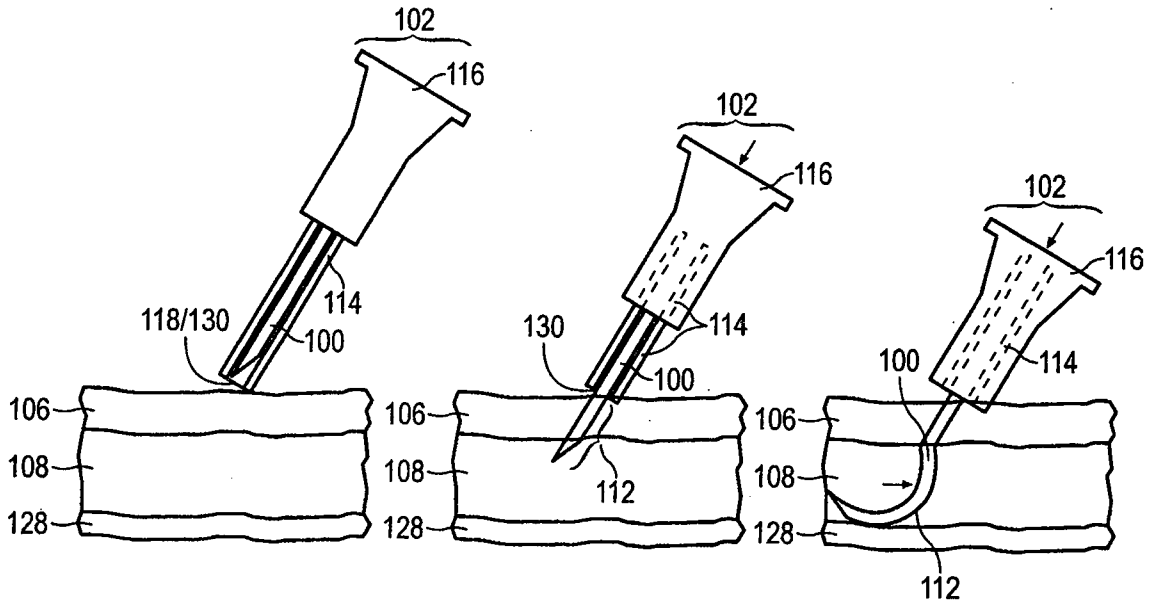


FIG. 2A FIG. 2B FIG. 2C

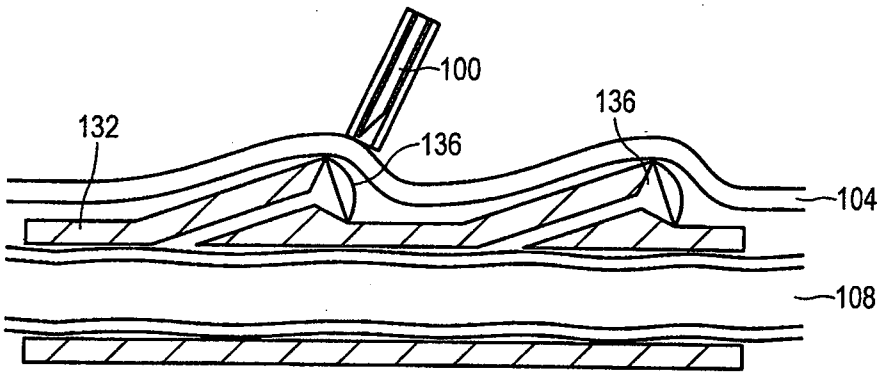


FIG. 3A

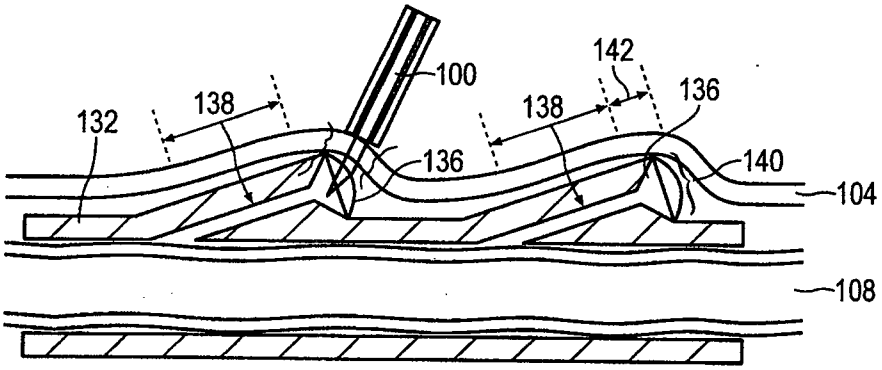


FIG. 3B

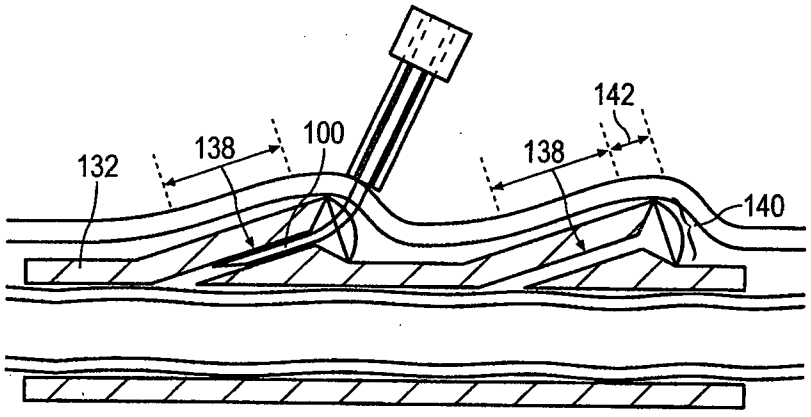


FIG. 3C

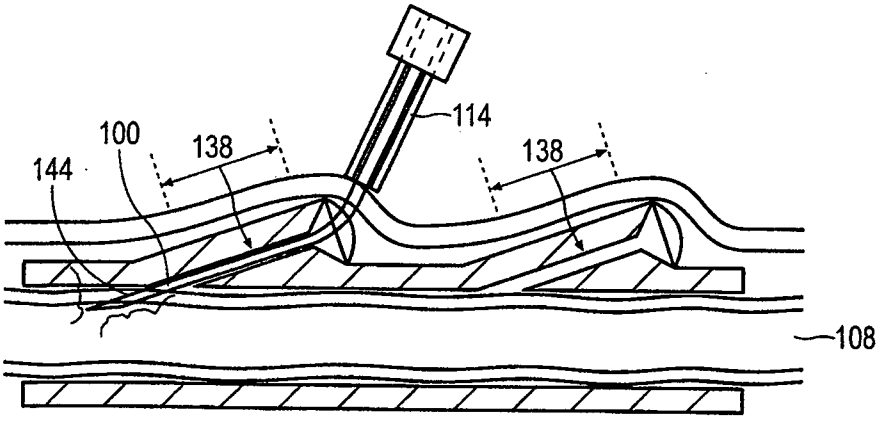


FIG. 3D

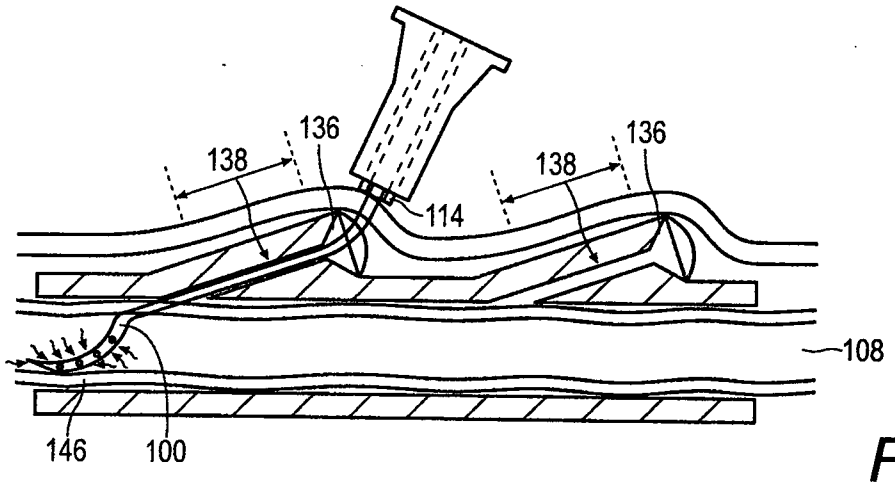


FIG. 3E

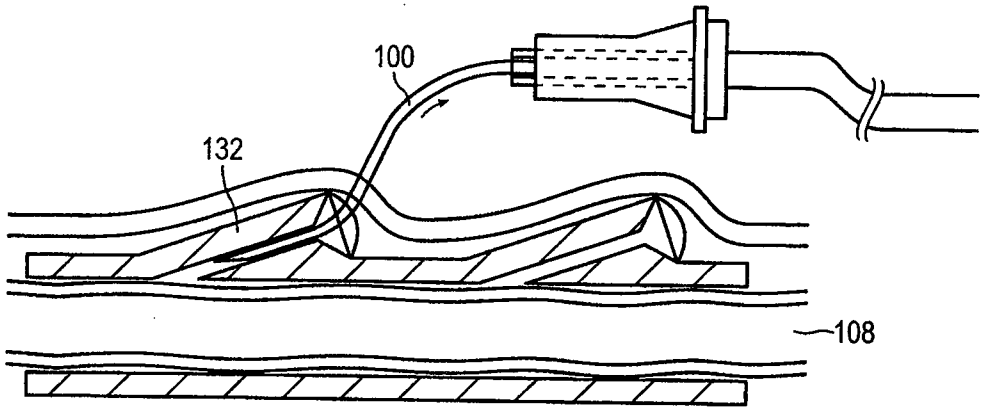


FIG. 3F

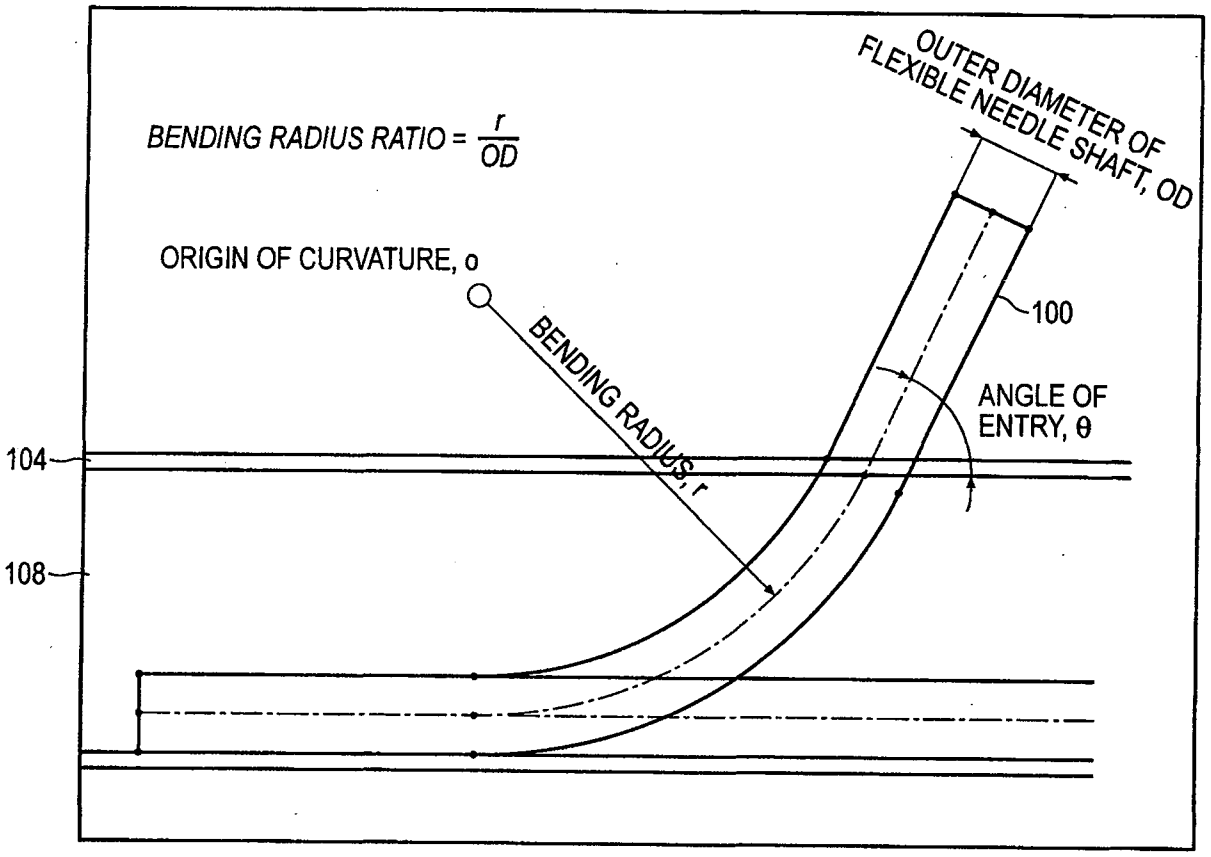
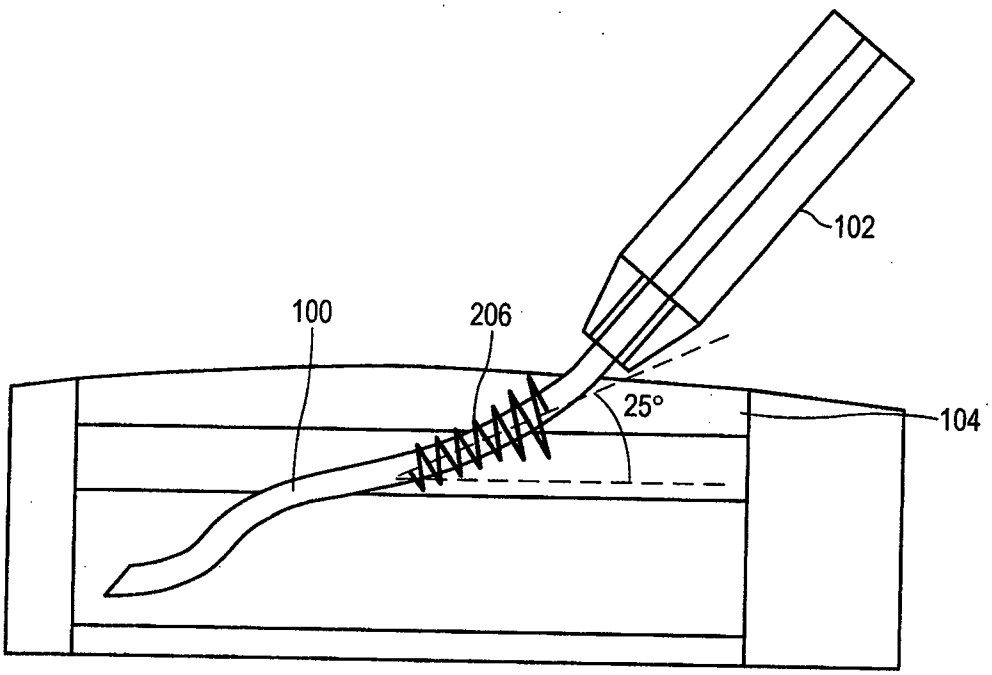

BENDING RADIUS RATIO = r/OD
OUTER DIAMETER OF FLEXIBLE NEEDLE SHAFT, OD
ORIGIN OF CURVATURE, o
BENDING RADIUS, r
100
ANGLE OF ENTRY, θ
104
108

FIG. 4A



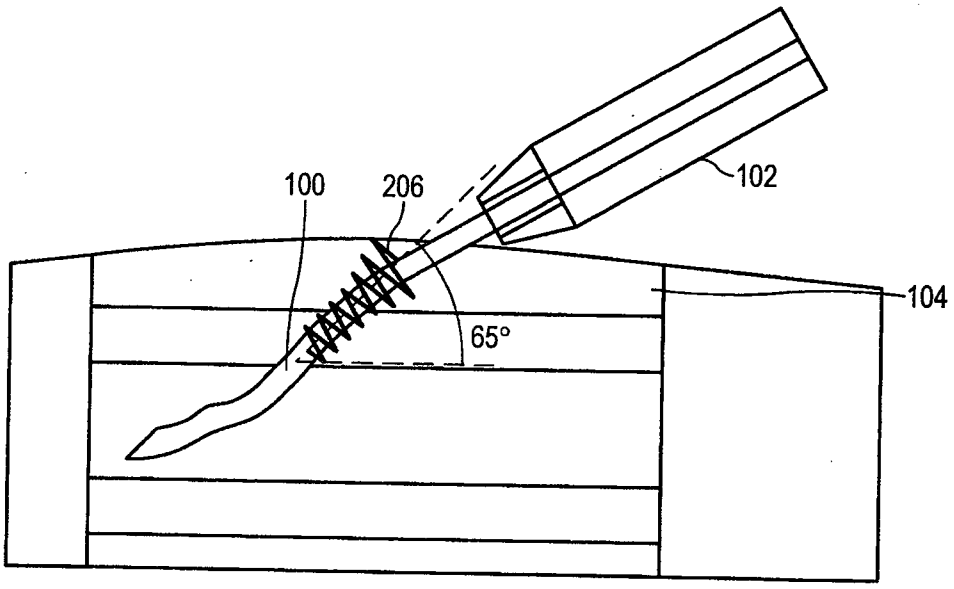


FIG. 4B

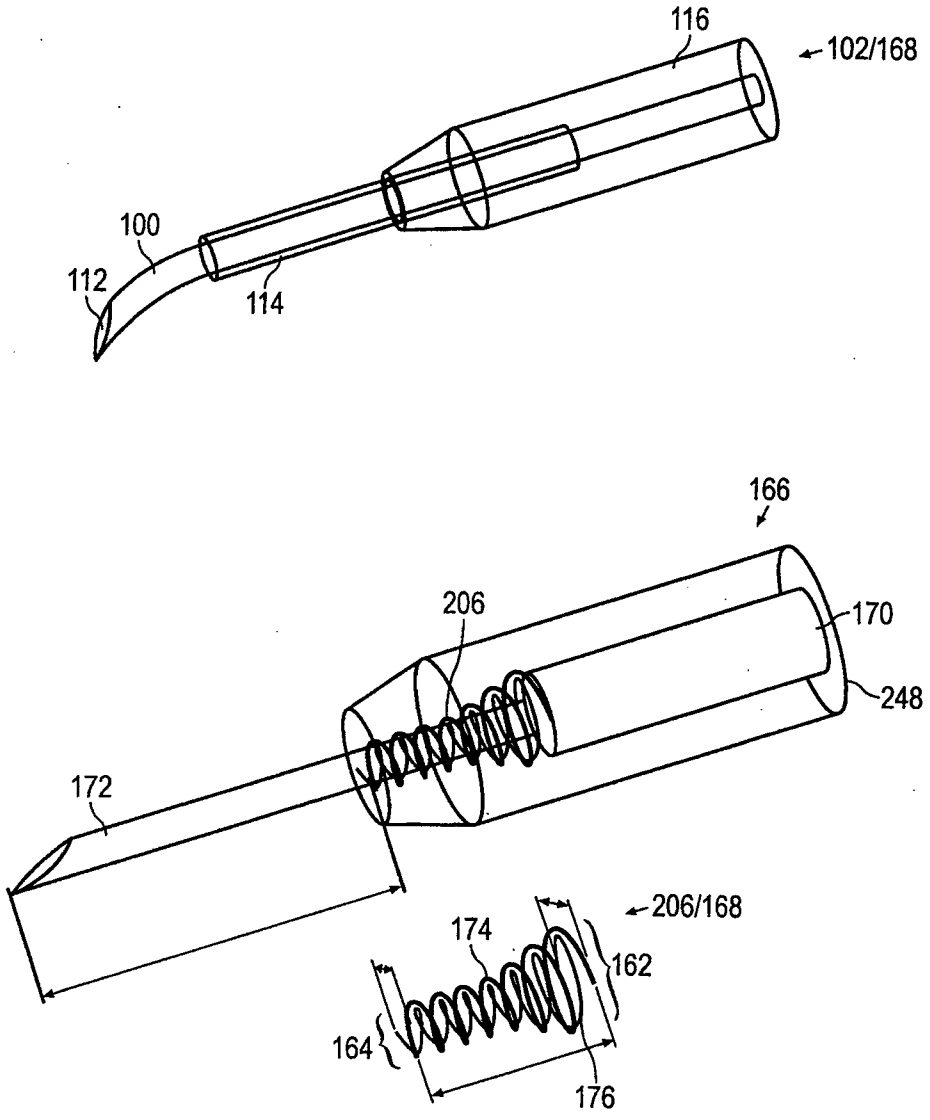

116
102/168
100
112
114
166
206
170
248
172
206/168
174
162
164
176

FIG. 5A

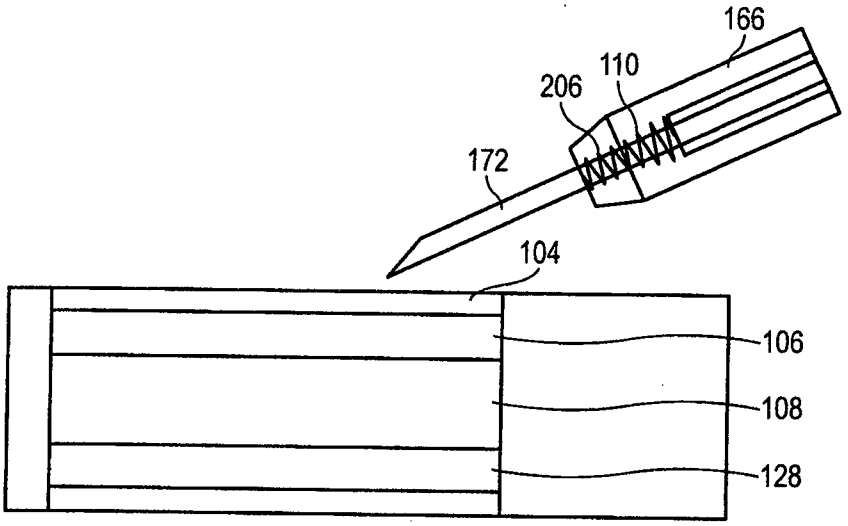


FIG. 5B

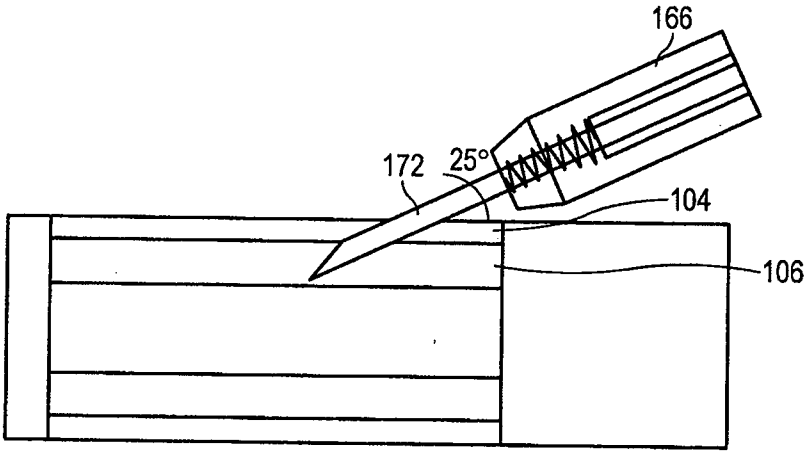


FIG. 5C

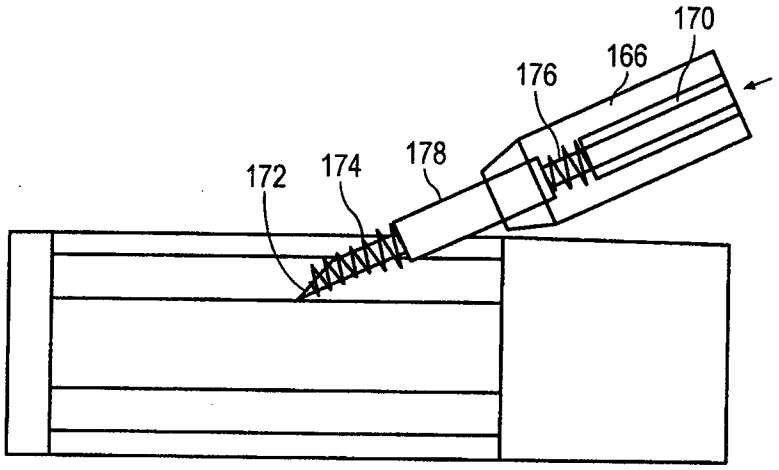


FIG. 5D

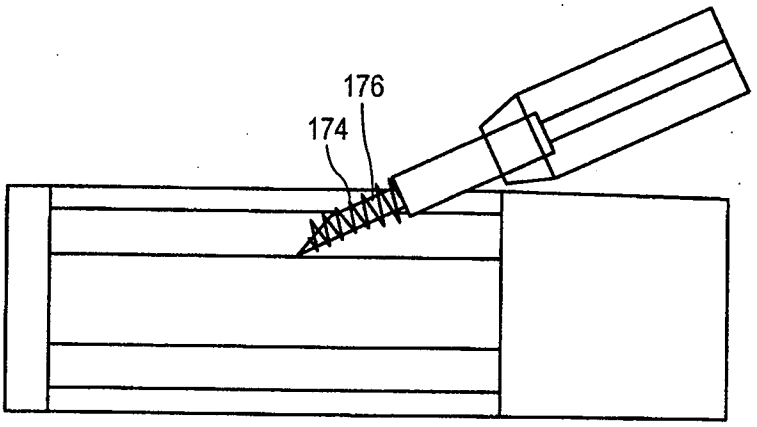


FIG. 5E

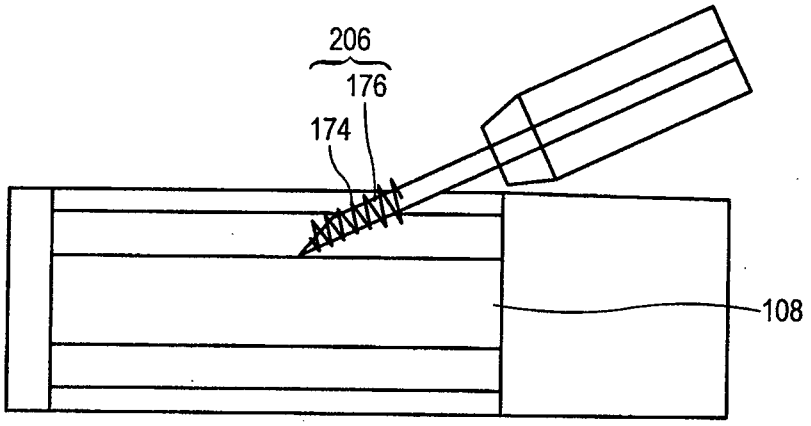


FIG. 5F

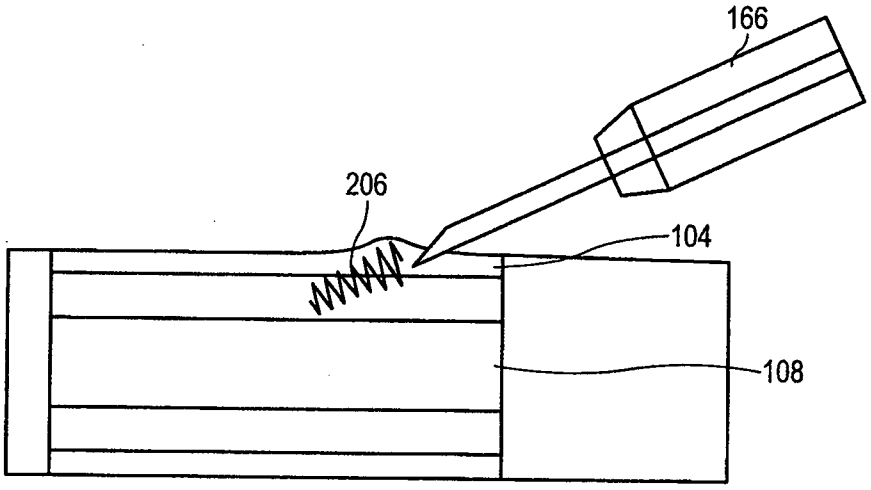


FIG. 5G

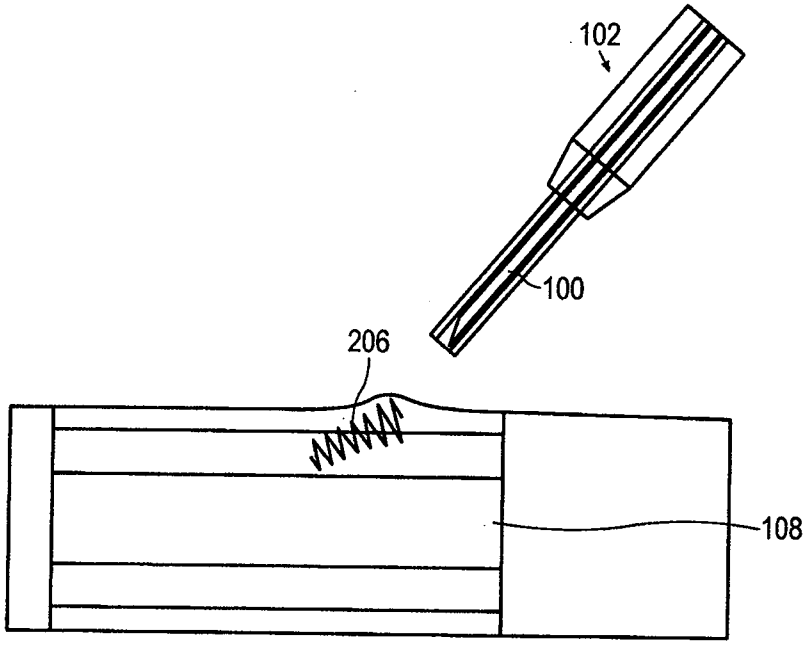


FIG. 5H

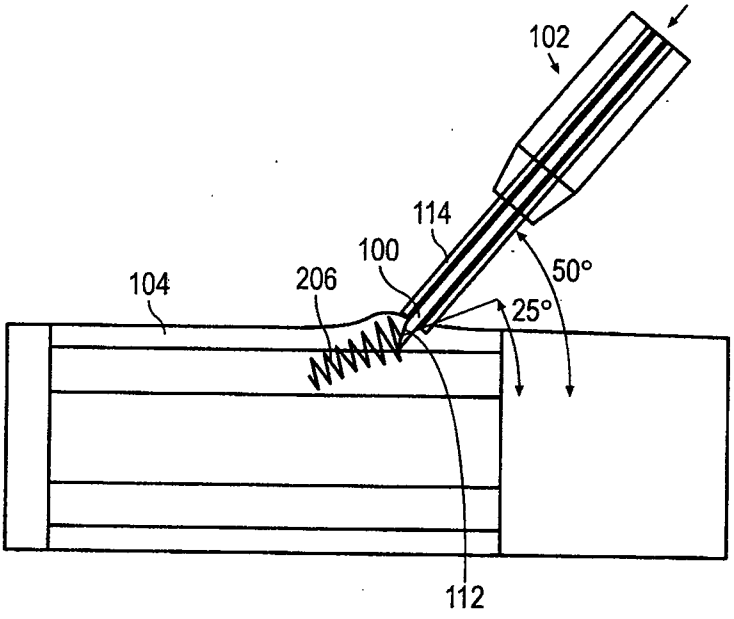


FIG. 5I

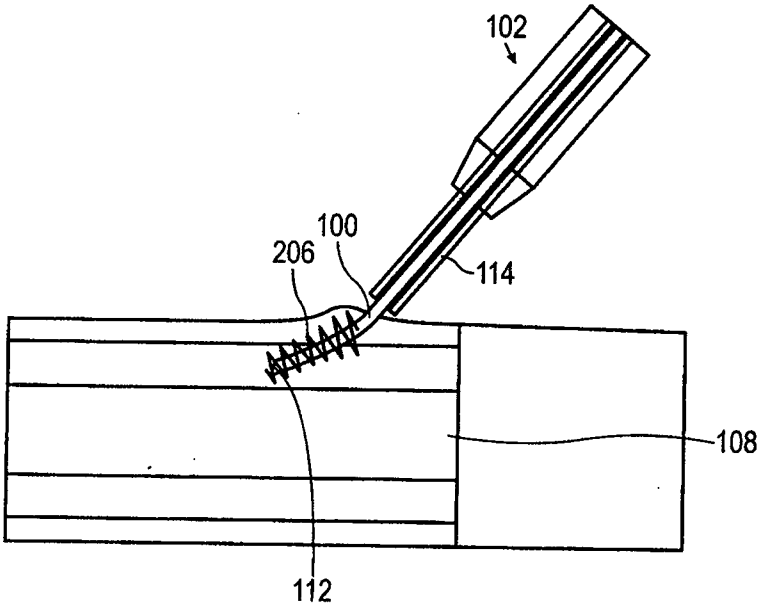


FIG. 5J

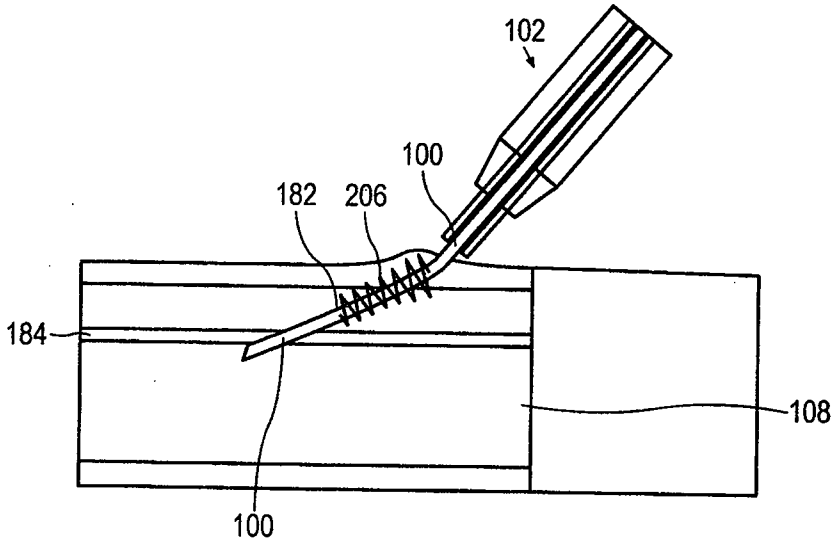


FIG. 5K

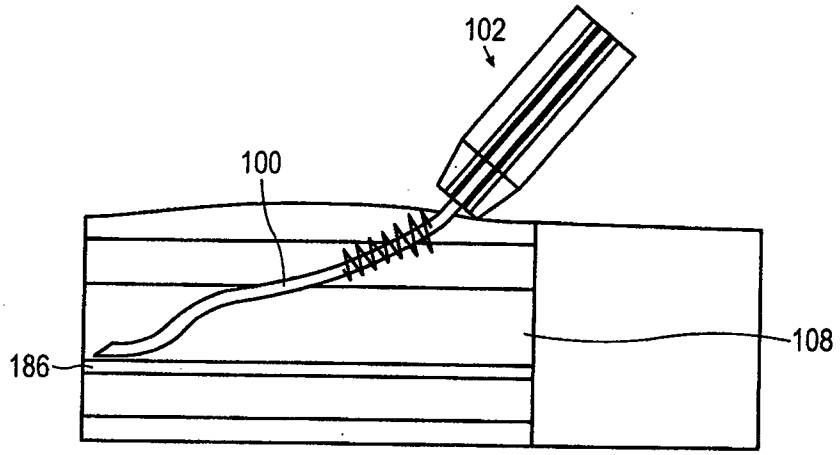


FIG. 5L

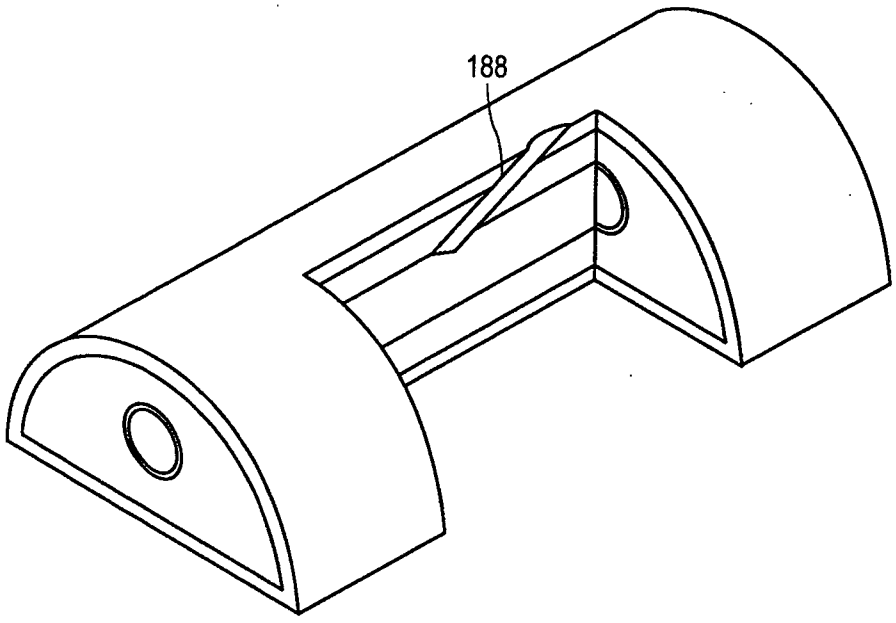


FIG. 5M

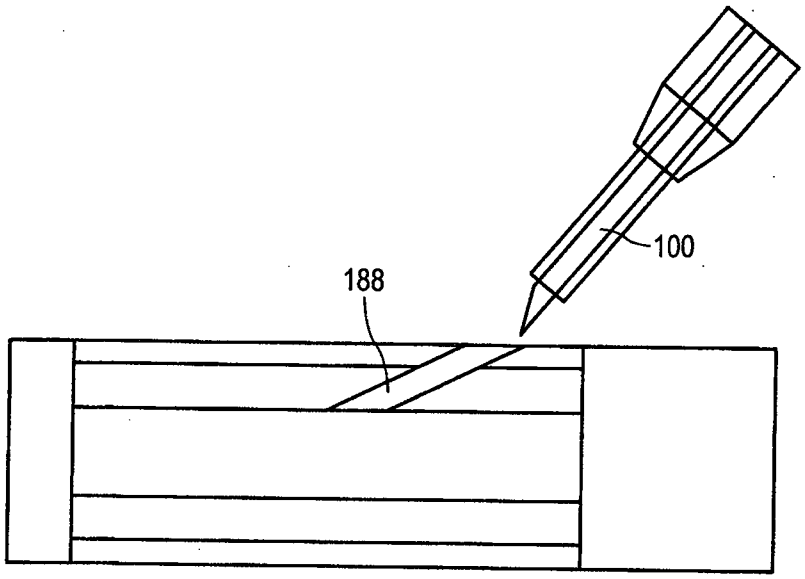


FIG. 5N

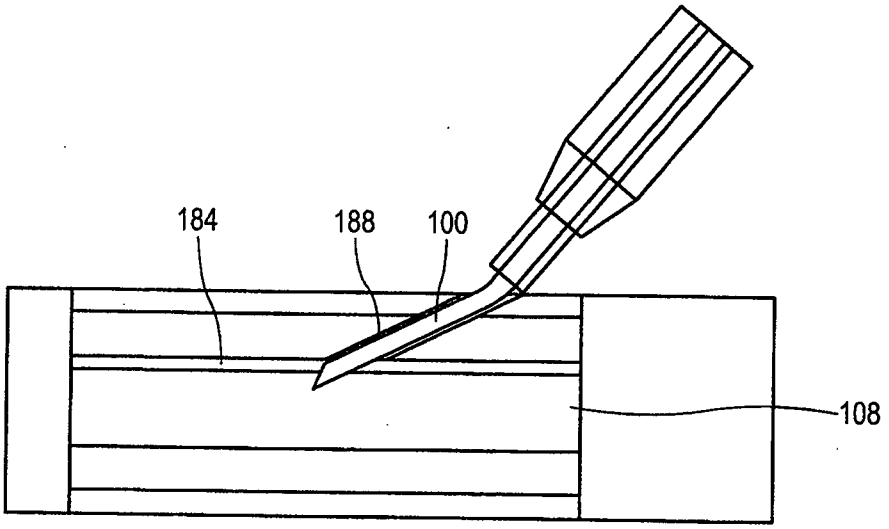


FIG. 5O

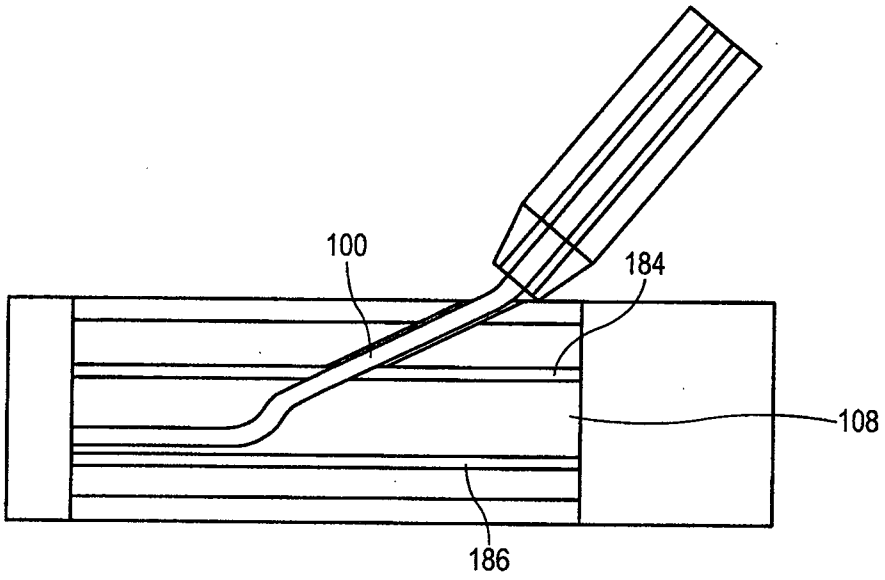


FIG. 5P

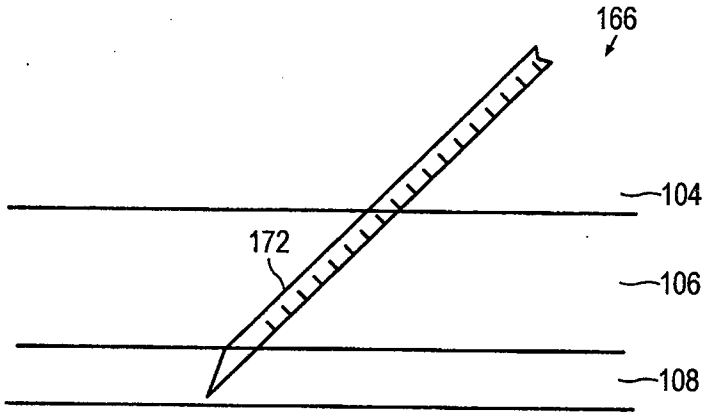


FIG. 6A

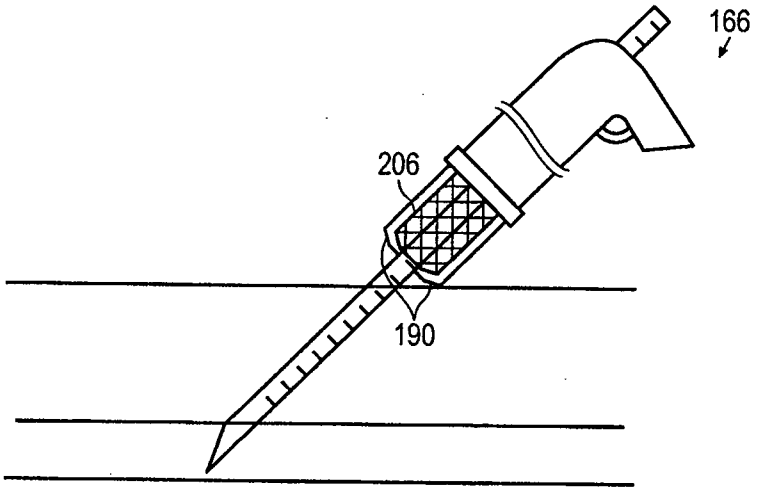


FIG. 6B

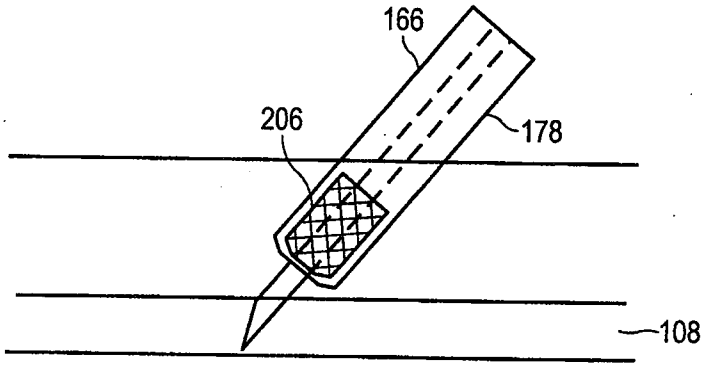


FIG. 6C

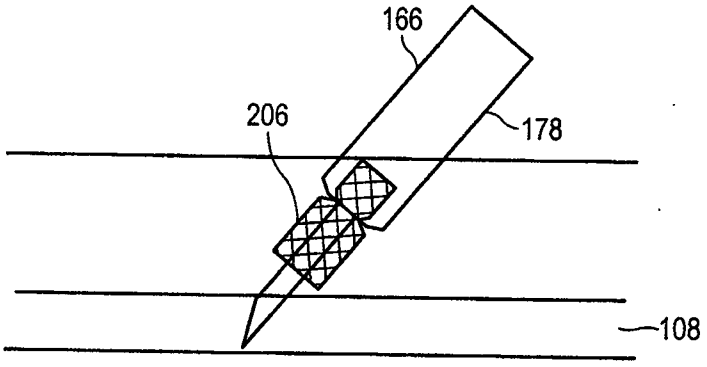


FIG. 6D

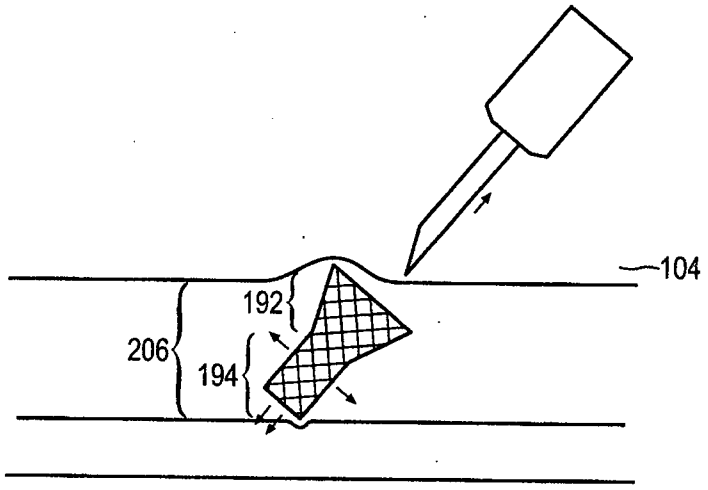


FIG. 6E

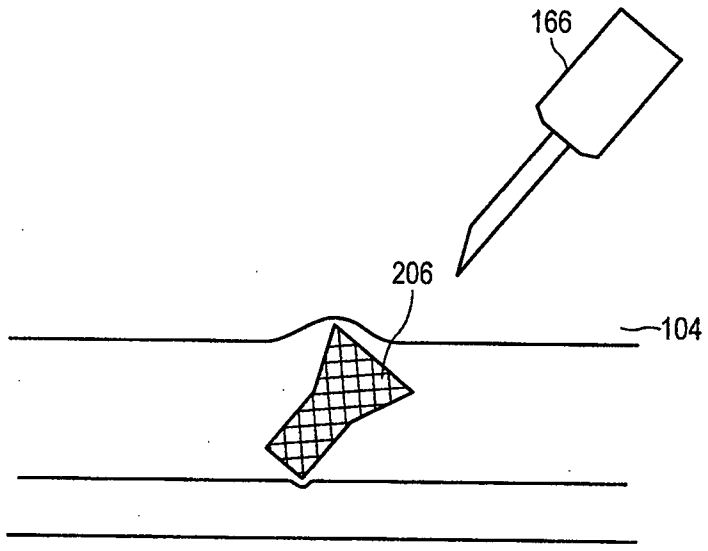


FIG. 6F

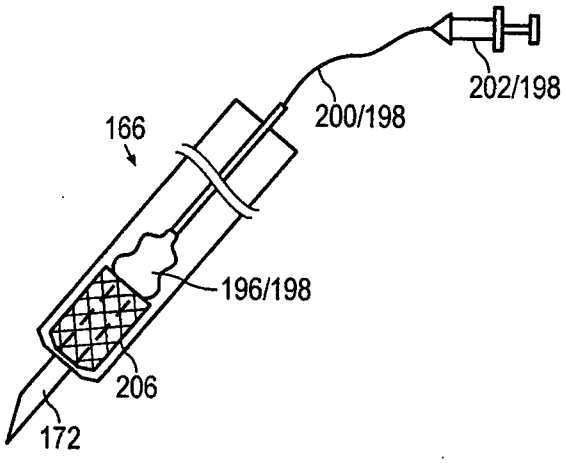


FIG. 6G

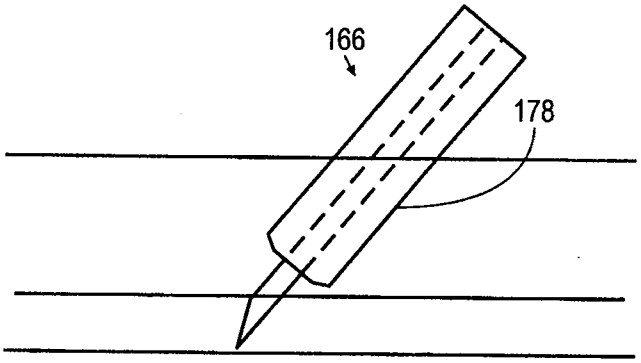


FIG. 6H

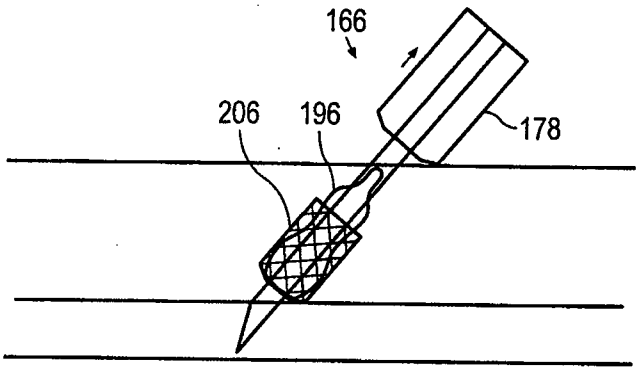


FIG. 6I

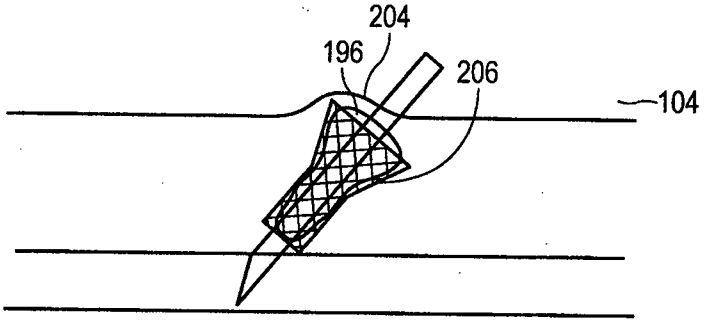


FIG. 6J

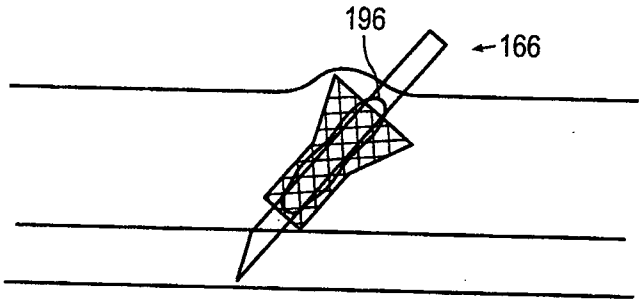


FIG. 6K

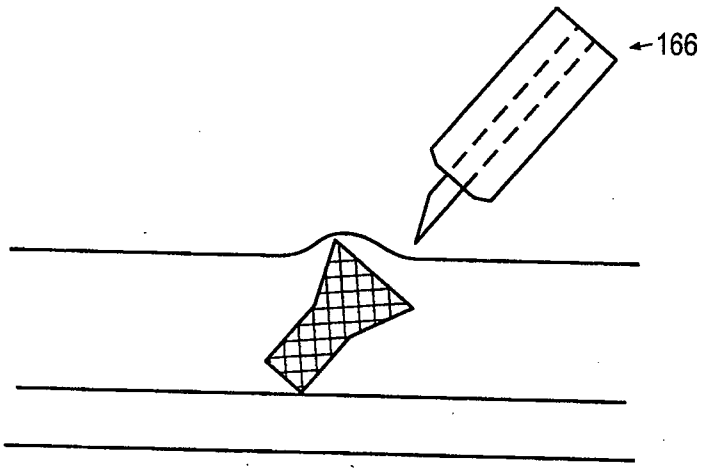


FIG. 6L

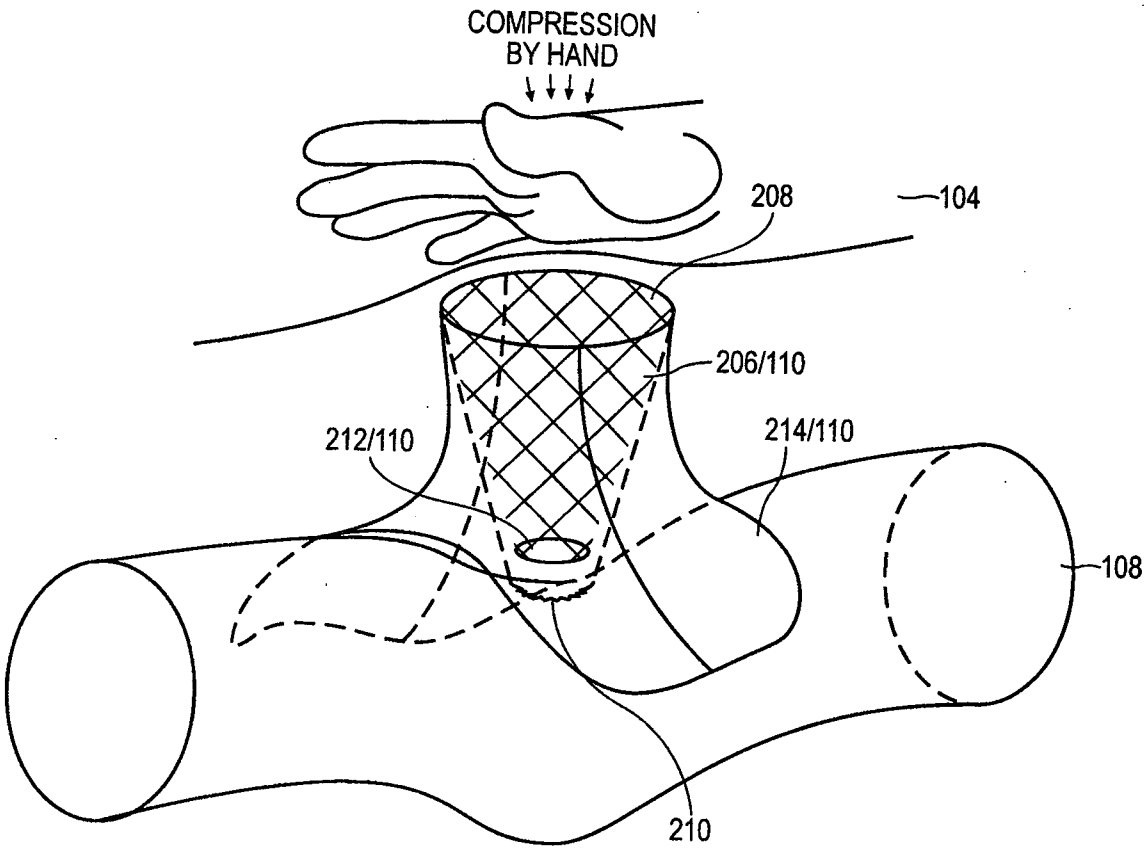


FIG. 7A

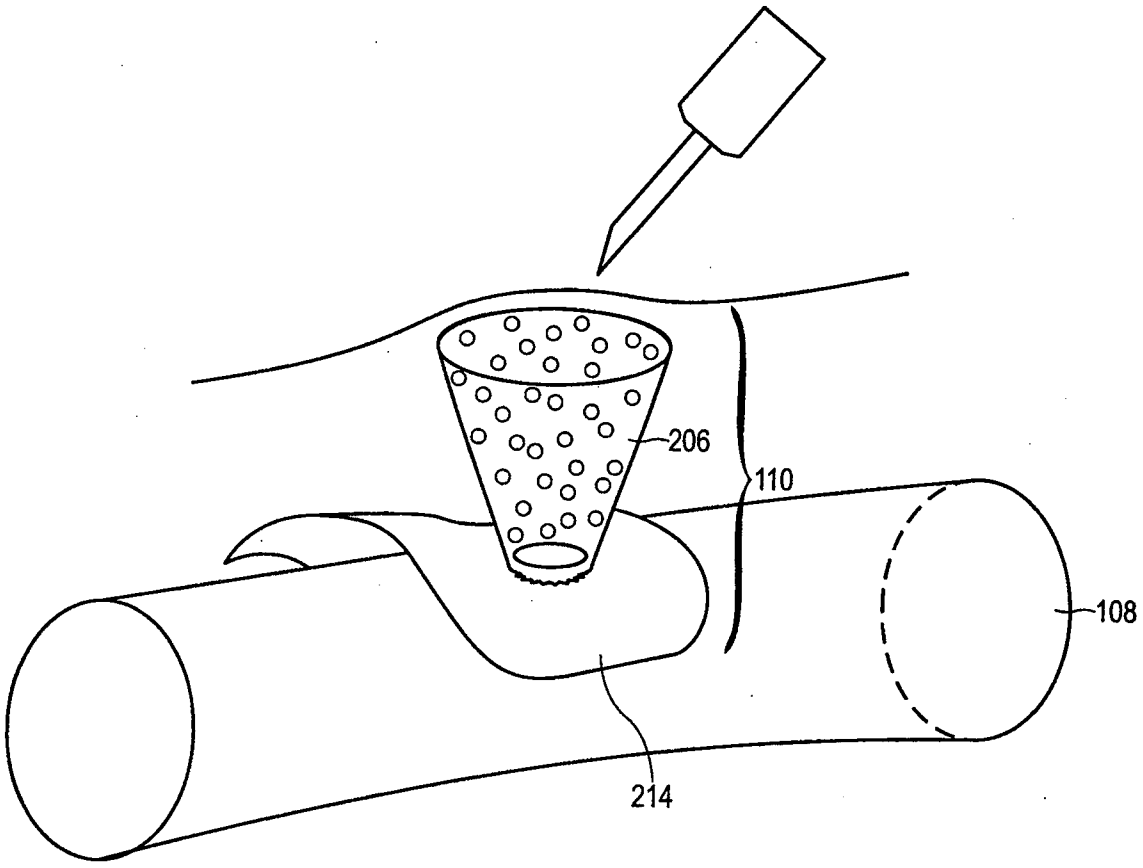


FIG. 7B

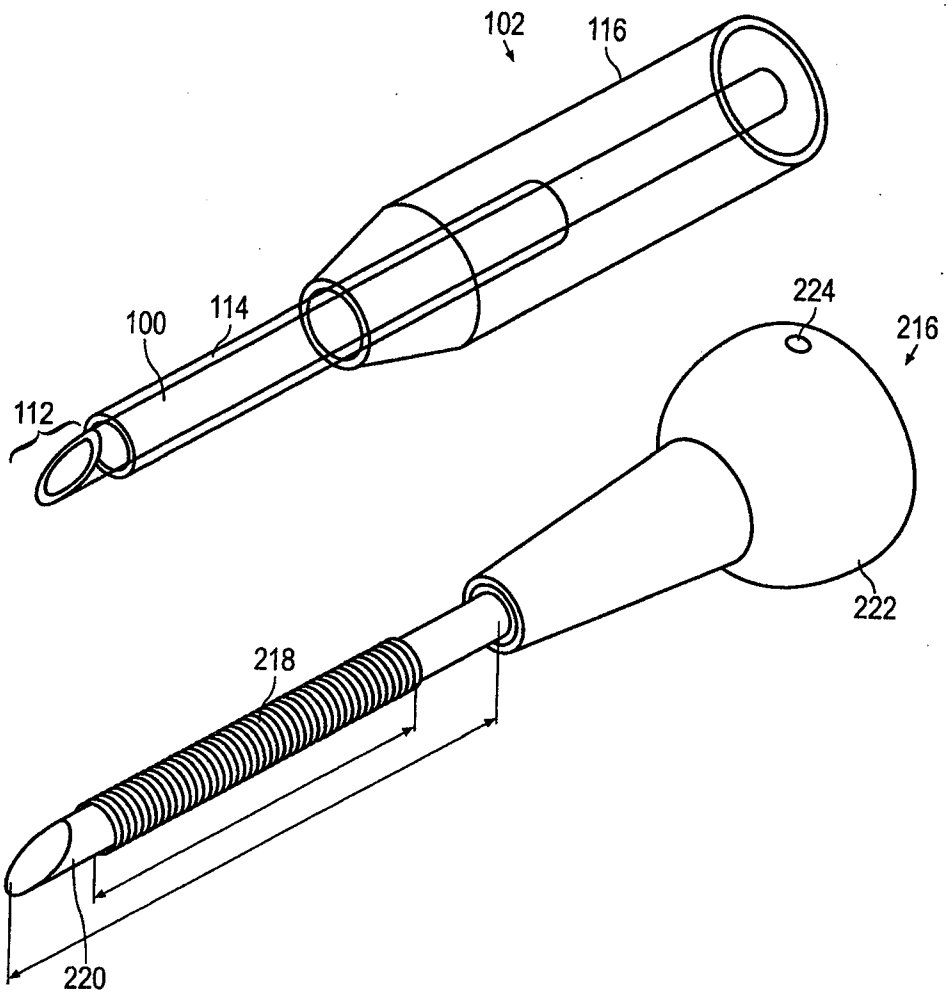


FIG. 8A

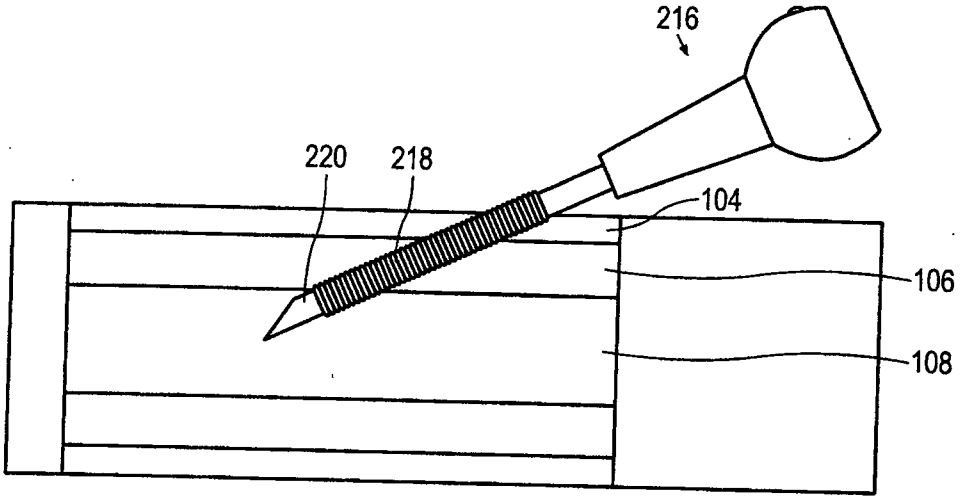


FIG. 8B

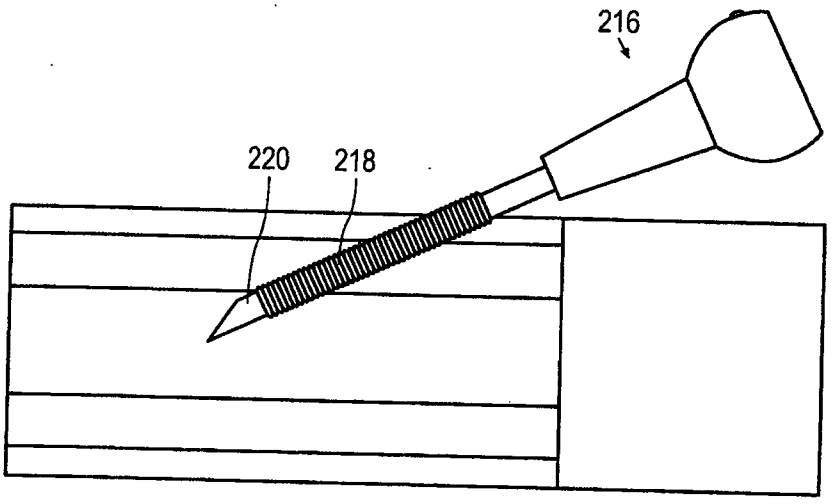


FIG. 8C

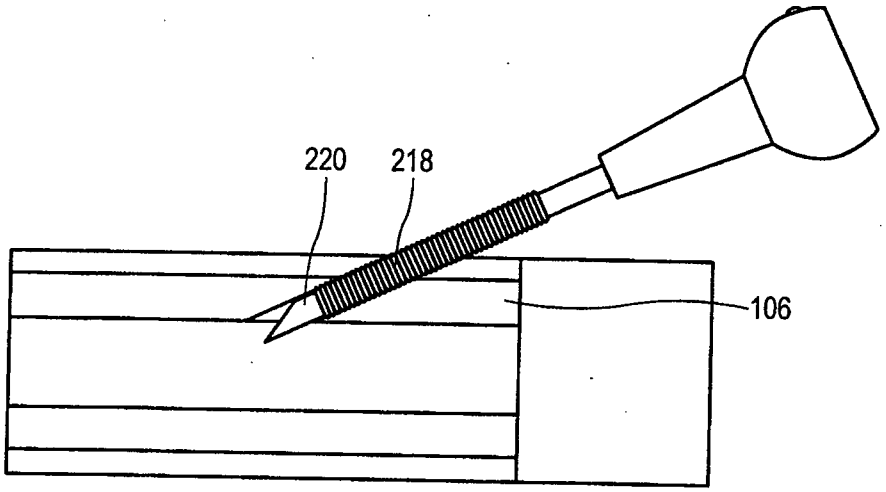


FIG. 8D

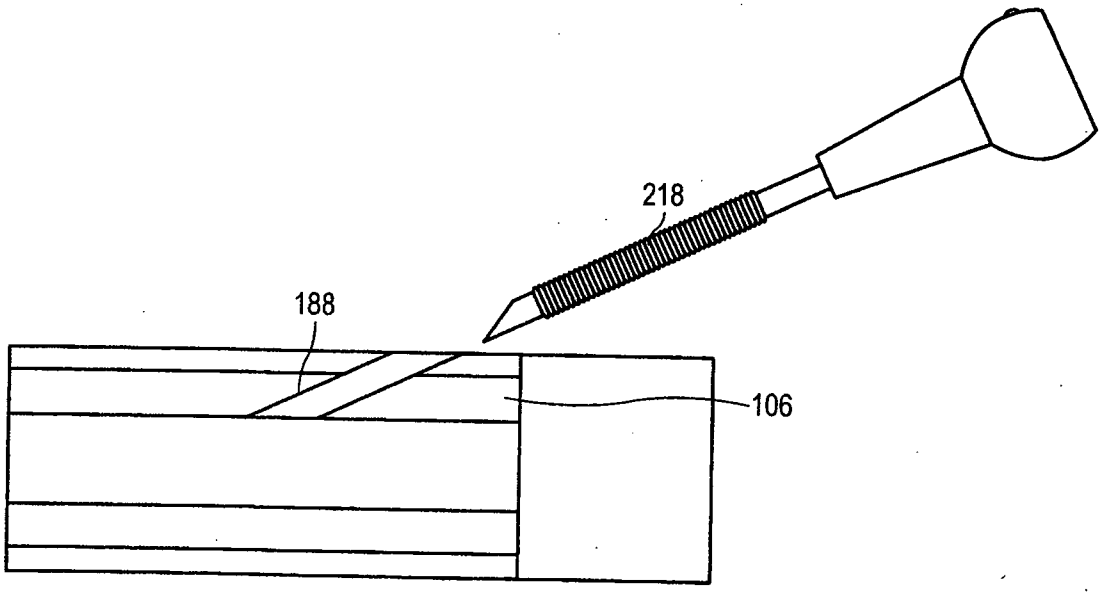


FIG. 8E

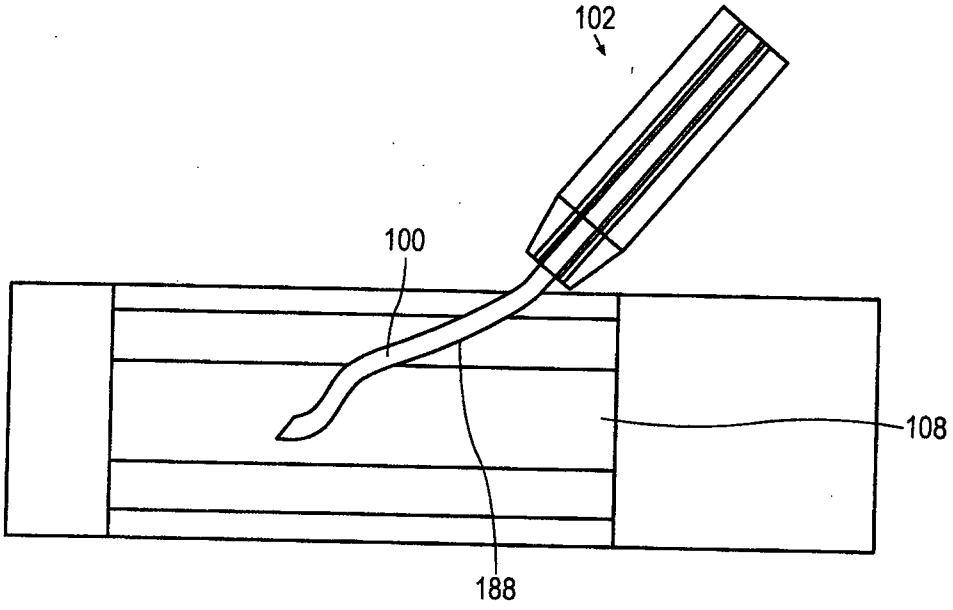


FIG. 8F

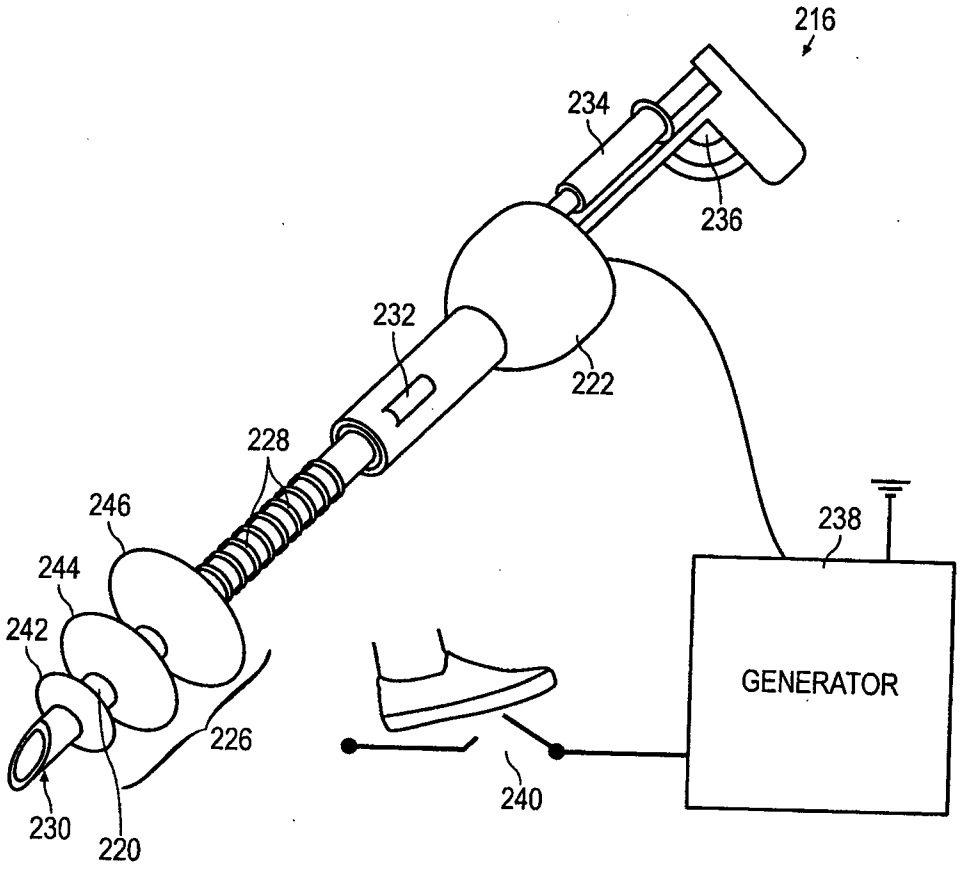

216
234
236
232
222
228
246
238
244
242
GENERATOR
226
240
230
220

FIG. 8G

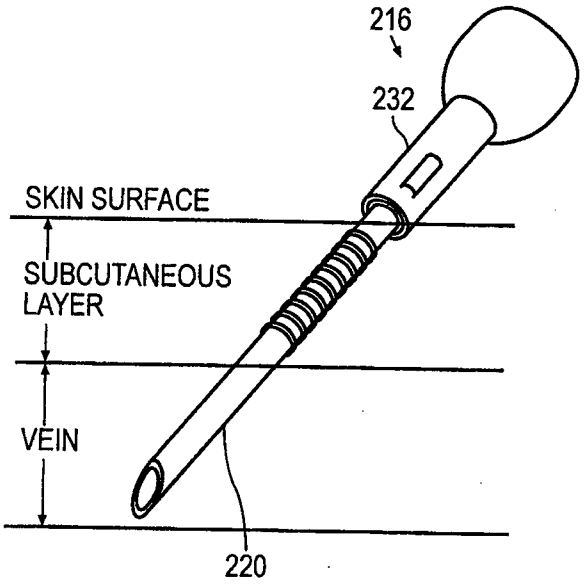

216
232
SKIN SURFACE
SUBCUTANEOUS
LAYER
VEIN
220

FIG. 8H

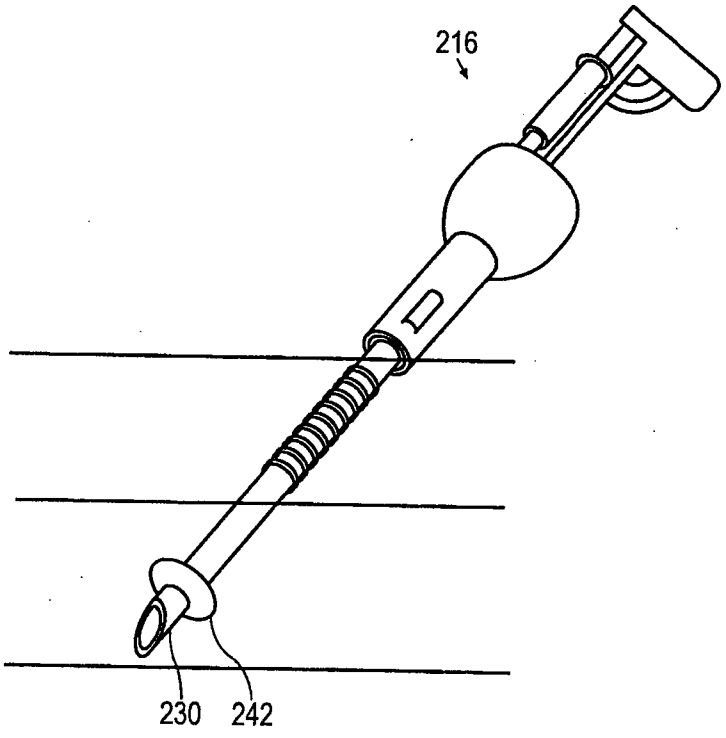

216
230
242

FIG. 8I

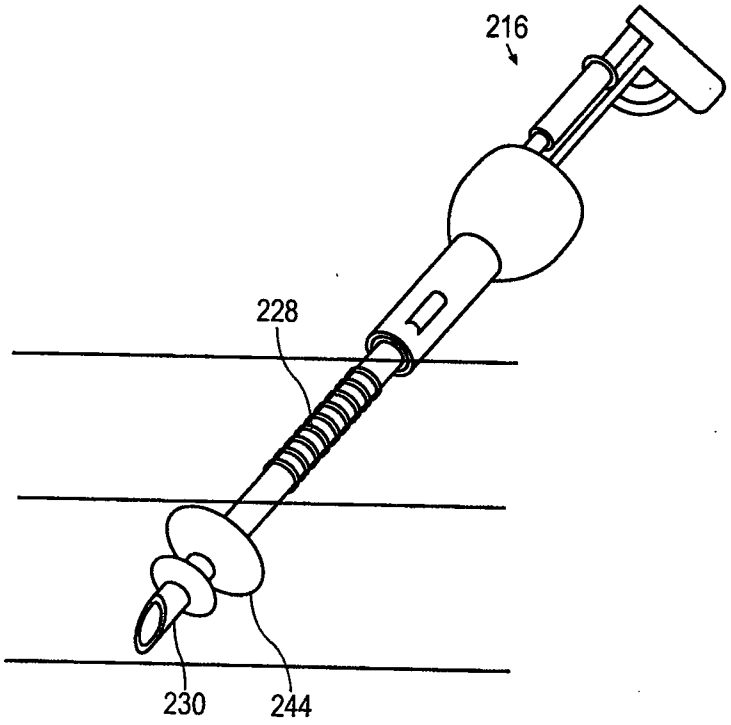


FIG. 8J

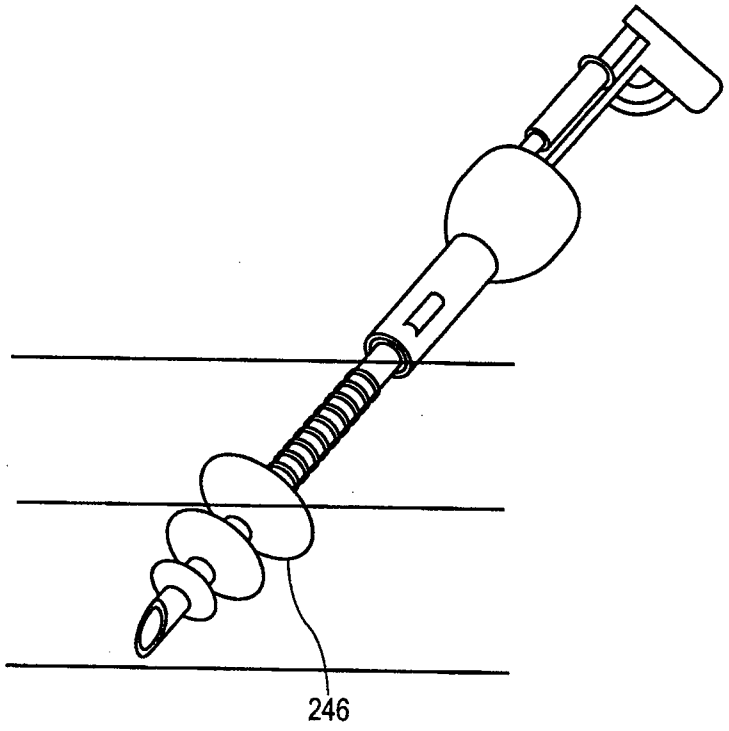


FIG. 8K

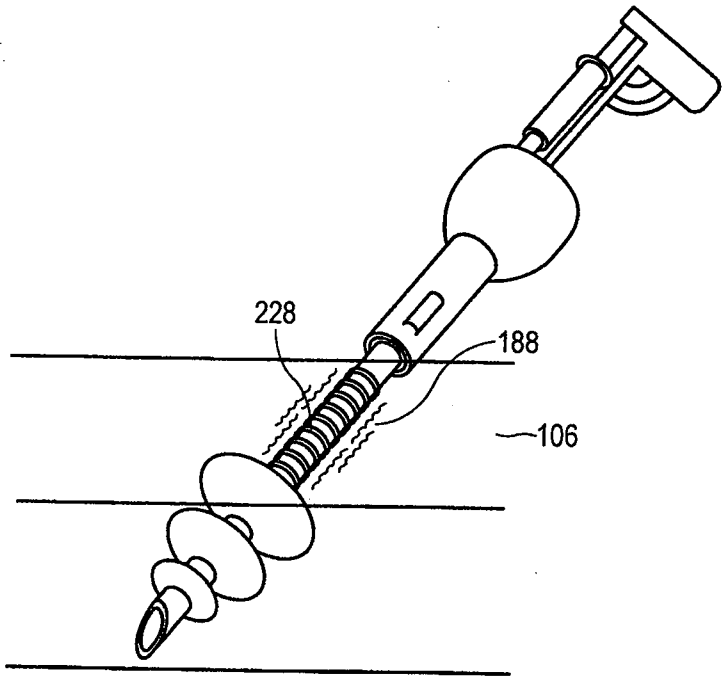


FIG. 8L

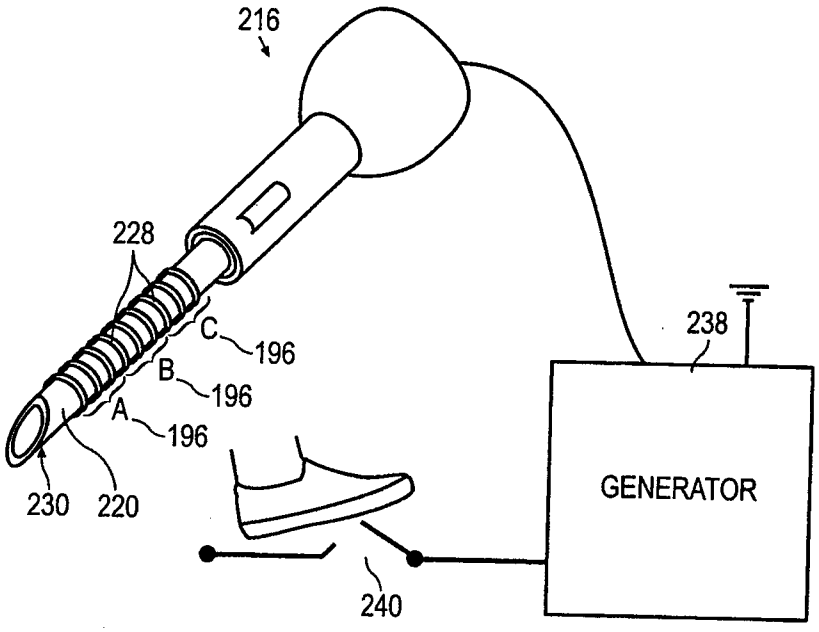


FIG. 8M

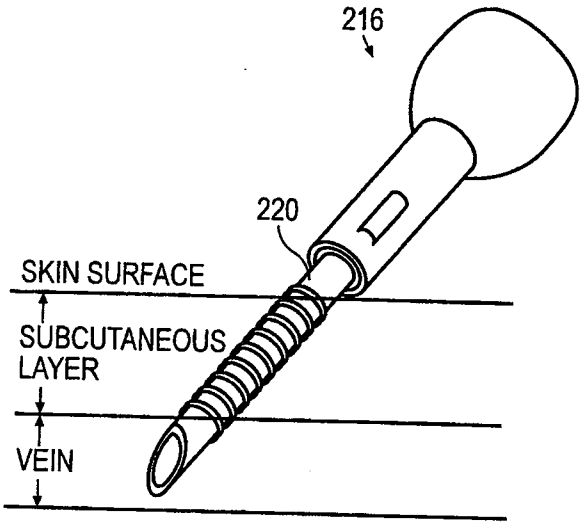

216
220
SKIN SURFACE
SUBCUTANEOUS LAYER
VEIN

FIG. 8N

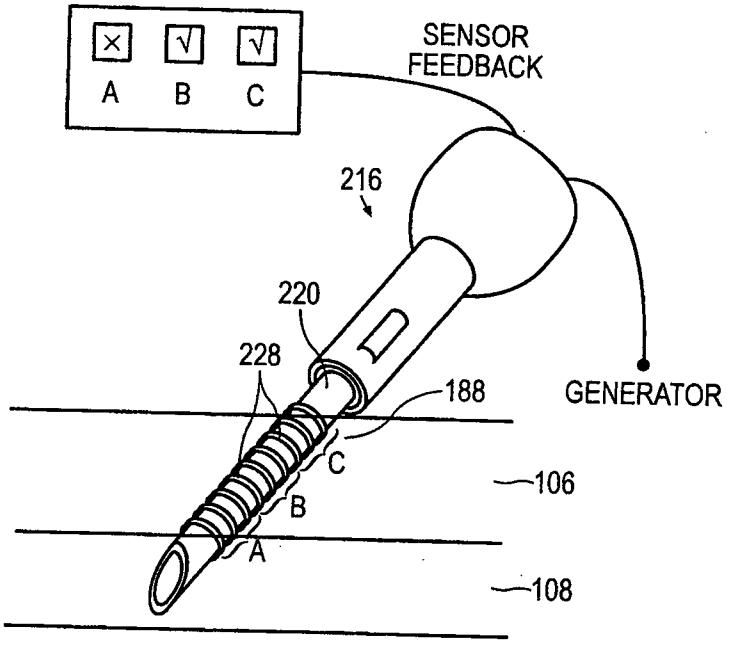

A
B
C
SENSOR FEEDBACK
216
220
228
188
GENERATOR
C
B
A
106
108

FIG. 8O

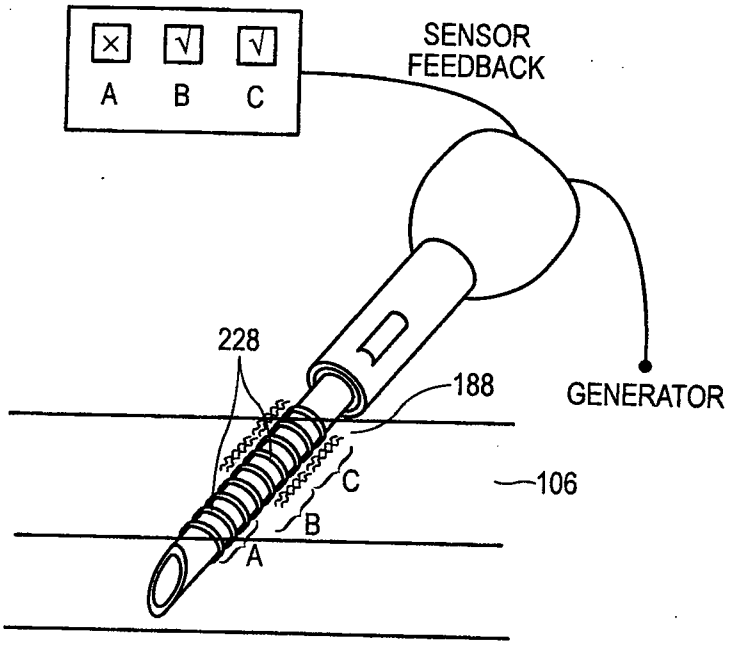


FIG. 8P

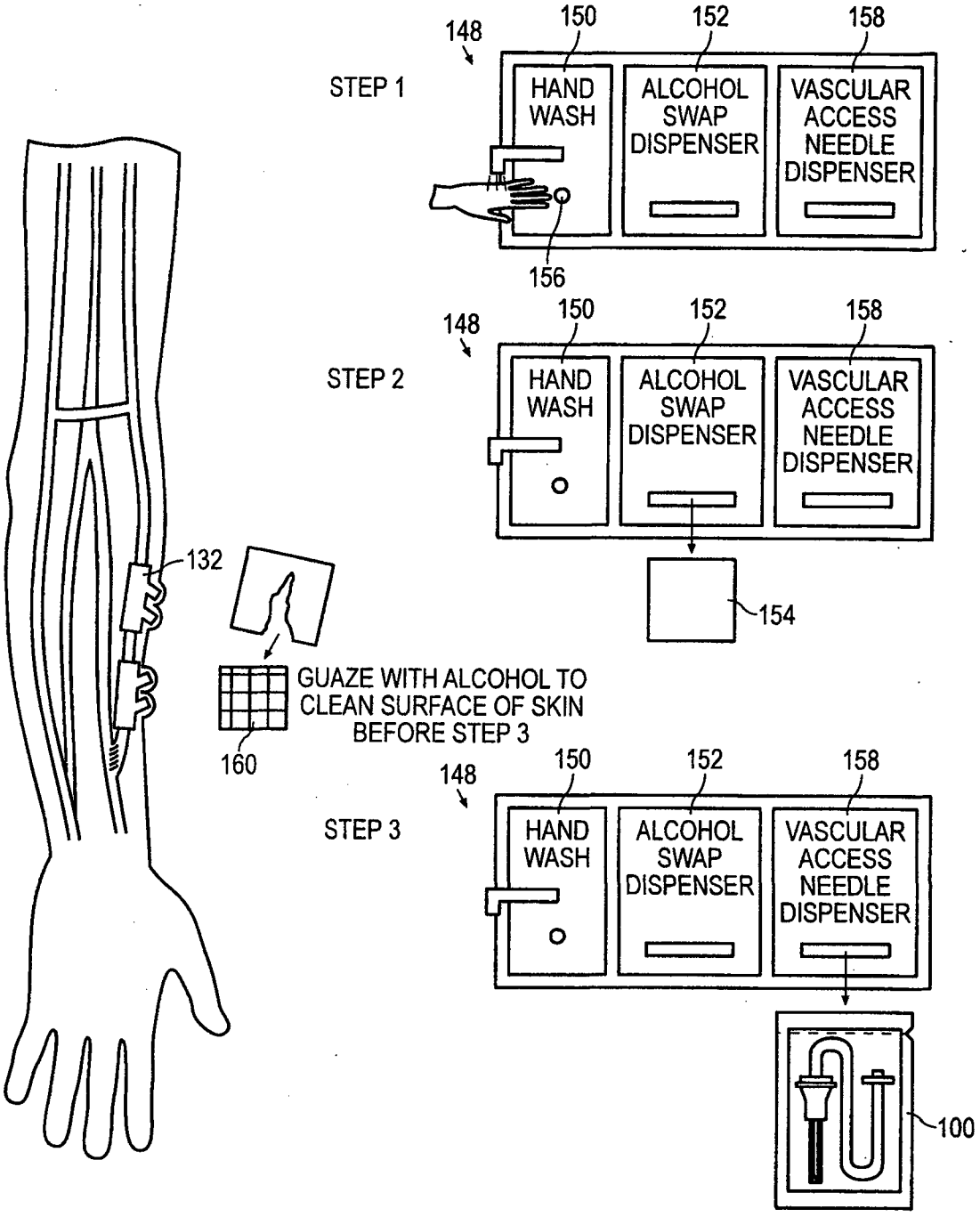

148
150
152
158
STEP 1
HAND WASH
ALCOHOL SWAP DISPENSER
VASCULAR ACCESS NEEDLE DISPENSER
156
148
150
152
158
STEP 2
HAND WASH
ALCOHOL SWAP DISPENSER
VASCULAR ACCESS NEEDLE DISPENSER
154
132
GUAZE WITH ALCOHOL TO CLEAN SURFACE OF SKIN BEFORE STEP 3
160
148
150
152
158
STEP 3
HAND WASH
ALCOHOL SWAP DISPENSER
VASCULAR ACCESS NEEDLE DISPENSER
100

FIG. 9