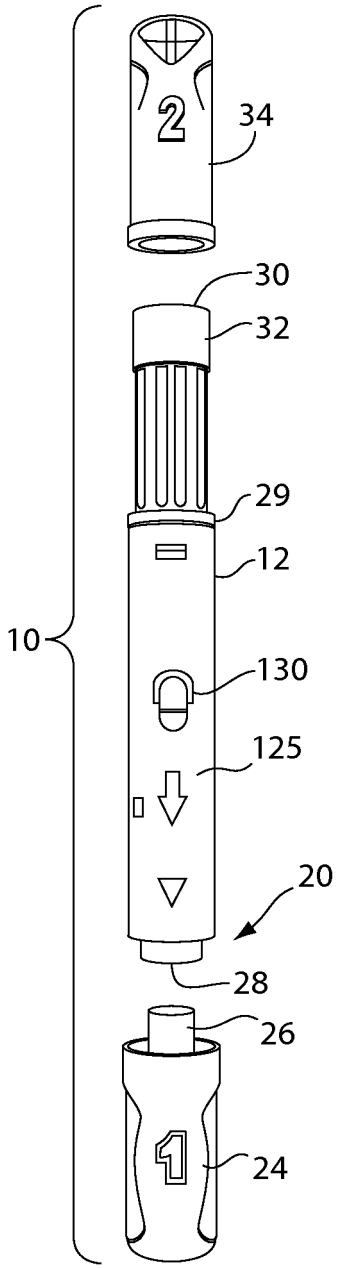


Fig. 1

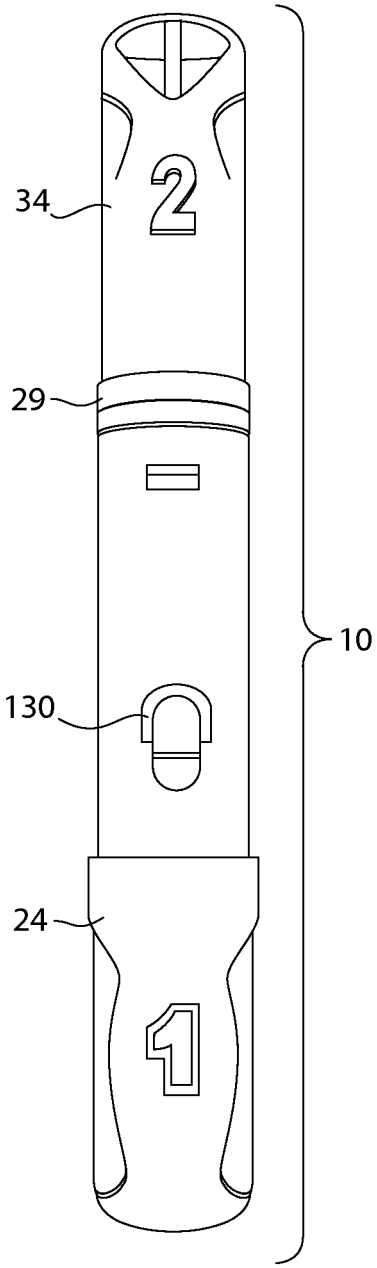


Fig. 2

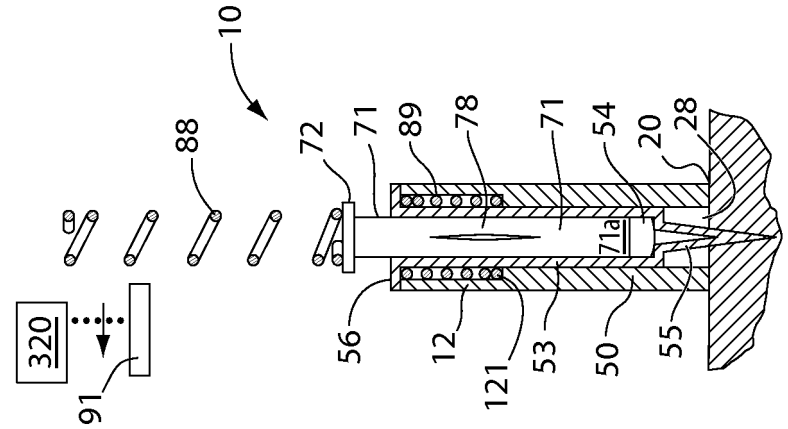


Fig. 5
PRIOR ART

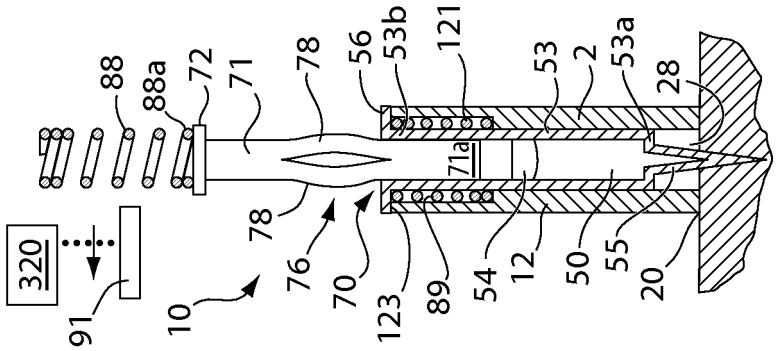


Fig. 4
PRIOR ART

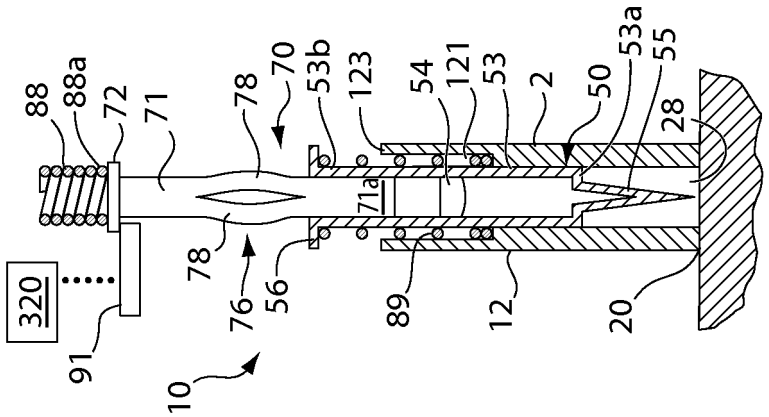


Fig. 3
PRIOR ART

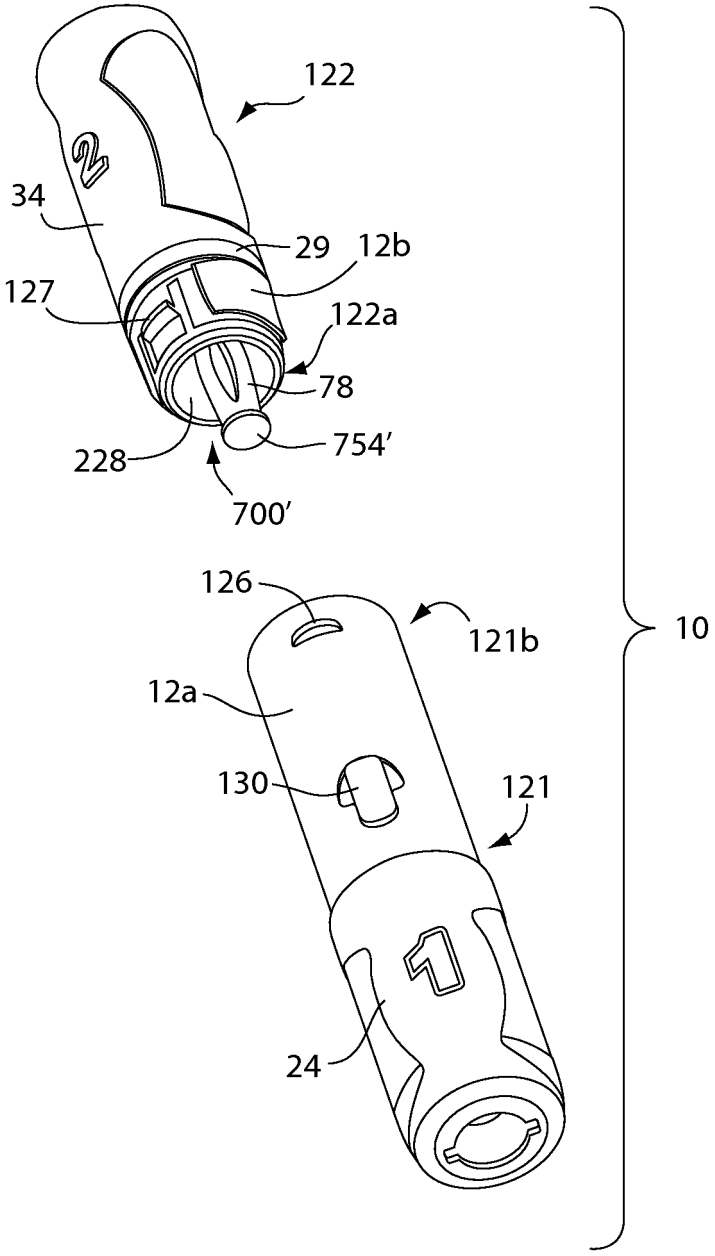

122
2
34
29
12b
127
122a
78
754'
228
700'
126
121b
10
12a
130
121
1
24

Fig. 6

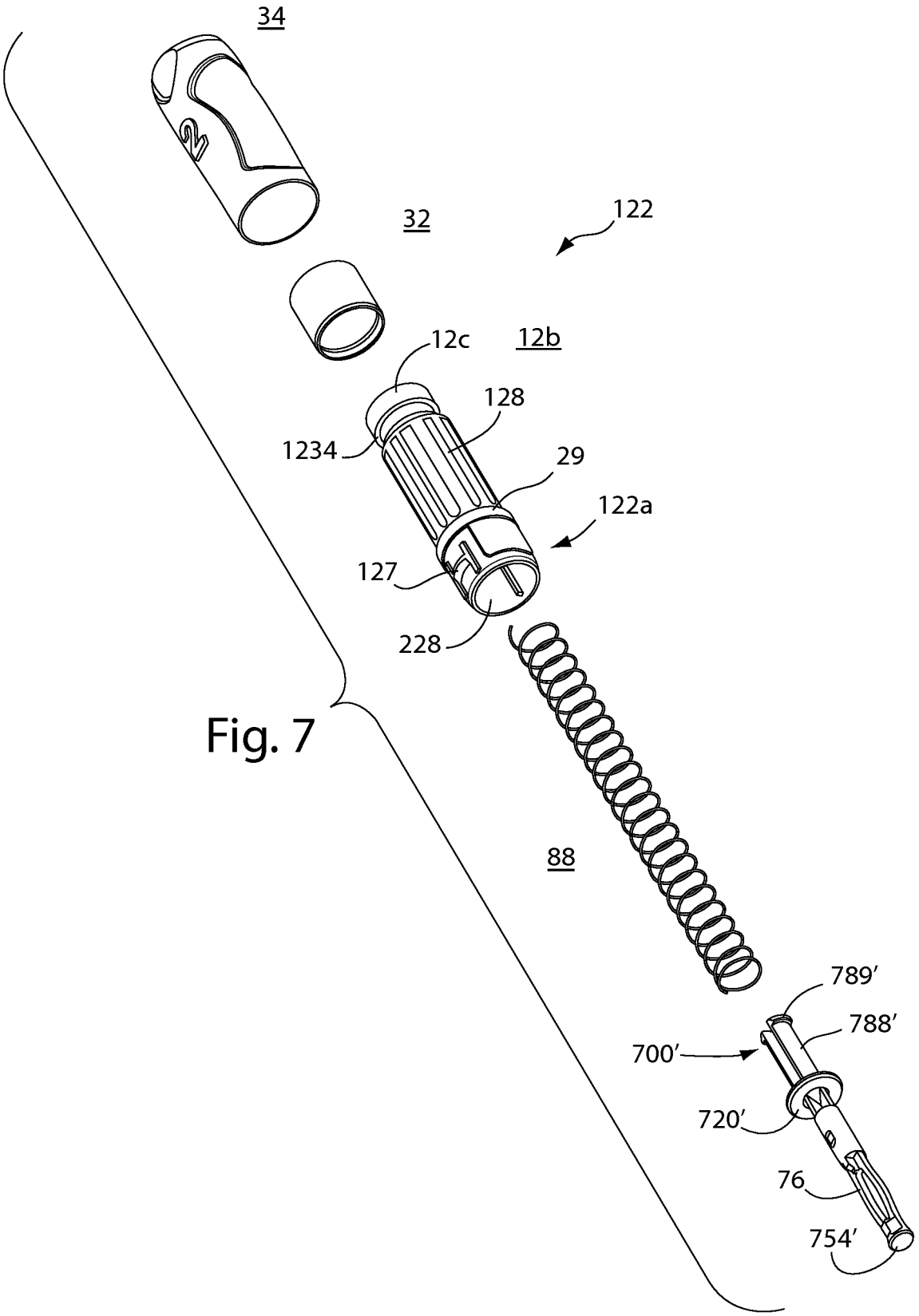

34
32
122
12c
12b
128
1234
29
122a
127
228
88
789′
788′
700′
720′
76
754′

Fig. 7

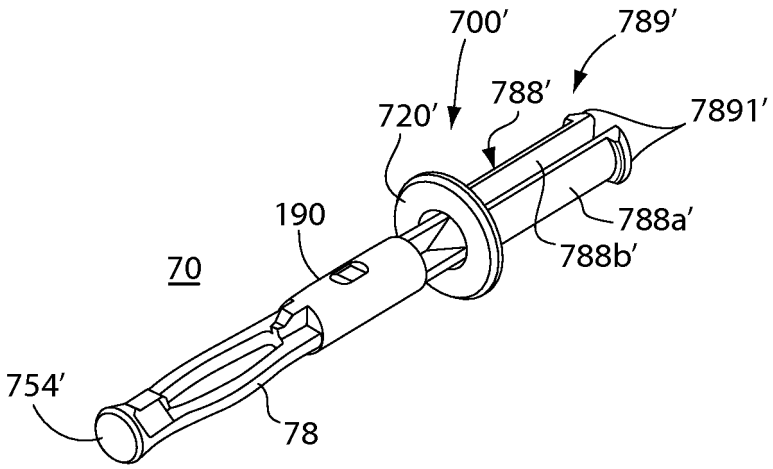


Fig. 8

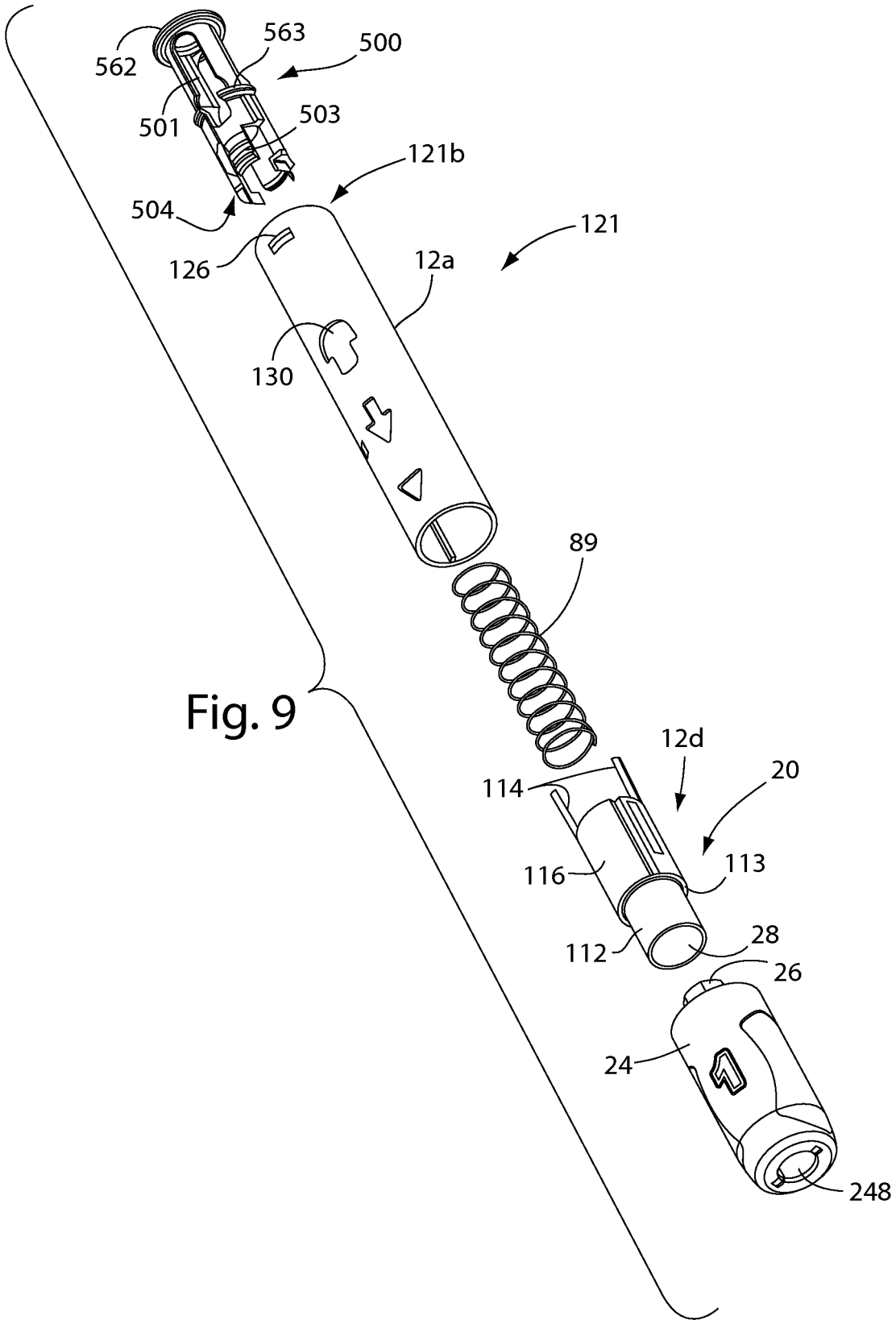

562
563
500
501
503
121b
504
121
126
12a
130
89
12d
20
114
116
113
112
28
26
24
248

Fig. 9

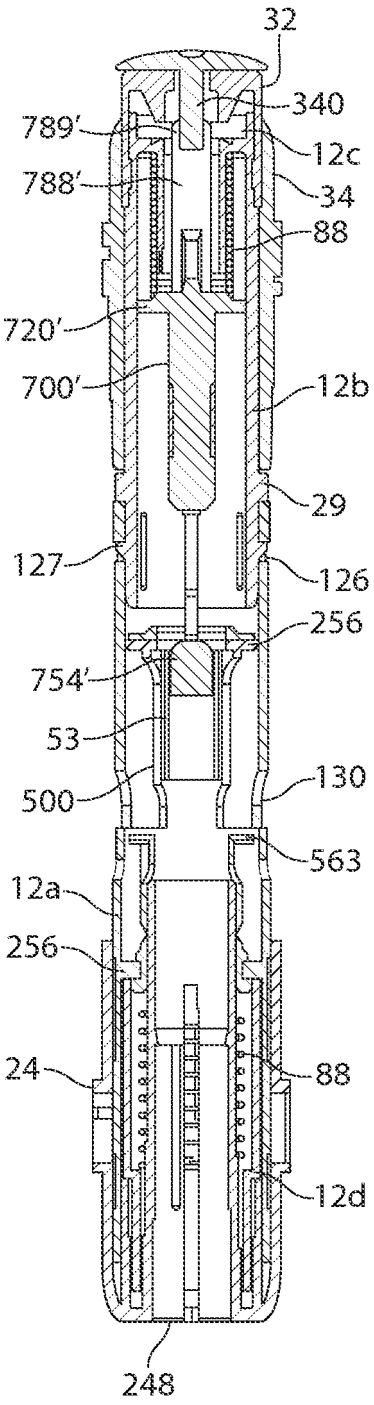


Fig. 10A

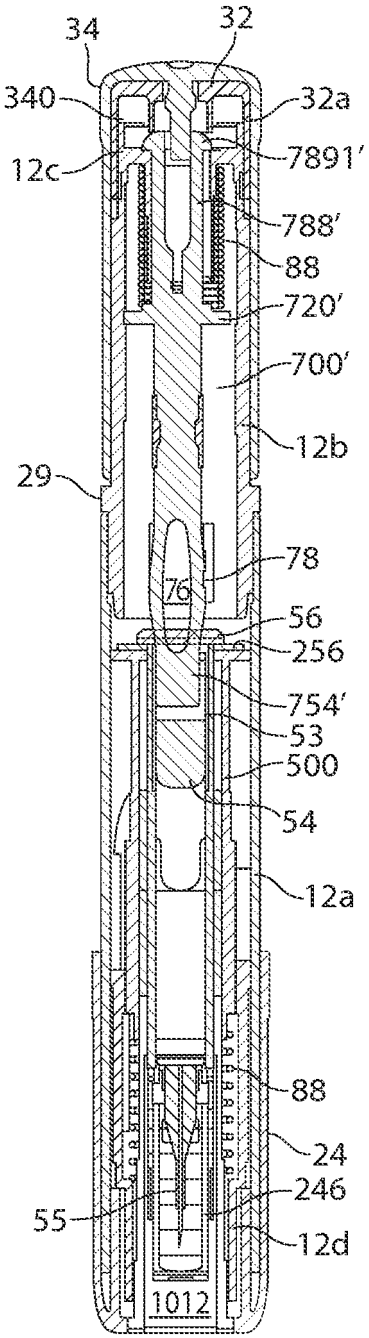


Fig. 10B

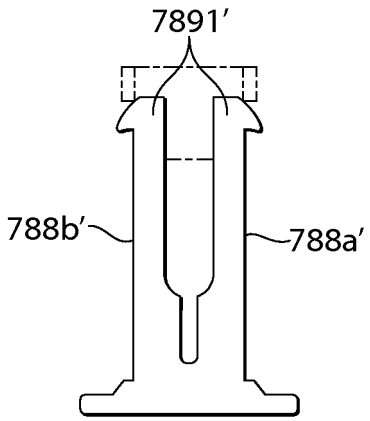


Fig. 11A

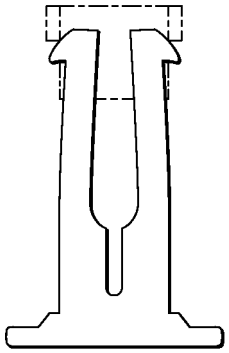


Fig. 11B

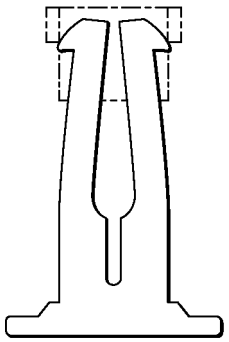


Fig. 11C

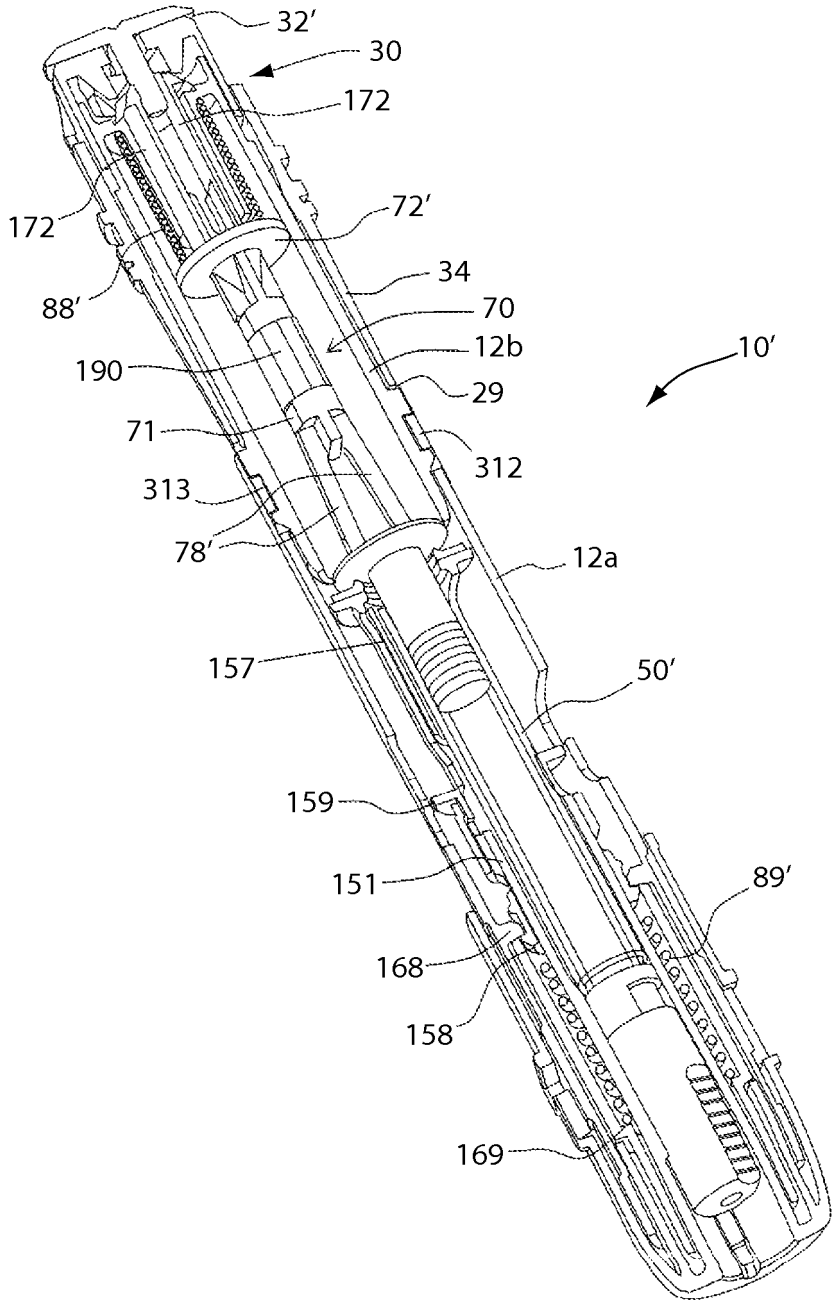

32′
30
172
172
72′
34
88′
70
12b
10′
190
29
71
312
313
78′
12a
157
50′
159
151
89′
168
158
169

Fig. 12

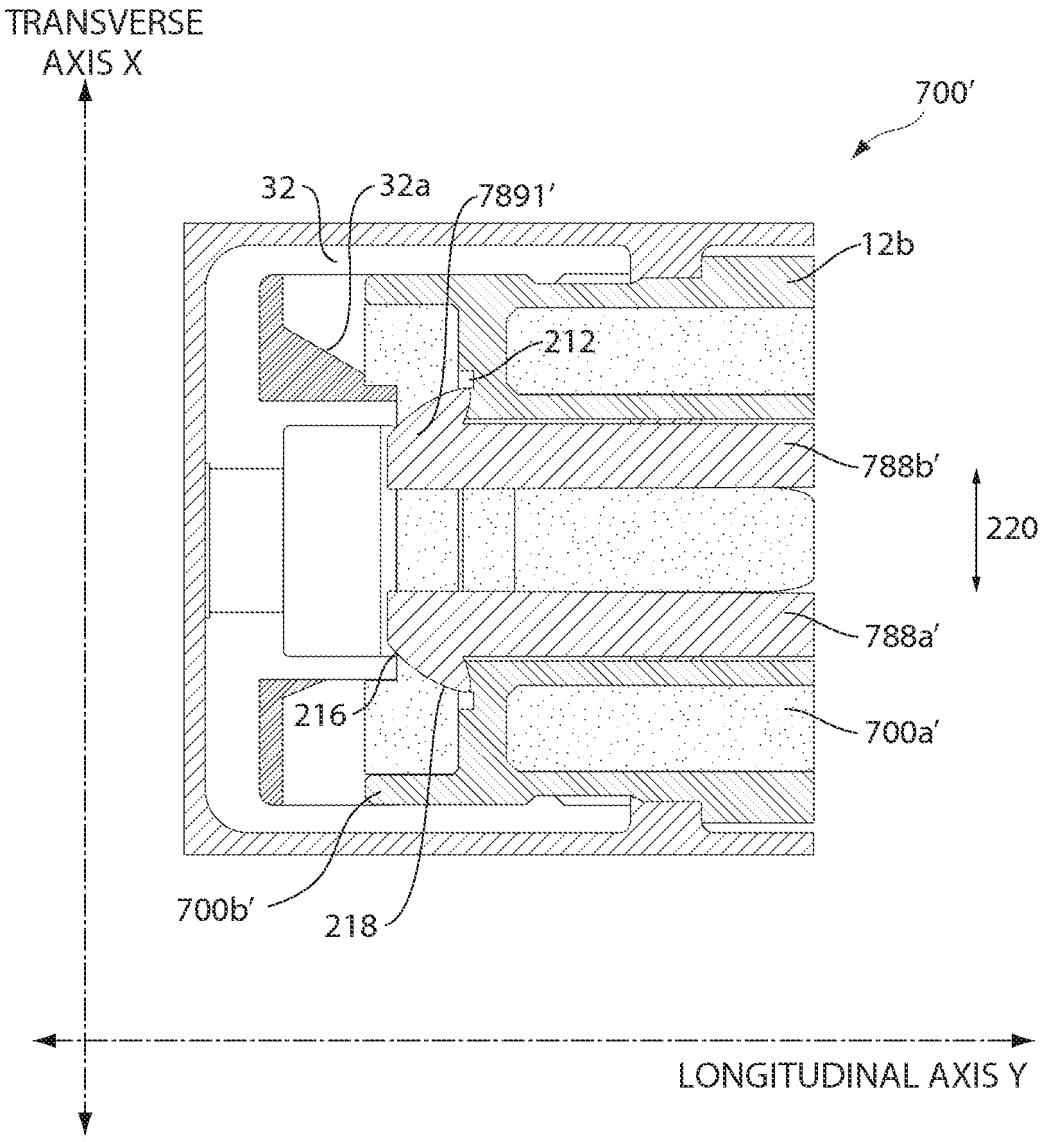

TRANSVERSE
AXIS X
700'
32
32a
7891'
12b
212
788b'
220
788a'
216
700a'
700b'
218
LONGITUDINAL AXIS Y

Fig. 13A

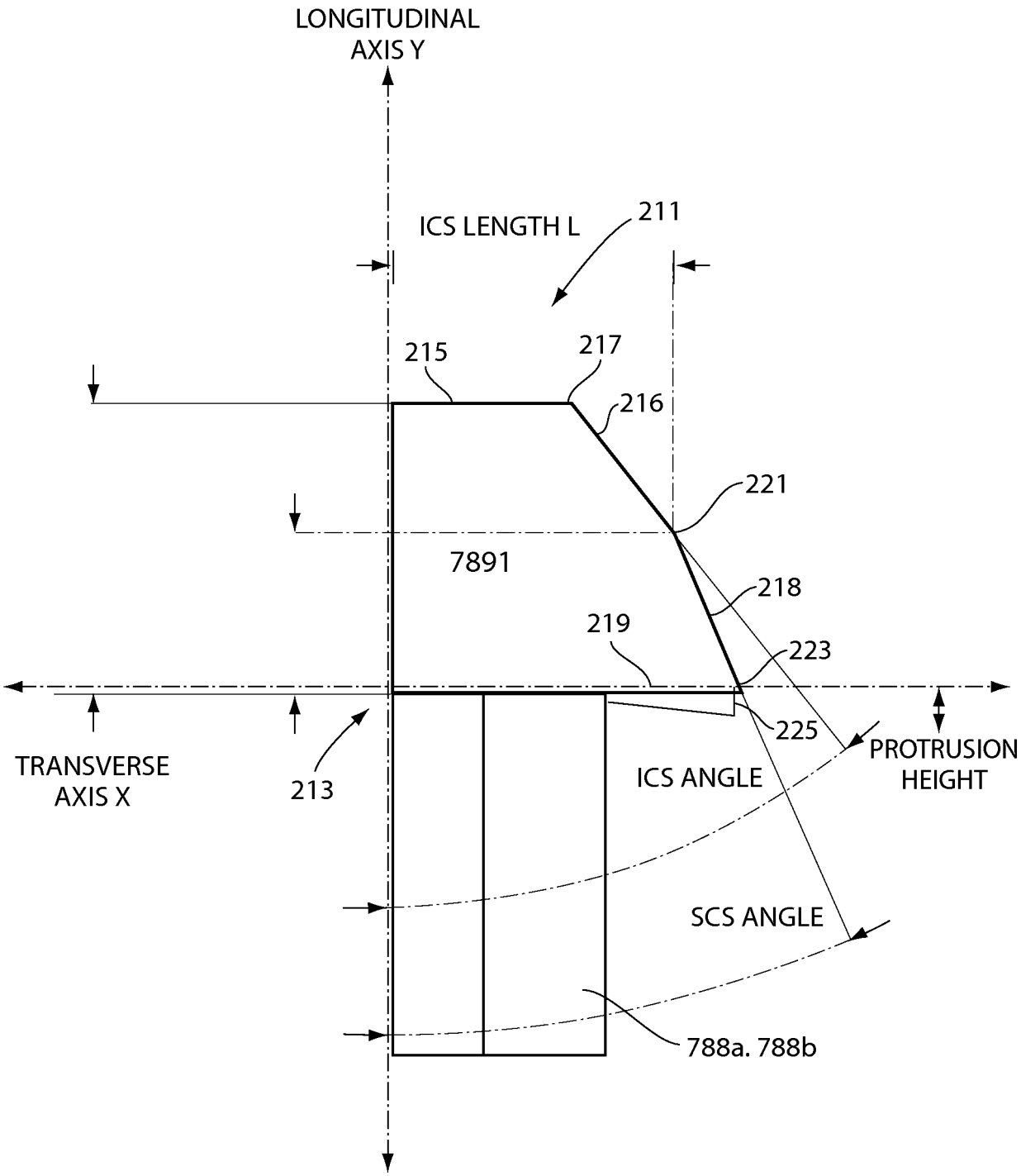

LONGITUDINAL
AXIS Y
ICS LENGTH L
211
215
217
216
221
7891
218
219
223
225
TRANSVERSE
AXIS X
213
ICS ANGLE
PROTRUSION
HEIGHT
SCS ANGLE
788a. 788b

Fig. 13B

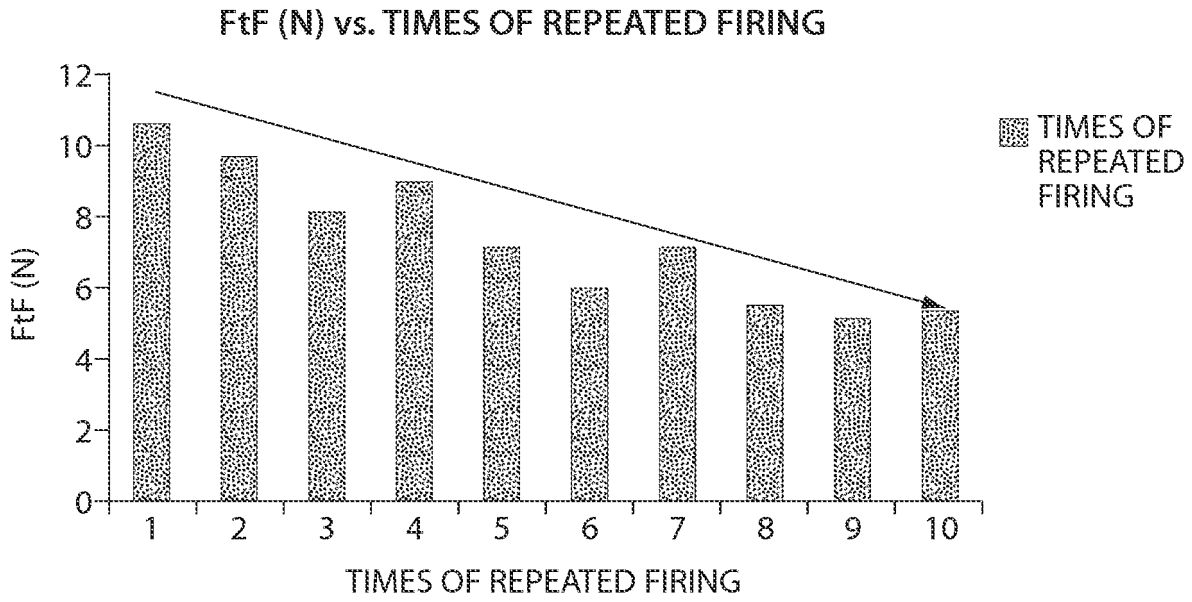


Fig. 14A

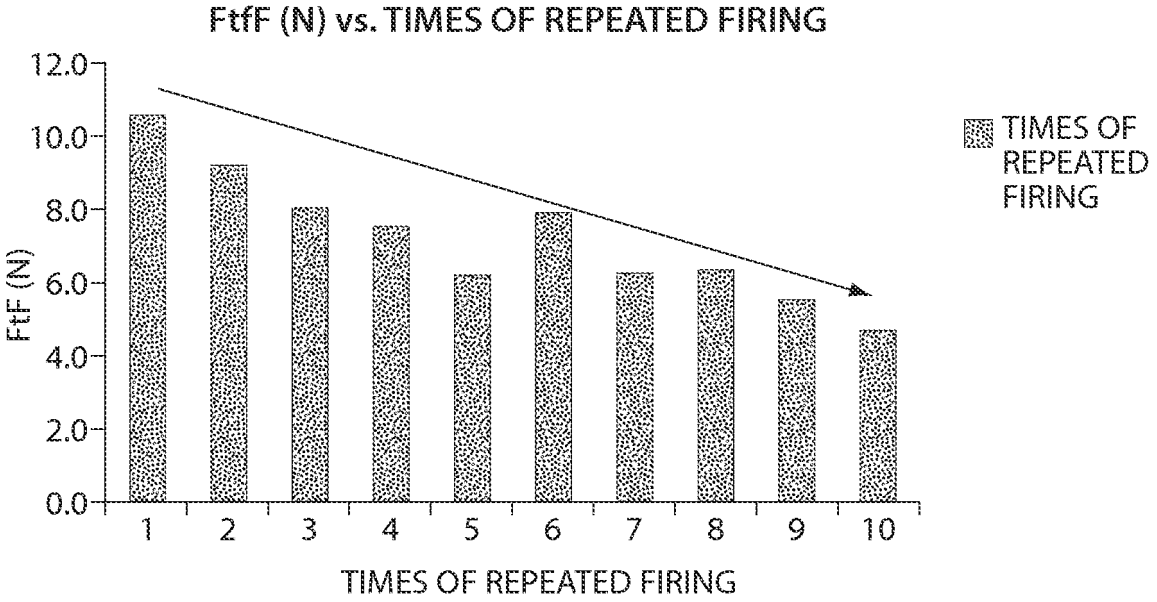


Fig. 14B

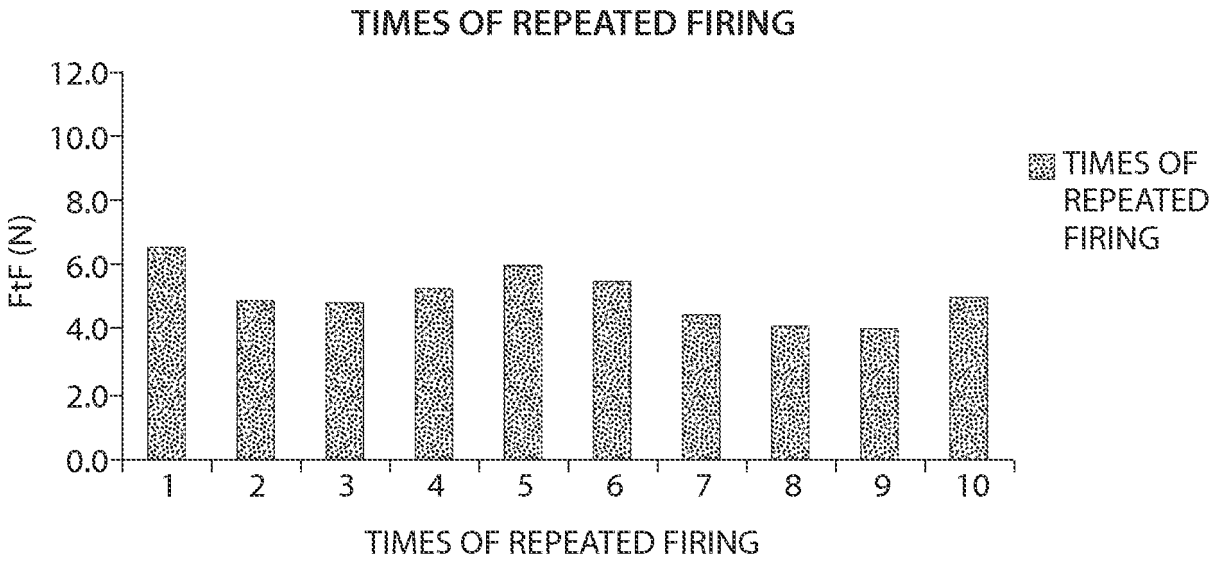

TIMES OF REPEATED FIRING
12.0
10.0
8.0
6.0
4.0
2.0
0.0
FtF (N)
1
2
3
4
5
6
7
8
9
10
TIMES OF REPEATED FIRING
TIMES OF REPEATED FIRING

Fig. 15

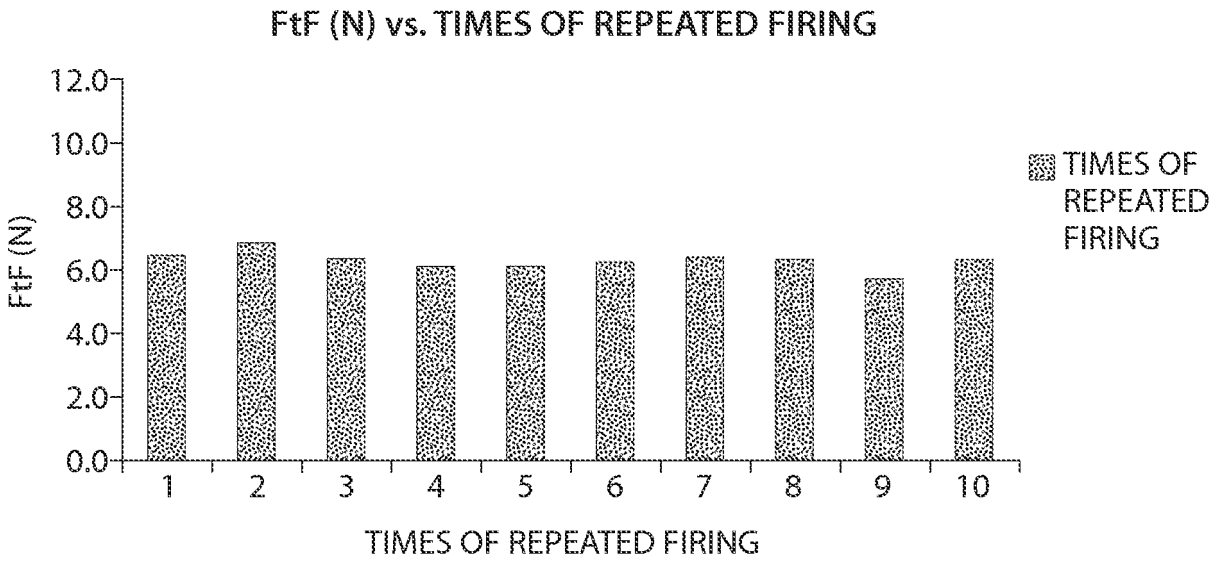

FtF (N) vs. TIMES OF REPEATED FIRING
12.0
10.0
8.0
6.0
4.0
2.0
0.0
FtF (N)
1
2
3
4
5
6
7
8
9
10
TIMES OF REPEATED FIRING
TIMES OF REPEATED FIRING

Fig. 16

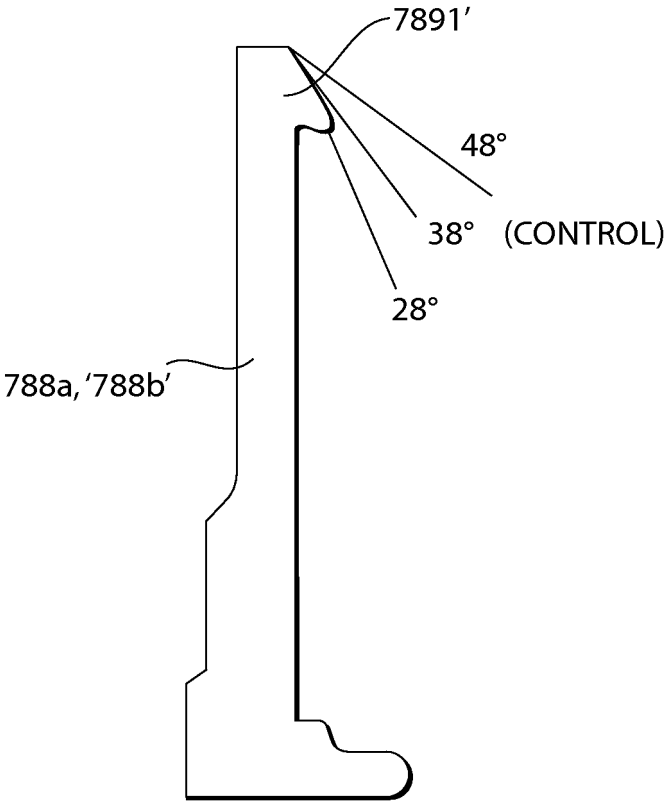


Fig. 17

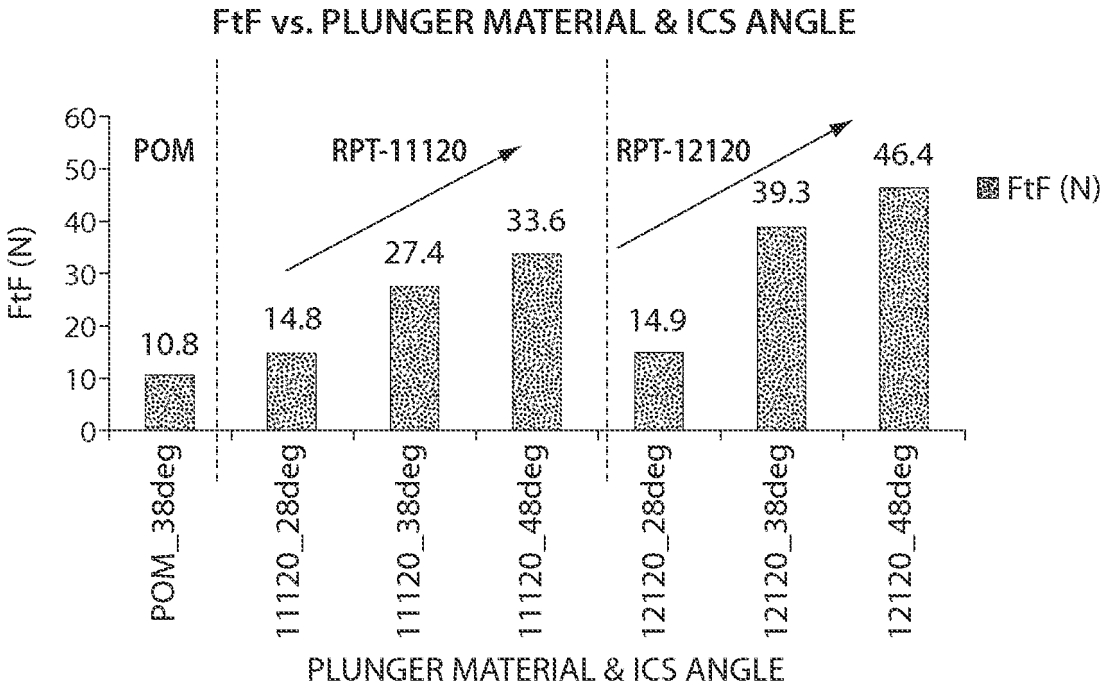

FtF vs. PLUNGER MATERIAL & ICS ANGLE
FtF (N)
60
50
40
30
20
10
0
POM
RPT-11120
RPT-12120
10.8
14.8
27.4
33.6
14.9
39.3
46.4
FtF (N)
POM_38deg
11120_28deg
11120_38deg
11120_48deg
12120_28deg
12120_38deg
12120_48deg
PLUNGER MATERIAL & ICS ANGLE

Fig. 18

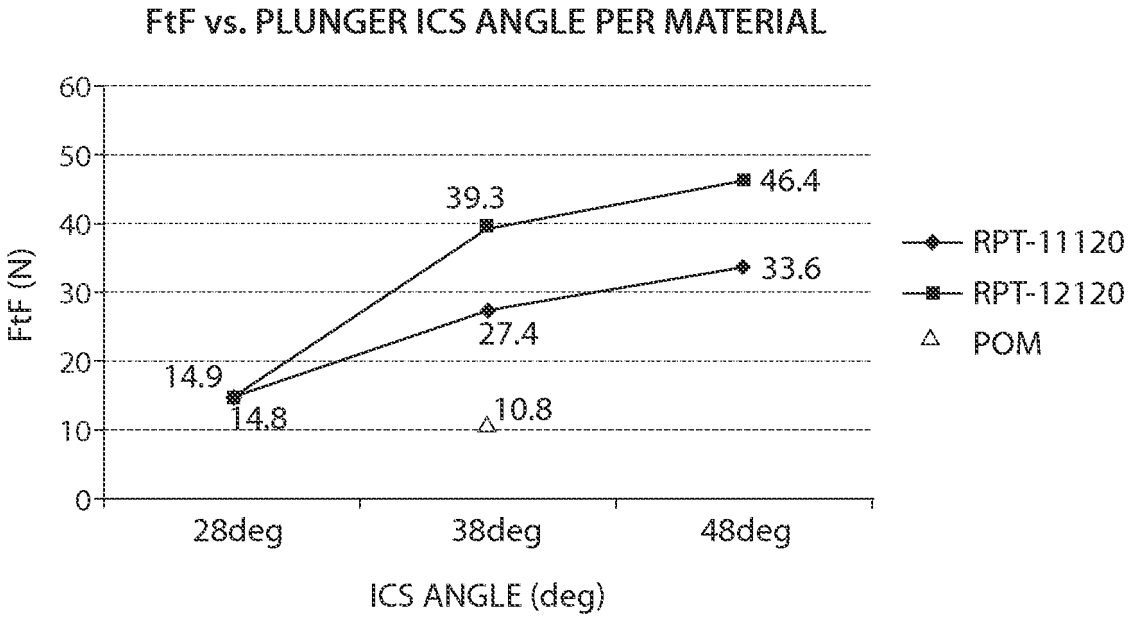

FtF vs. PLUNGER ICS ANGLE PER MATERIAL
FtF (N)
60
50
40
30
20
10
0
39.3
46.4
33.6
27.4
14.9
14.8
10.8
RPT-11120
RPT-12120
POM
28deg
38deg
48deg
ICS ANGLE (deg)

Fig. 19

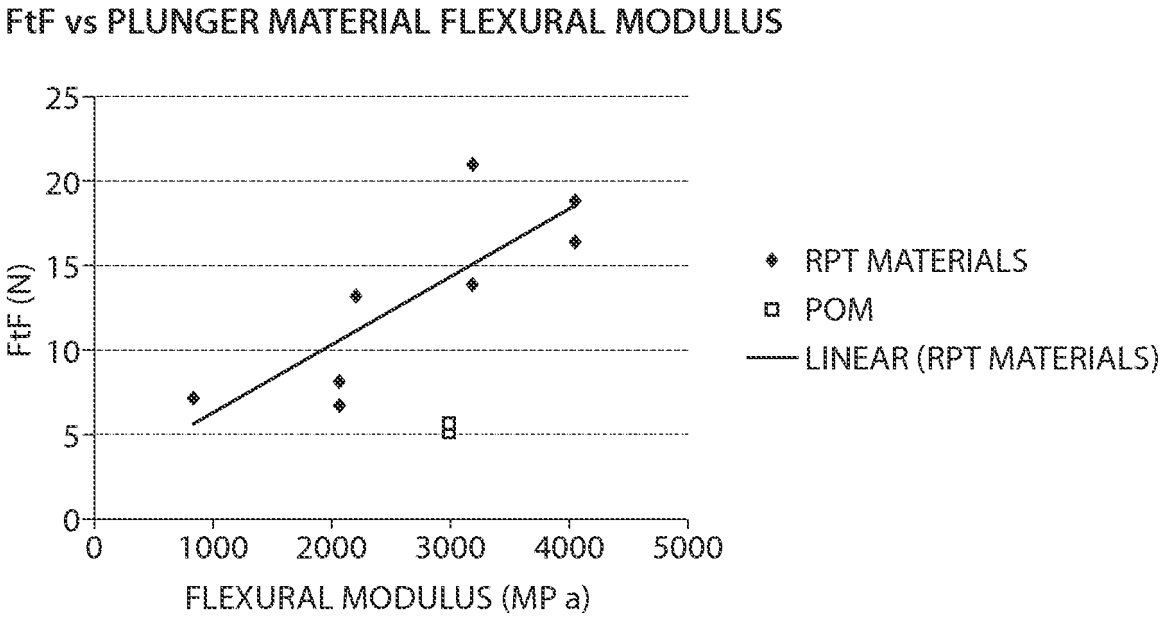

FtF vs PLUNGER MATERIAL FLEXURAL MODULUS
FtF (N)
25
20
15
10
5
0
0
1000
2000
3000
4000
5000
FLEXURAL MODULUS (MP a)
RPT MATERIALS
POM
LINEAR (RPT MATERIALS)

Fig. 20

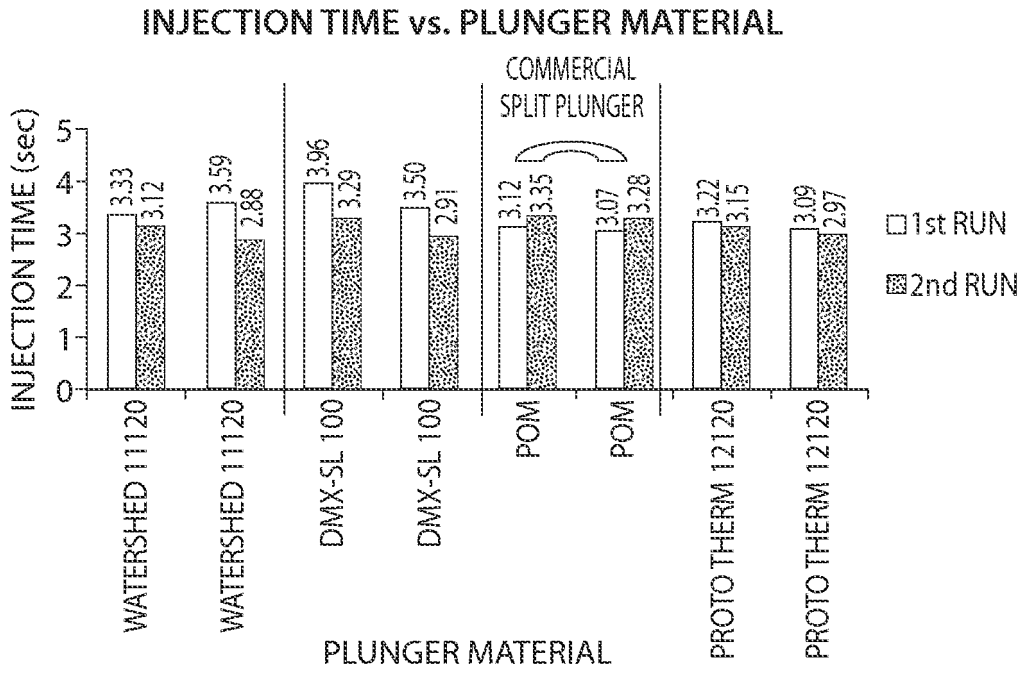

INJECTION TIME vs. PLUNGER MATERIAL
INJECTION TIME (sec)
0
1
2
3
4
5
COMMERCIAL
SPLIT PLUNGER
3.33
3.12
3.59
2.88
3.96
3.29
3.50
2.91
3.12
3.35
3.07
3.28
3.22
3.15
3.09
2.97
WATERSHED 11120
WATERSHED 11120
DMX-SL 100
DMX-SL 100
POM
POM
PROTO THERM 12120
PROTO THERM 12120
PLUNGER MATERIAL
1st RUN
2nd RUN

Fig. 21

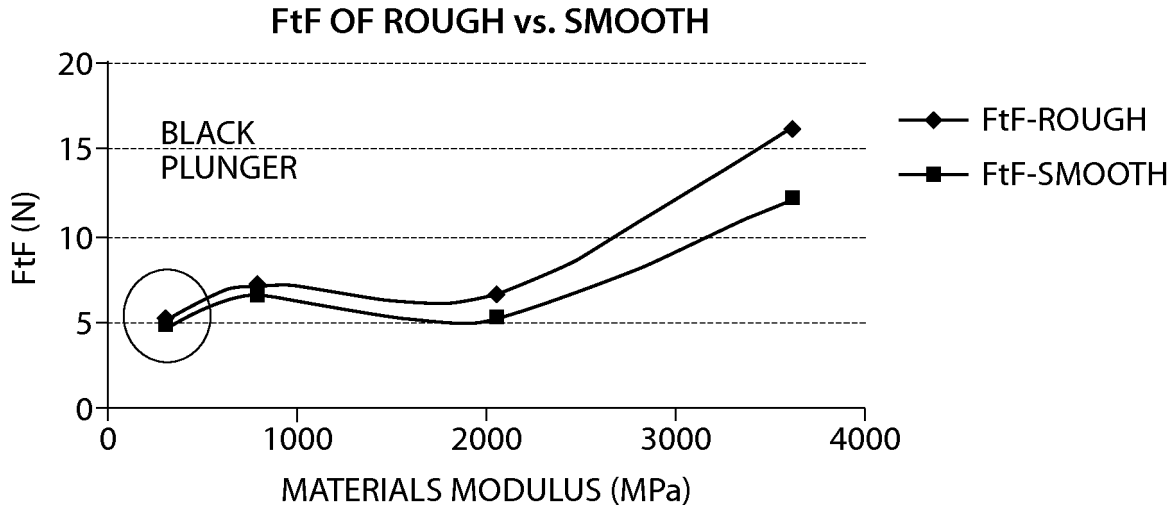

FtF OF ROUGH vs. SMOOTH
20
15
10
5
0
FtF (N)
BLACK
PLUNGER
0
1000
2000
3000
4000
MATERIALS MODULUS (MPa)
FtF-ROUGH
FtF-SMOOTH

Fig. 22

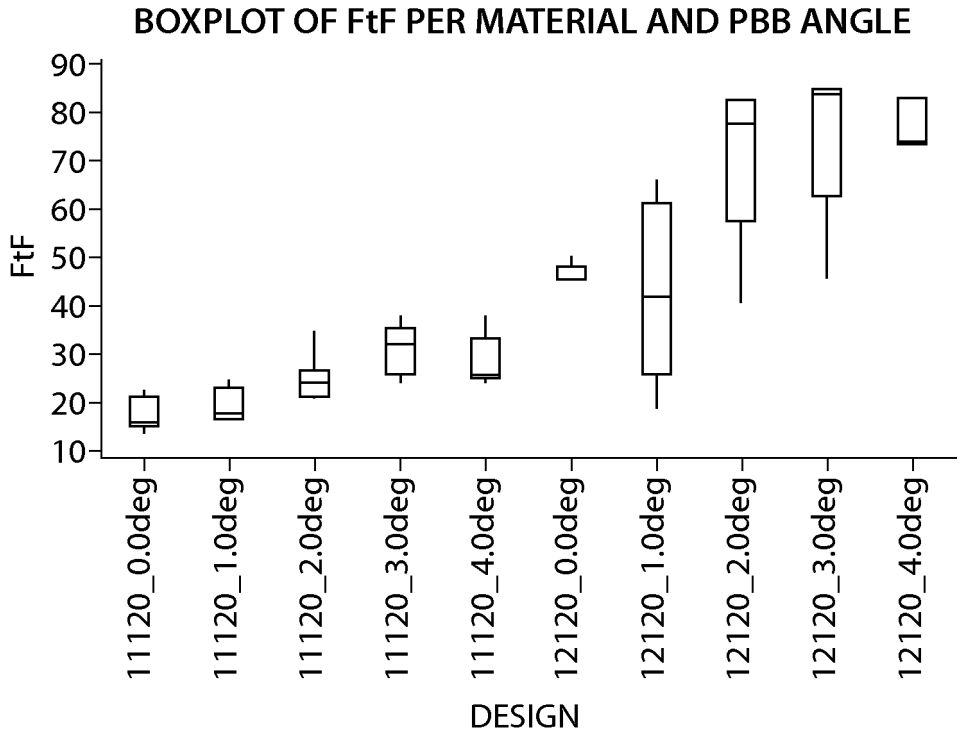

BOXPLOT OF FtF PER MATERIAL AND PBB ANGLE
90
80
70
60
50
40
30
20
10
FtF
11120_0.0deg
11120_1.0deg
11120_2.0deg
11120_3.0deg
11120_4.0deg
12120_0.0deg
12120_1.0deg
12120_2.0deg
12120_3.0deg
12120_4.0deg
DESIGN

Fig. 23

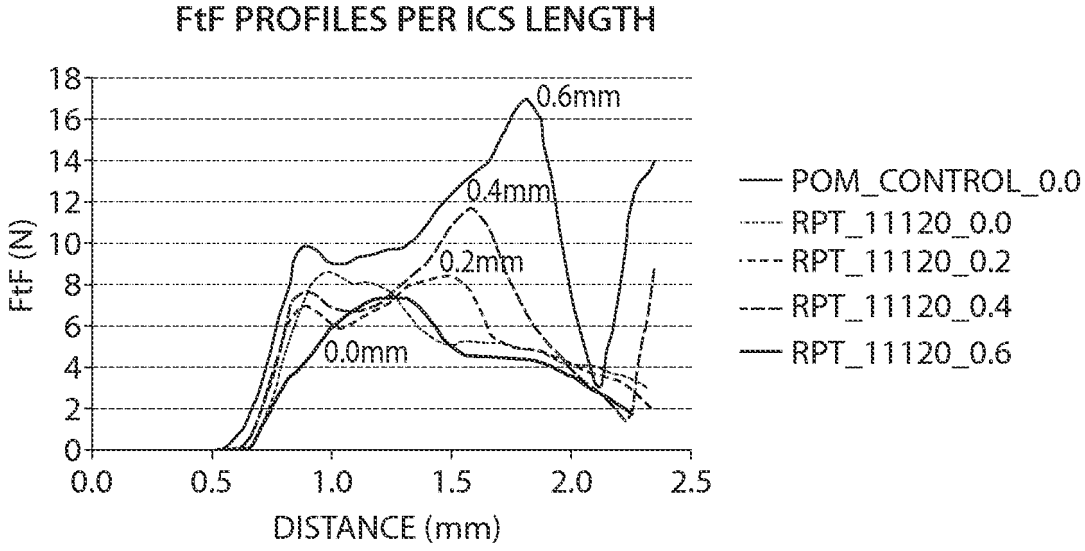

FtF PROFILES PER ICS LENGTH
FtF (N)
DISTANCE (mm)
0.6mm
0.4mm
0.2mm
0.0mm
POM_CONTROL_0.0
RPT_11120_0.0
RPT_11120_0.2
RPT_11120_0.4
RPT_11120_0.6

Fig. 24

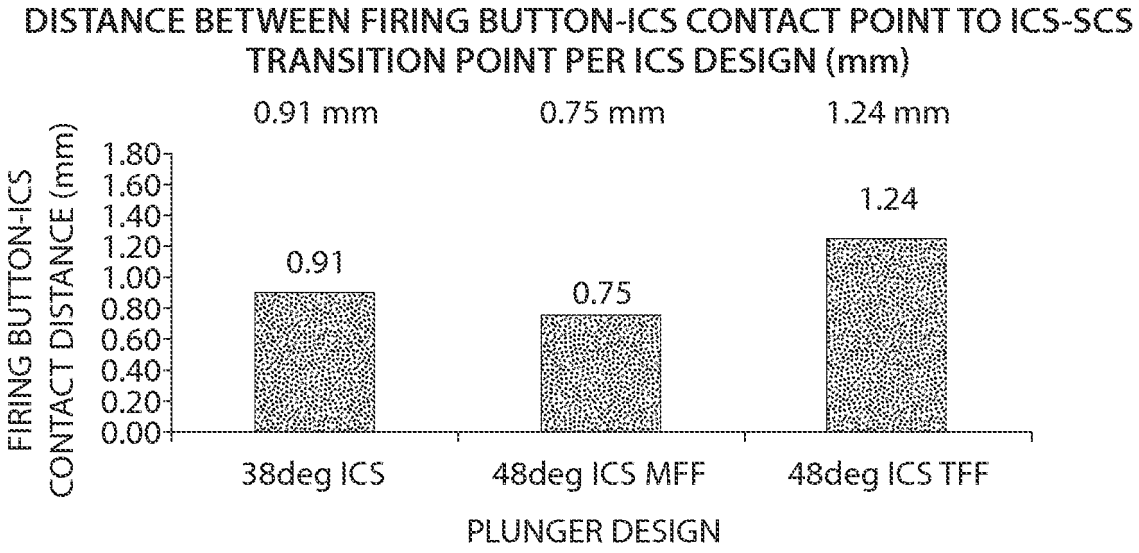

DISTANCE BETWEEN FIRING BUTTON-ICS CONTACT POINT TO ICS-SCS TRANSITION POINT PER ICS DESIGN (mm)
FIRING BUTTON-ICS CONTACT DISTANCE (mm)
0.91 mm
0.75 mm
1.24 mm
0.91
0.75
1.24
38deg ICS
48deg ICS MFF
48deg ICS TFF
PLUNGER DESIGN

Fig. 25

CONTROL (ICS = 38°)

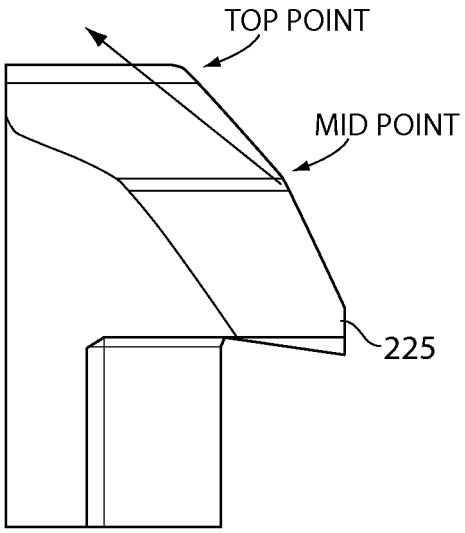


Fig. 26A

ICS = 48° (MID POINT FIXED)

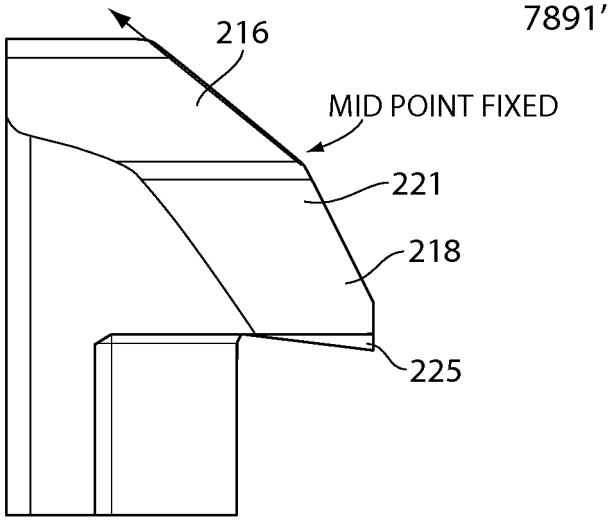


Fig. 26B

CONTROL (ICS = 38°)

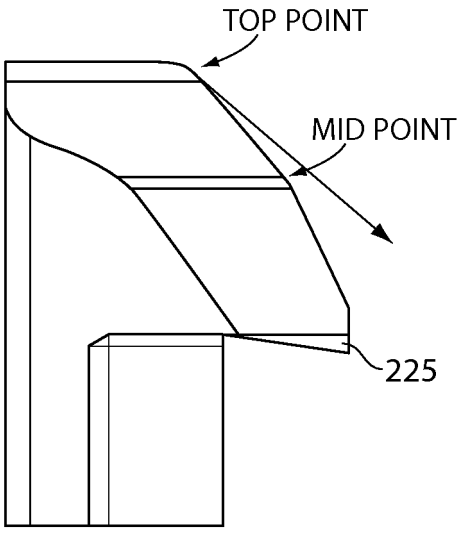


Fig. 27A

ICS = 48° (TOP POINT FIXED)

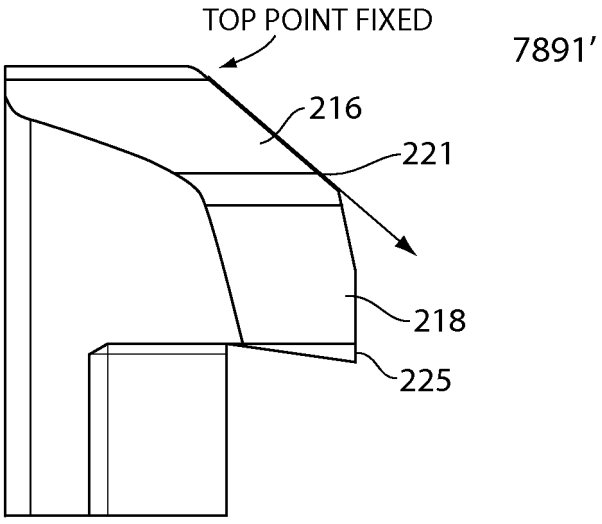


Fig. 27B

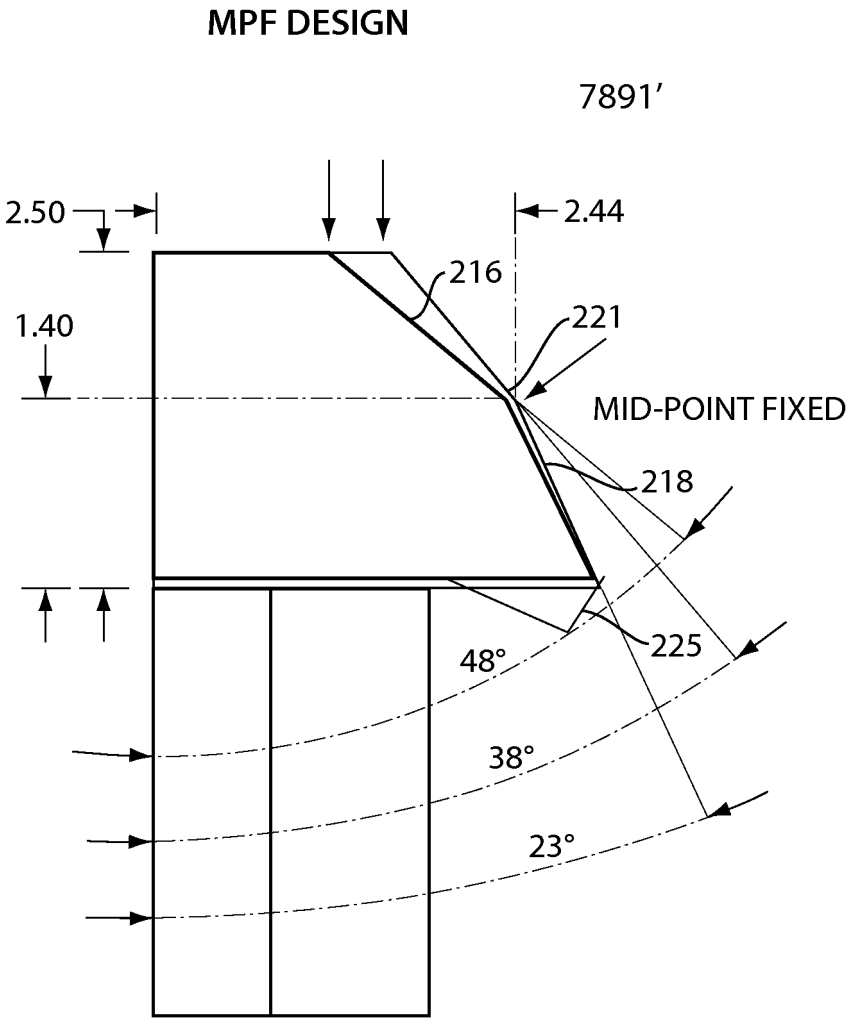

MPF DESIGN
7891'
2.50
2.44
216
1.40
221
MID-POINT FIXED
218
225
48°
38°
23°

Fig. 28A

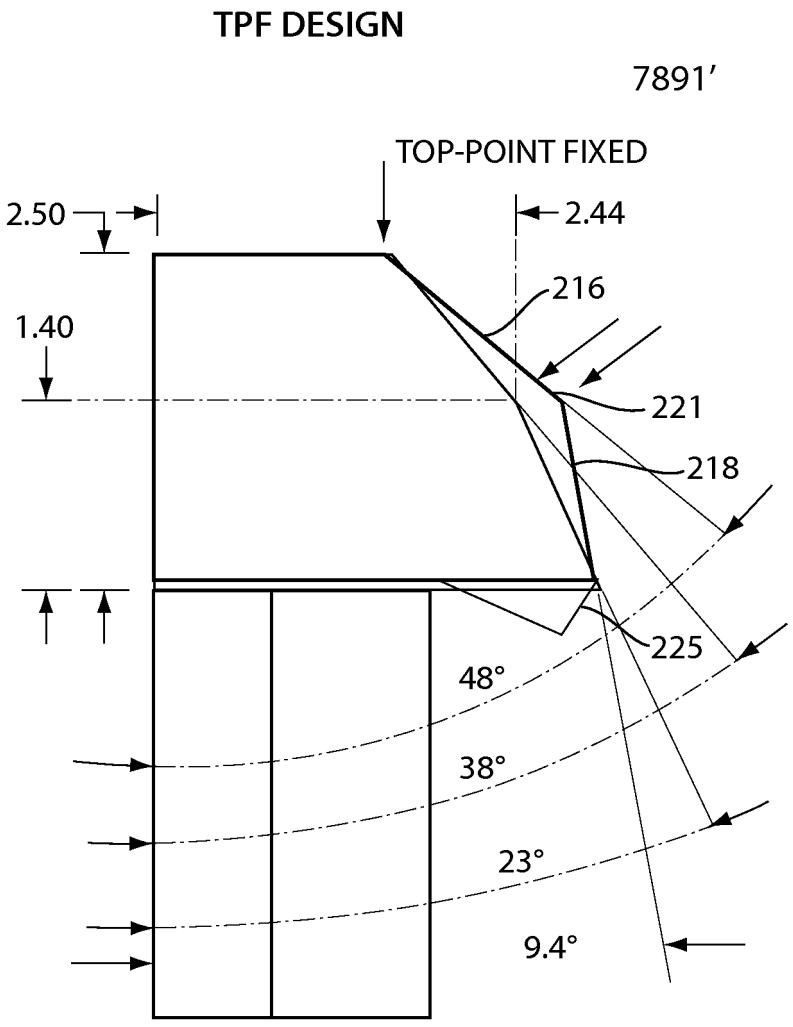

TPF DESIGN
7891'
TOP-POINT FIXED
2.50
2.44
216
1.40
221
218
225
48°
38°
23°
9.4°

Fig. 28B

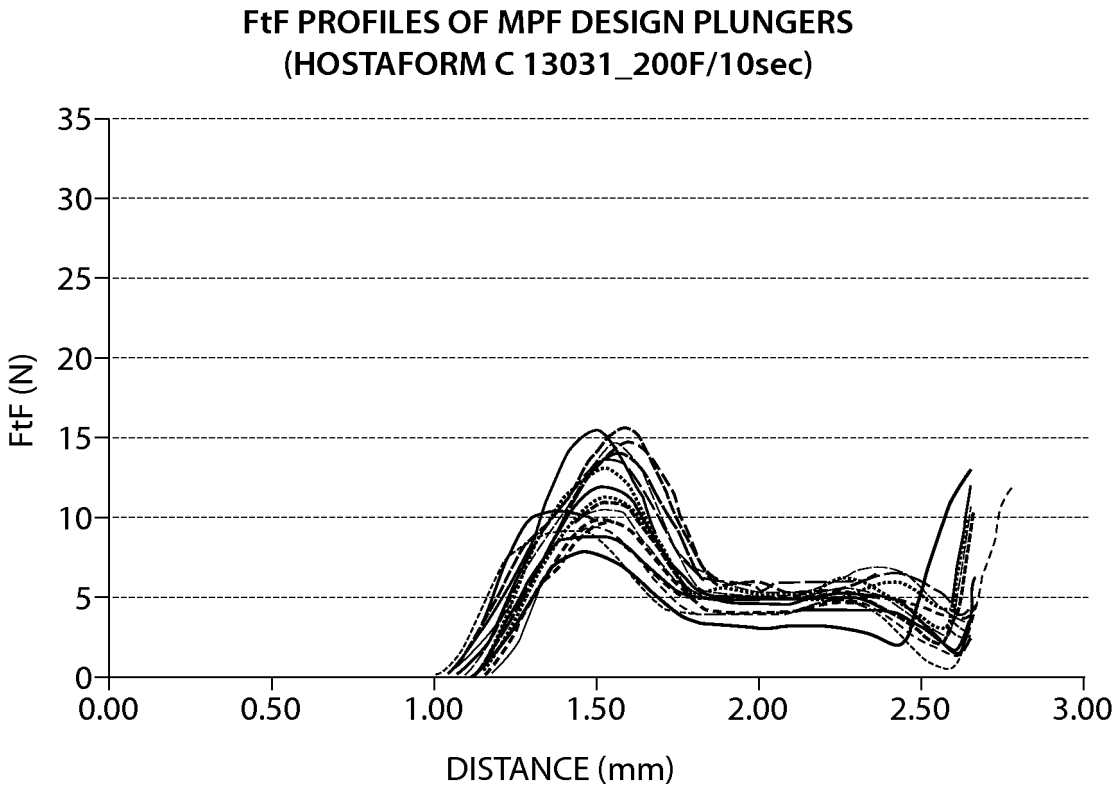

FtF PROFILES OF MPF DESIGN PLUNGERS
(HOSTAFORM C 13031_200F/10sec)
FtF (N)
35
30
25
20
15
10
5
0
0.00
0.50
1.00
1.50
2.00
2.50
3.00
DISTANCE (mm)

Fig. 29A

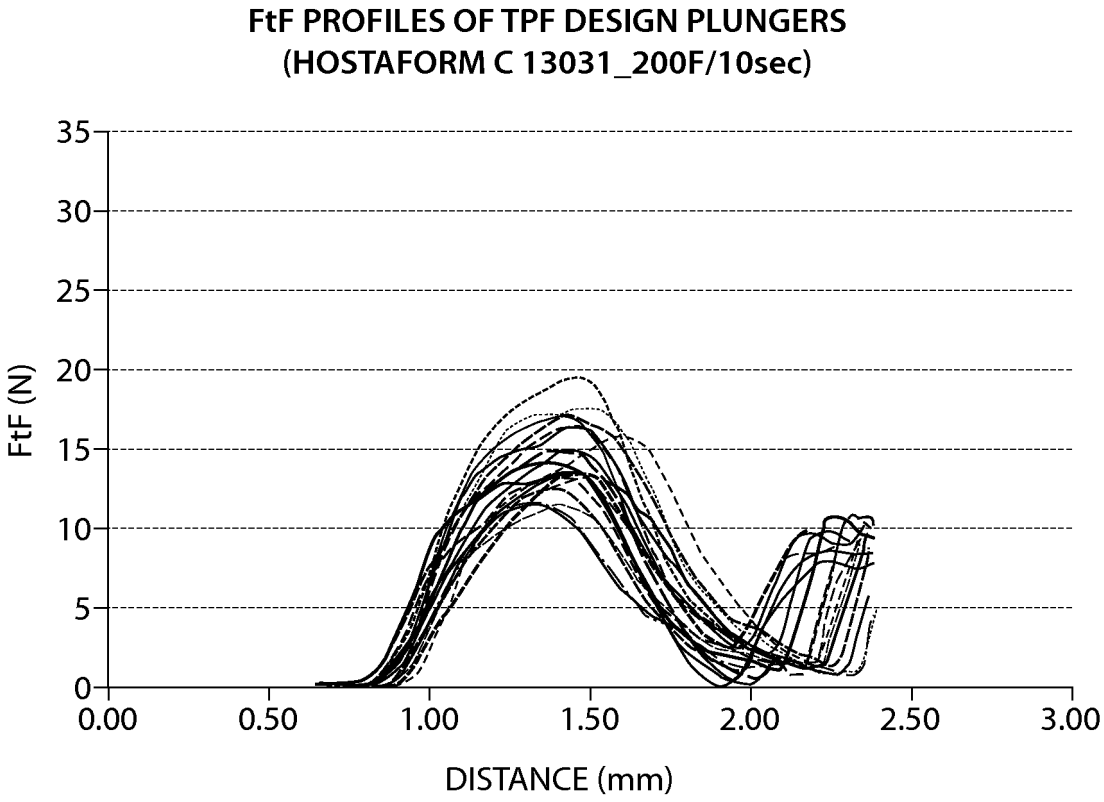
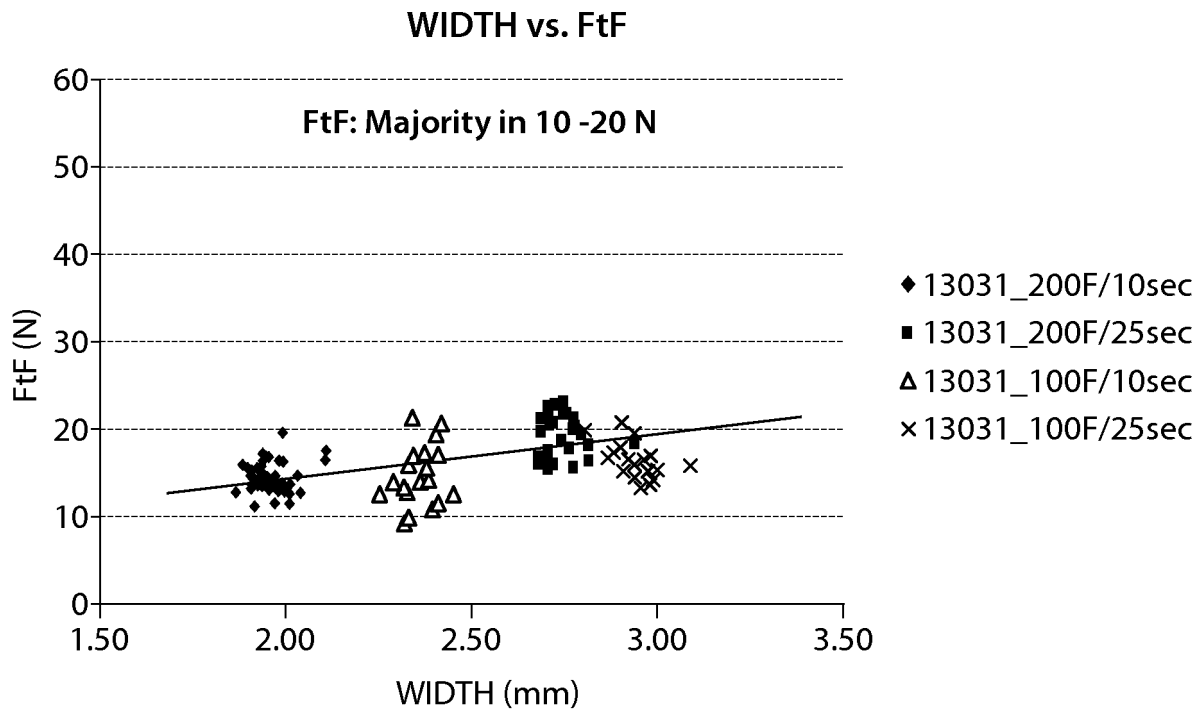

FtF PROFILES OF TPF DESIGN PLUNGERS
(HOSTAFORM C 13031_200F/10sec)
FtF (N)
35
30
25
20
15
10
5
0
0.00
0.50
1.00
1.50
2.00
2.50
3.00
DISTANCE (mm)

Fig. 29B

FtF (ICS = 48 / TPF): CONTROL RESIN + 4 CONDITIONS

FtF: MAJORITY IN 10 - 20 N WITH RANGE IN 9.2 - 23.9 N



(CONTROL RESIN / ICS = 48 DEG / TOP POINT FIXED)

Fig. 30

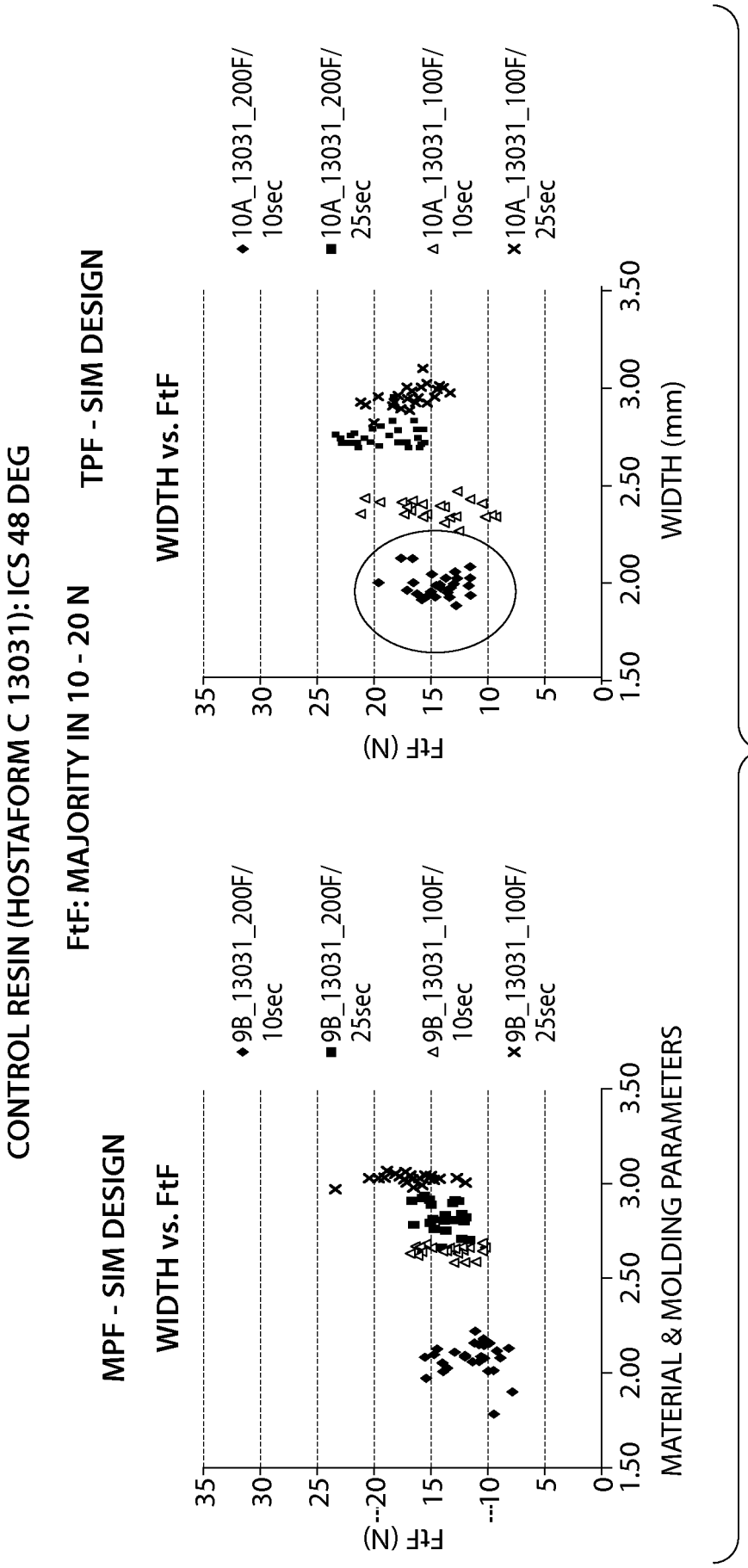

CONTROL RESIN (HOSTAFORM C 13031): ICS 48 DEG
FtF: MAJORITY IN 10 - 20 N
MPF - SIM DESIGN
WIDTH vs. FtF
9B_13031_200F/ 10sec
9B_13031_200F/ 25sec
9B_13031_100F/ 10sec
9B_13031_100F/ 25sec
FtF (N)
MATERIAL & MOLDING PARAMETERS
TPF - SIM DESIGN
WIDTH vs. FtF
10A_13031_200F/ 10sec
10A_13031_200F/ 25sec
10A_13031_100F/ 10sec
10A_13031_100F/ 25sec
FtF (N)
WIDTH (mm)

Fig. 31

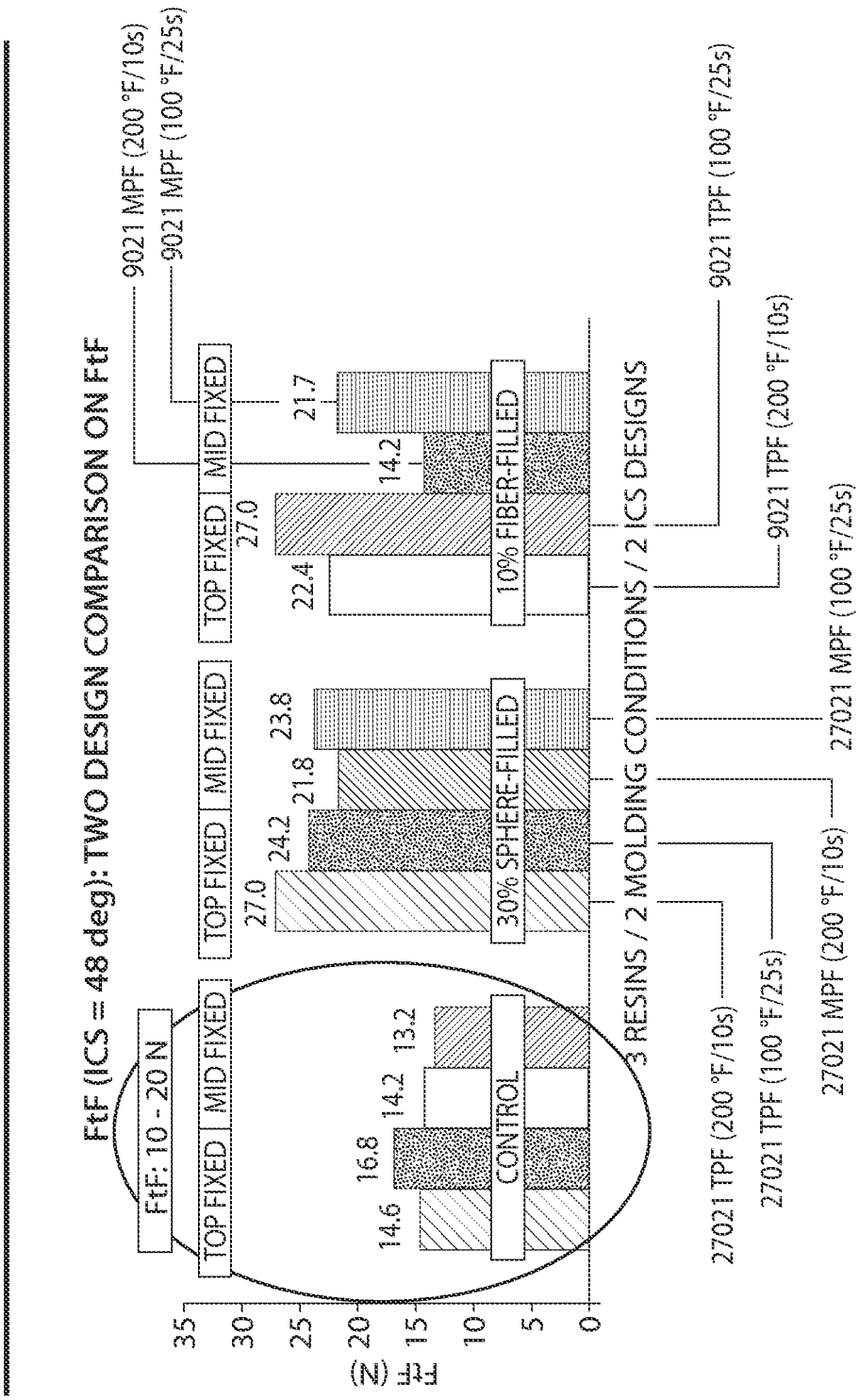

FtF (ICS = 48): TOP-POINT vs. MID-POINT FIXED DESIGN
FtF (ICS = 48 deg): TWO DESIGN COMPARISON ON FtF
FtF: 10 - 20 N
TOP FIXED
MID FIXED
CONTROL
30% SPHERE-FILLED
10% FIBER-FILLED
3 RESINS / 2 MOLDING CONDITIONS / 2 ICS DESIGNS
9021 MPF (200 °F/10s)
9021 MPF (100 °F/25s)
9021 TPF (100 °F/25s)
9021 TPF (200 °F/10s)
27021 MPF (100 °F/25s)
27021 MPF (200 °F/10s)
27021 TPF (200 °F/10s)
27021 TPF (100 °F/25s)
FtF (N)
0
5
10
15
20
25
30
35
14.6
16.8
14.2
13.2
27.0
24.2
21.8
23.8
22.4
27.0
14.2
21.7

Fig. 32

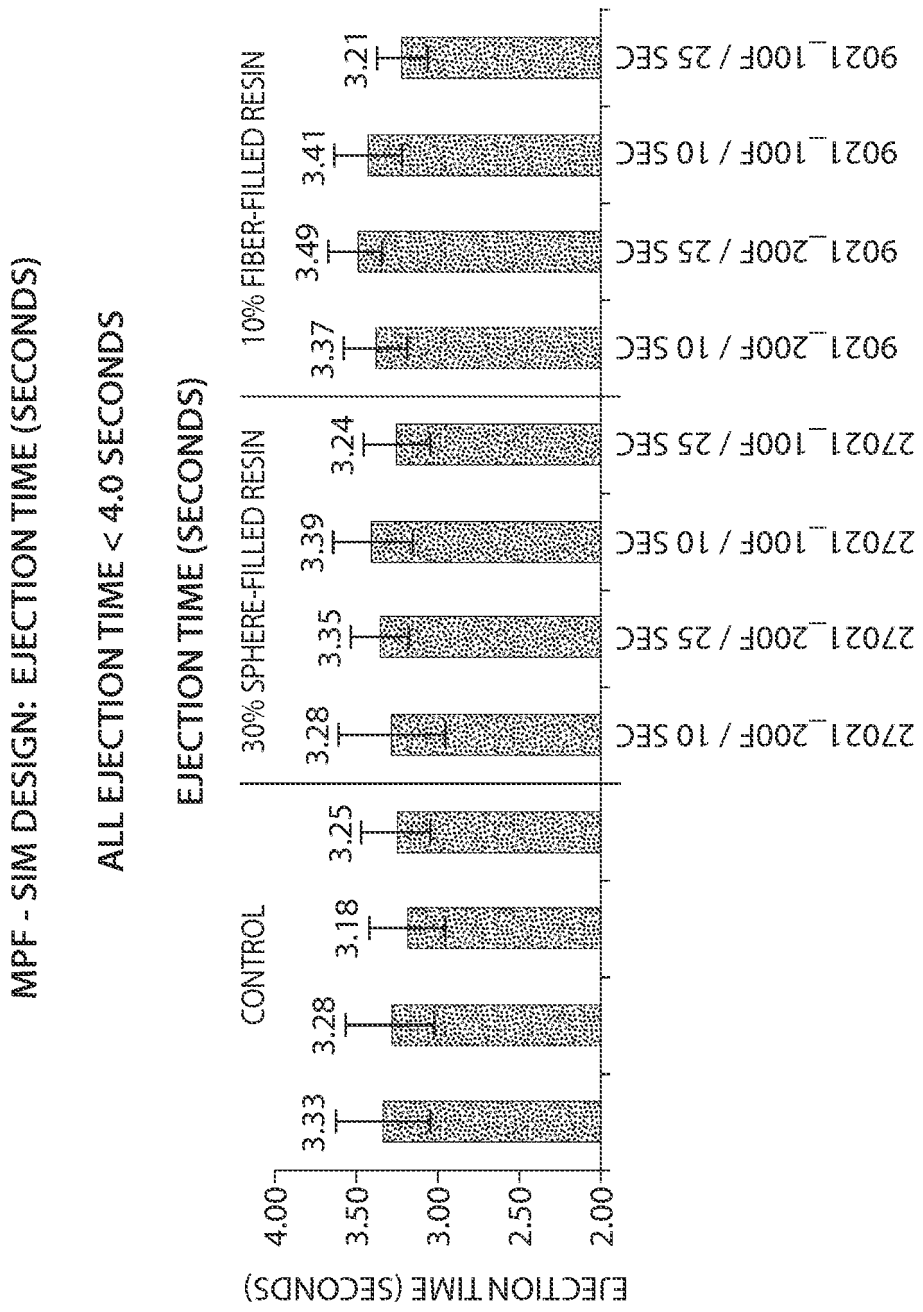

MPF - SIM DESIGN: EJECTION TIME (SECONDS)
ALL EJECTION TIME < 4.0 SECONDS
EJECTION TIME (SECONDS)
EJECTION TIME (SECONDS)
4.00
3.50
3.00
2.50
2.00
CONTROL
30% SPHERE-FILLED RESIN
10% FIBER-FILLED RESIN
3.33
3.28
3.18
3.25
3.28
3.35
3.39
3.24
3.37
3.49
3.41
3.21
2702I_200F / 10 SEC
2702I_200F / 25 SEC
2702I_100F / 10 SEC
2702I_100F / 25 SEC
902I_200F / 10 SEC
902I_200F / 25 SEC
902I_100F / 10 SEC
902I_100F / 25 SEC

Fig. 33

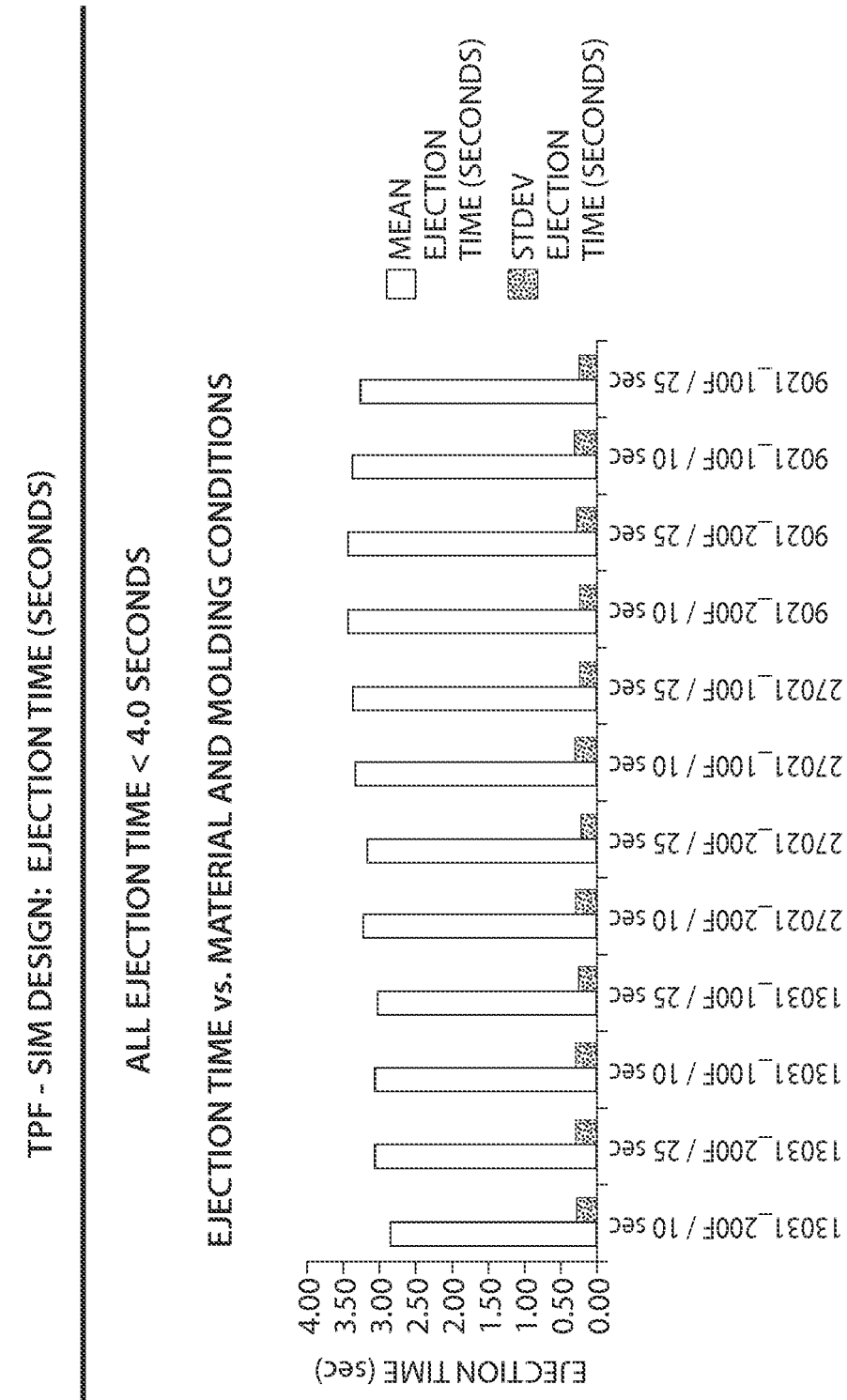
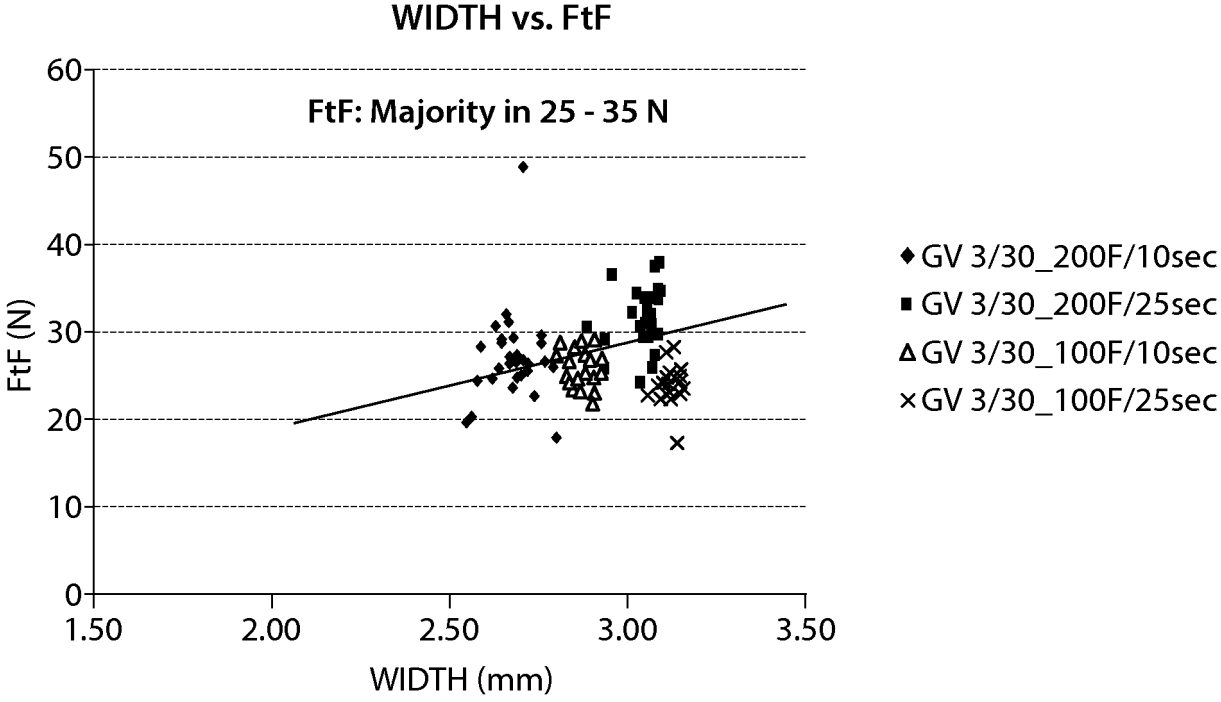

TPF - SIM DESIGN: EJECTION TIME (SECONDS)
ALL EJECTION TIME < 4.0 SECONDS
EJECTION TIME vs. MATERIAL AND MOLDING CONDITIONS
MEAN EJECTION TIME (SECONDS)
STDEV EJECTION TIME (SECONDS)
EJECTION TIME (sec)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1303I_200F / 10 sec
1303I_200F / 25 sec
1303I_100F / 10 sec
1303I_100F / 25 sec
27021_200F / 10 sec
27021_200F / 25 sec
27021_100F / 10 sec
27021_100F / 25 sec
9021_200F / 10 sec
9021_200F / 25 sec
9021_100F / 10 sec
9021_100F / 25 sec
MATERIAL & MOLDING PARAMETERS

Fig. 34

FtF (ICS = 48 / TPF): 30% SPHERE-FILLED RESIN + 4 CONDITIONS

FtF: MAJORITY IN 25 - 35 N WITH THE RANGE IN 17.3 - 38.1 N



(30% SPHERE-FILLED RESIN / ICS = 48 DEG / TOP POINT FIXED)

Fig. 35

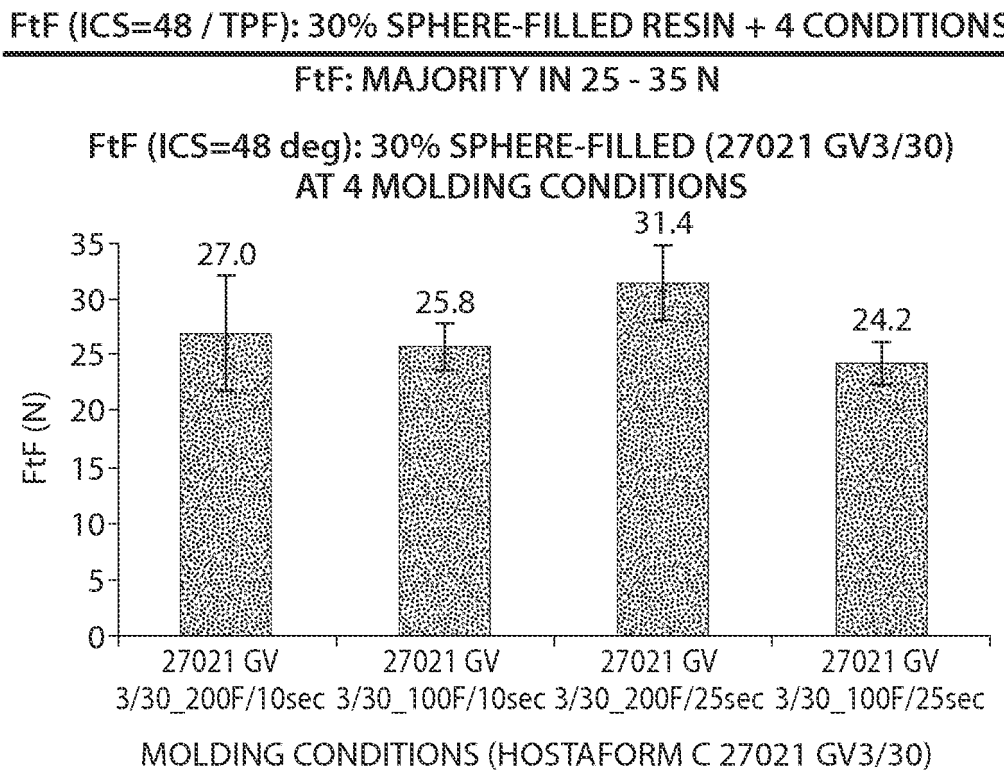

FtF (ICS=48 / TPF): 30% SPHERE-FILLED RESIN + 4 CONDITIONS
FtF: MAJORITY IN 25 - 35 N
FtF (ICS=48 deg): 30% SPHERE-FILLED (27021 GV3/30)
AT 4 MOLDING CONDITIONS
FtF (N)
35
30
25
20
15
10
5
0
27.0
25.8
31.4
24.2
27021 GV 3/30_200F/10sec
27021 GV 3/30_100F/10sec
27021 GV 3/30_200F/25sec
27021 GV 3/30_100F/25sec
MOLDING CONDITIONS (HOSTAFORM C 27021 GV3/30)

Fig. 36

FtF (ICS = 48 / TPF): 10% FIBER-FILLED RESIN + 4 CONDITIONS

FtF: MAJORITY IN 20 - 30 N WITH THE RANGE IN 13.4 - 32.1 N

WIDTH vs. FtF

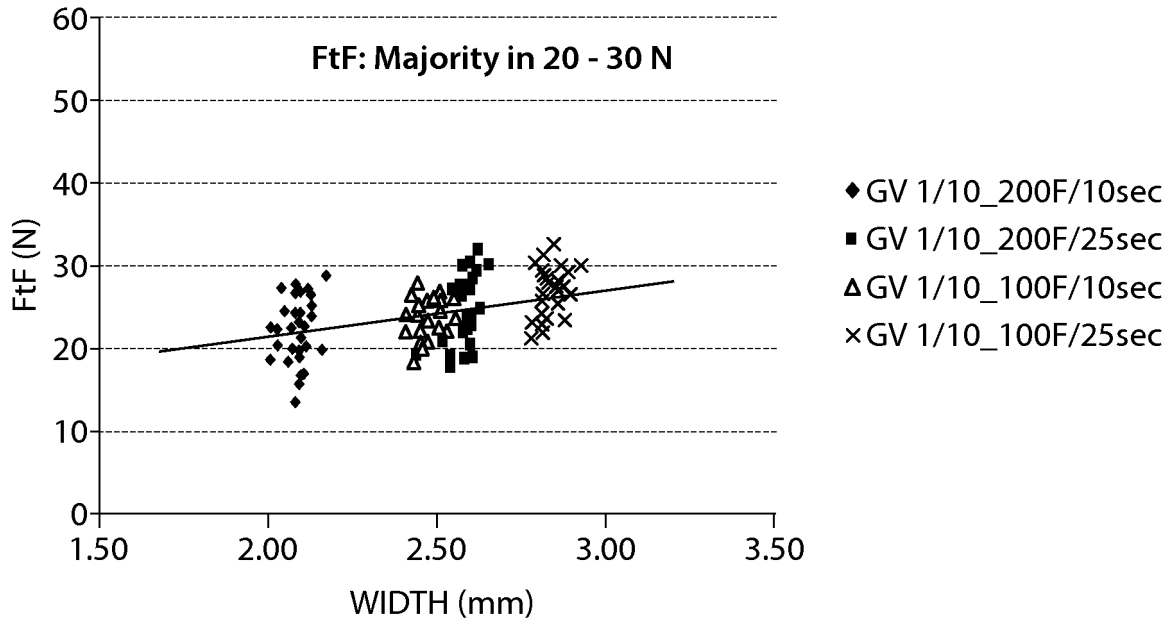


Fig. 37

FtF (ICS=48 / TPF): 10% FIBER-FILLED RESIN + 4 CONDITIONS

FtF: MAJORITY IN 20 - 30 N

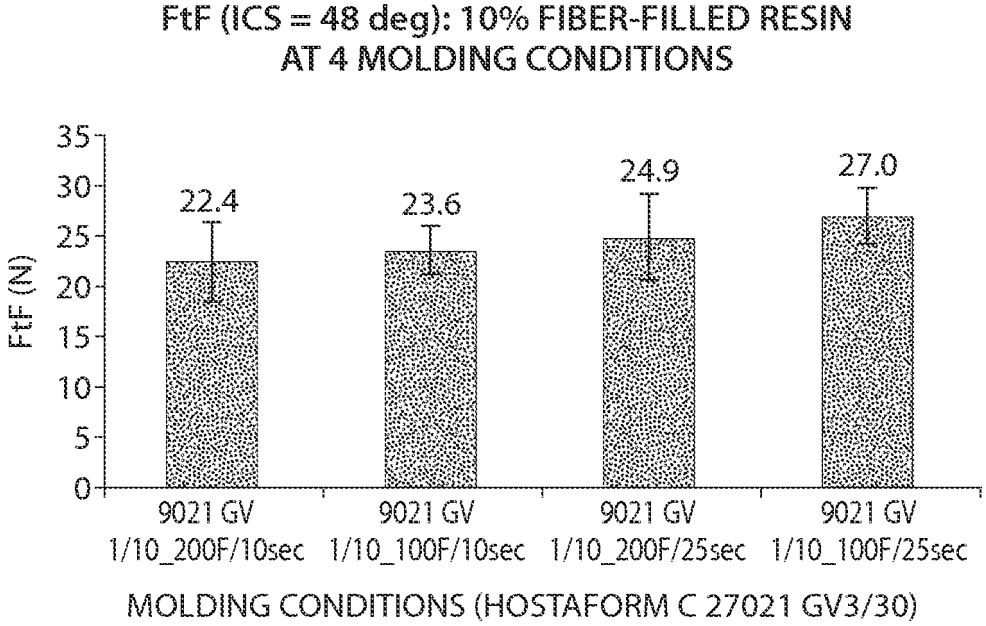


Fig. 38

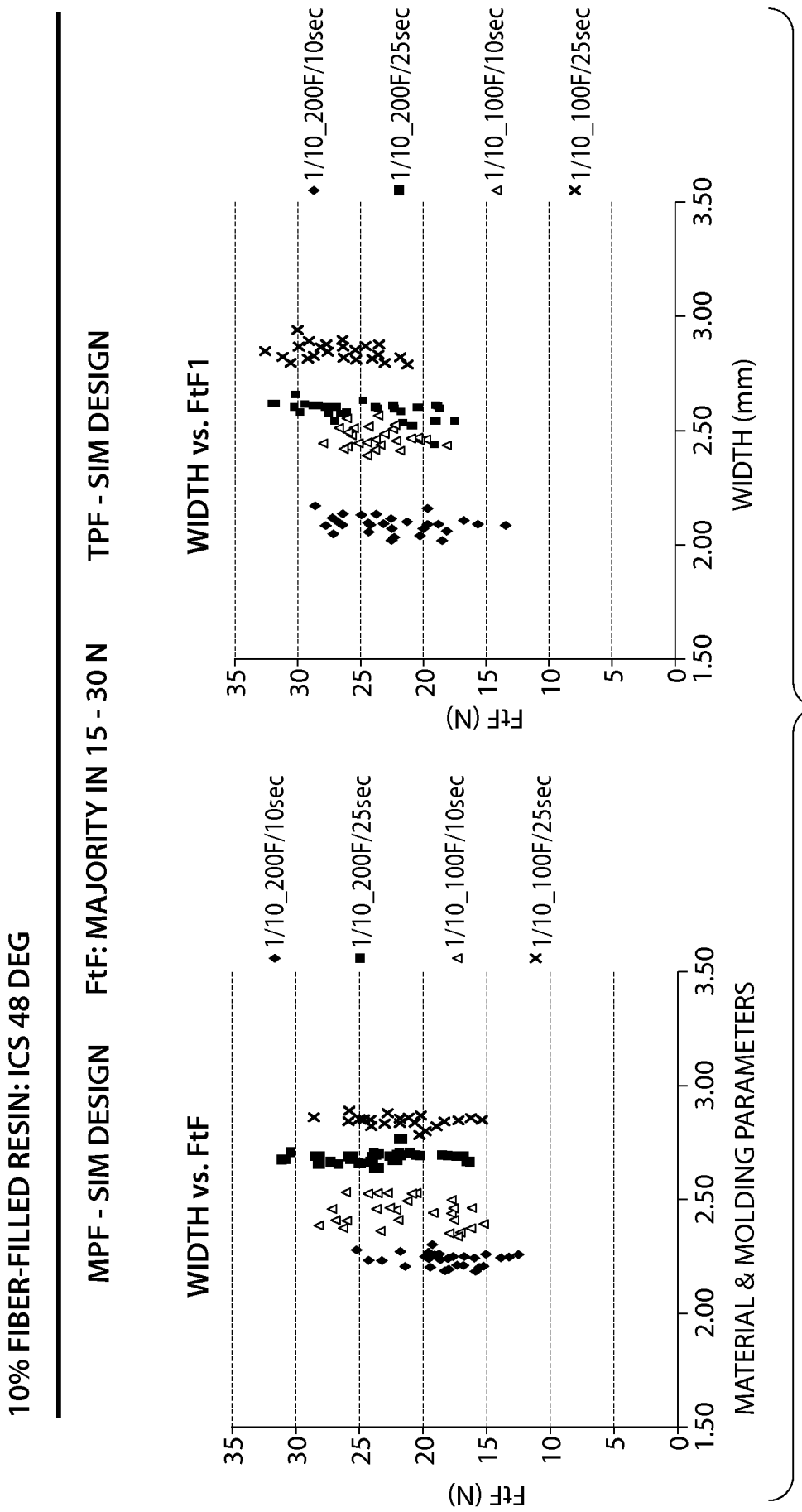

10% FIBER-FILLED RESIN: ICS 48 DEG
MPF - SIM DESIGN FtF: MAJORITY IN 15 - 30 N TPF - SIM DESIGN
WIDTH vs. FtF
WIDTH vs. FtF1
1/10_200F/10sec
1/10_200F/25sec
1/10_100F/10sec
1/10_100F/25sec
FtF (N)
WIDTH (mm)
MATERIAL & MOLDING PARAMETERS

Fig. 39

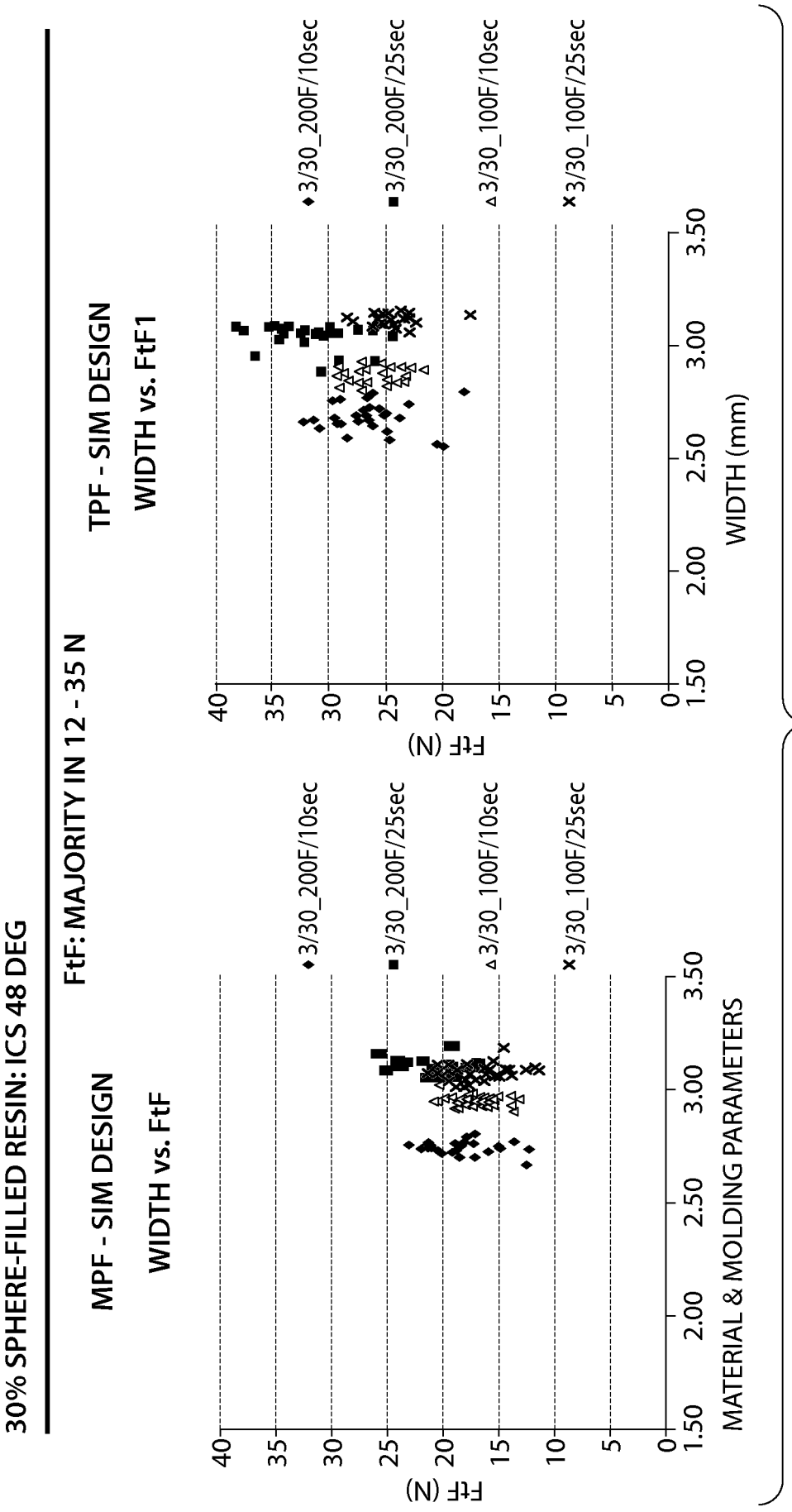

30% SPHERE-FILLED RESIN: ICS 48 DEG
FtF: MAJORITY IN 12 - 35 N
MPF - SIM DESIGN
WIDTH vs. FtF
TPF - SIM DESIGN
WIDTH vs. FtF1
3/30_200F/10sec
3/30_200F/25sec
3/30_100F/10sec
3/30_100F/25sec
FtF (N)
WIDTH (mm)
MATERIAL & MOLDING PARAMETERS

Fig. 40

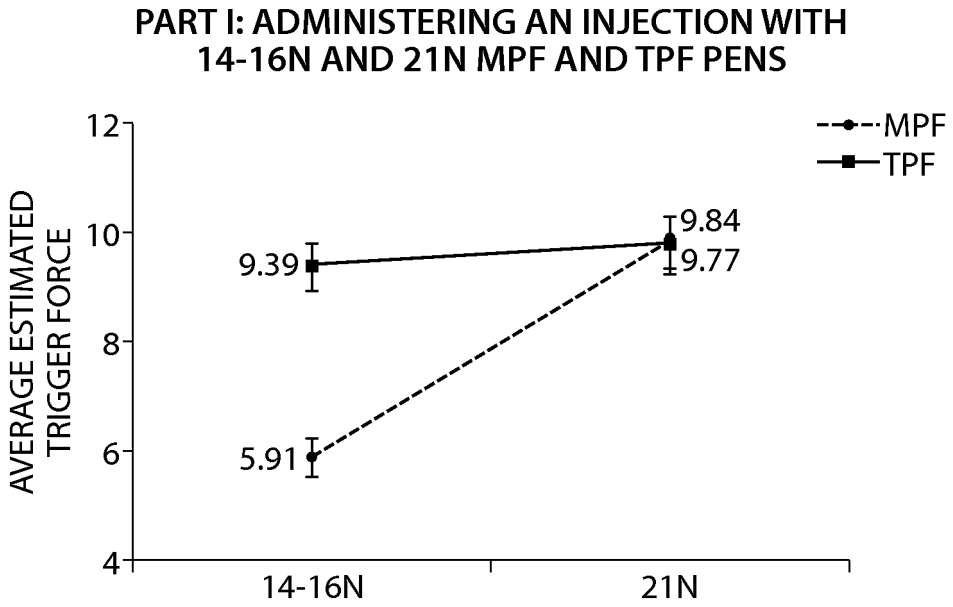


Fig. 41A

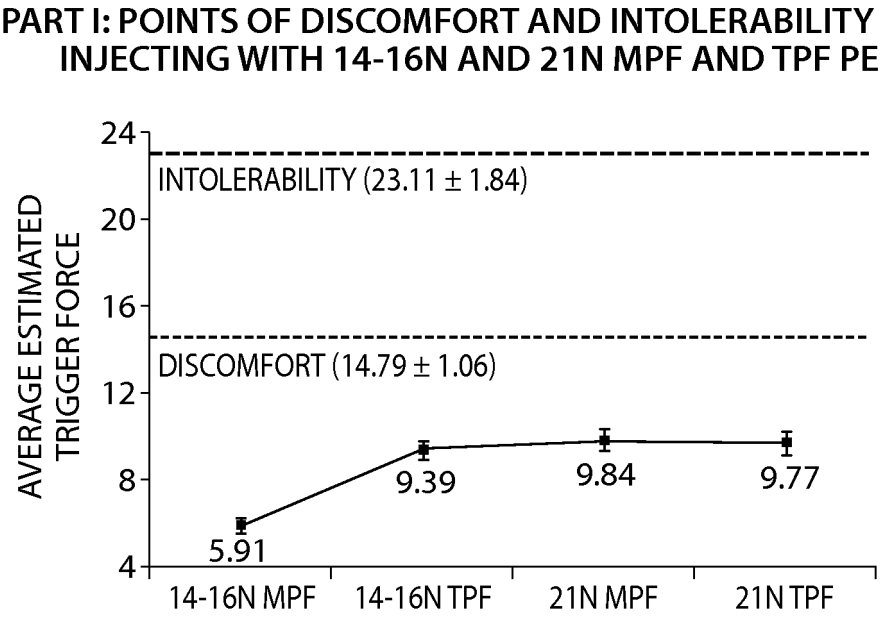


Fig. 41B

PART II: POINTS OF DISCOMFORT AND INTOLERABILITY WHEN ADMINISTERING AN INJECTION WITH 12-29N MPF PENS

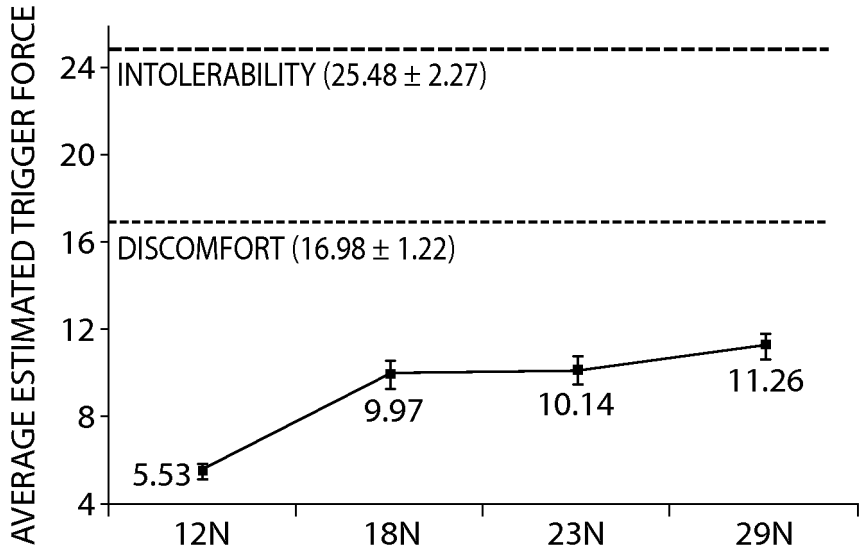


Fig. 42