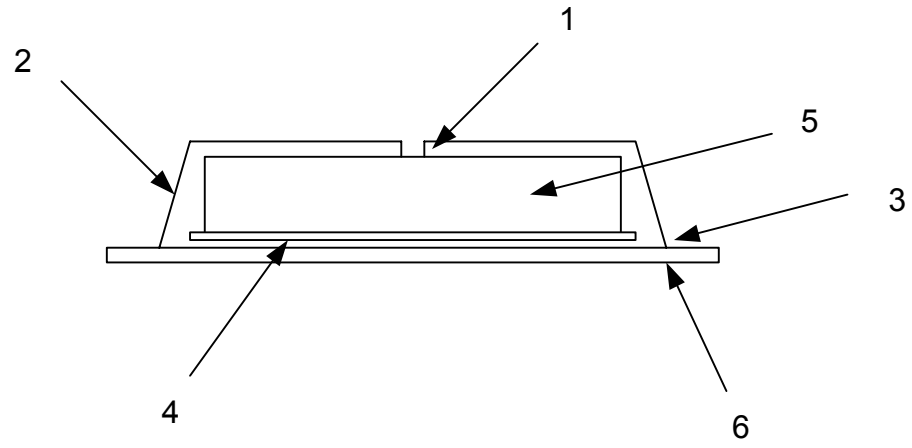


Fig. 1

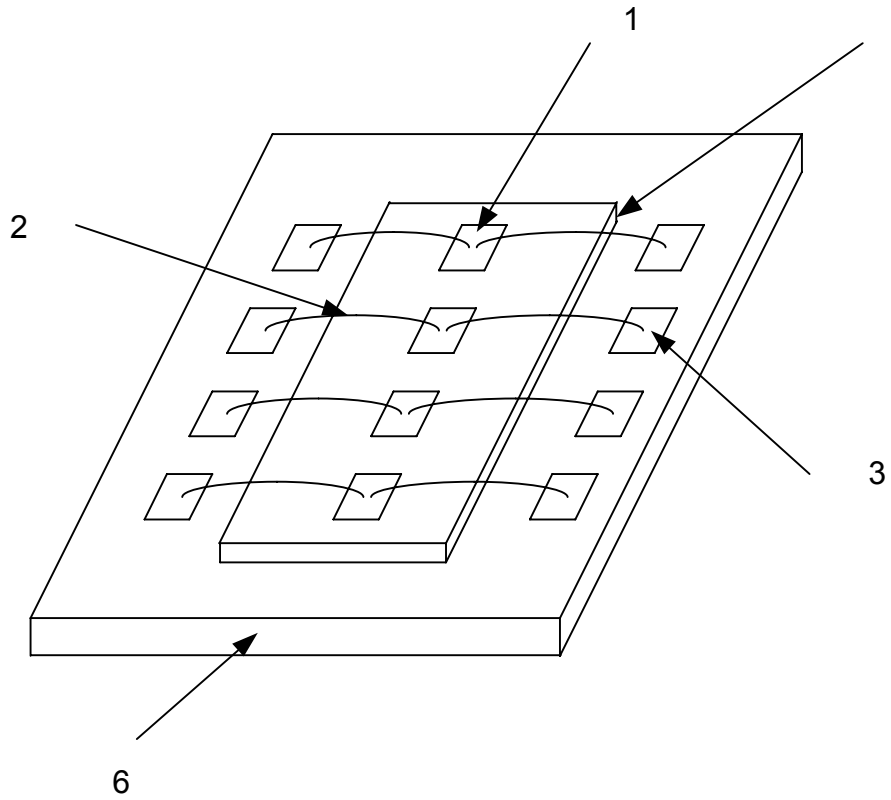


Fig. 2

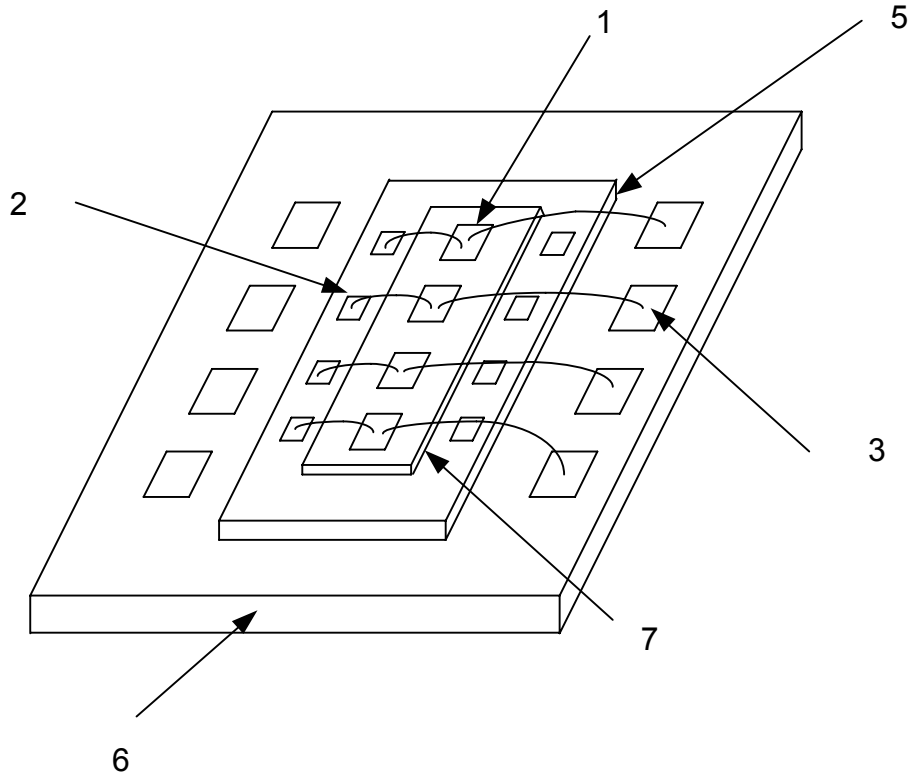


Fig. 3

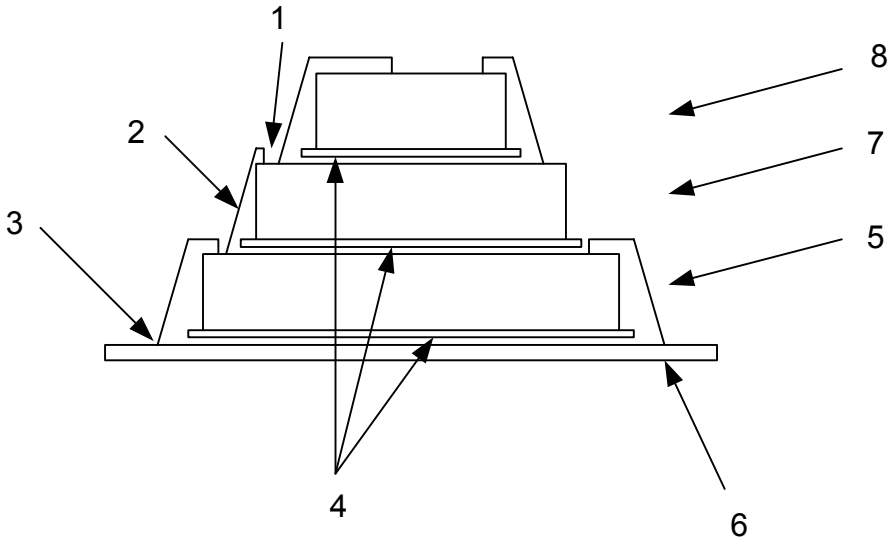


Fig. 4

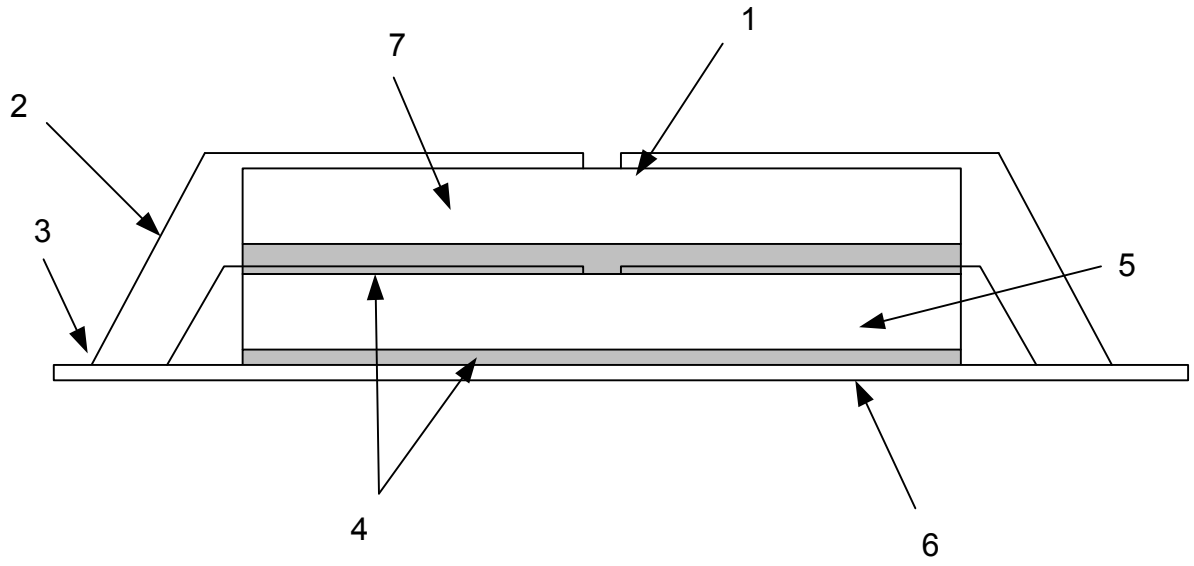


Fig. 5

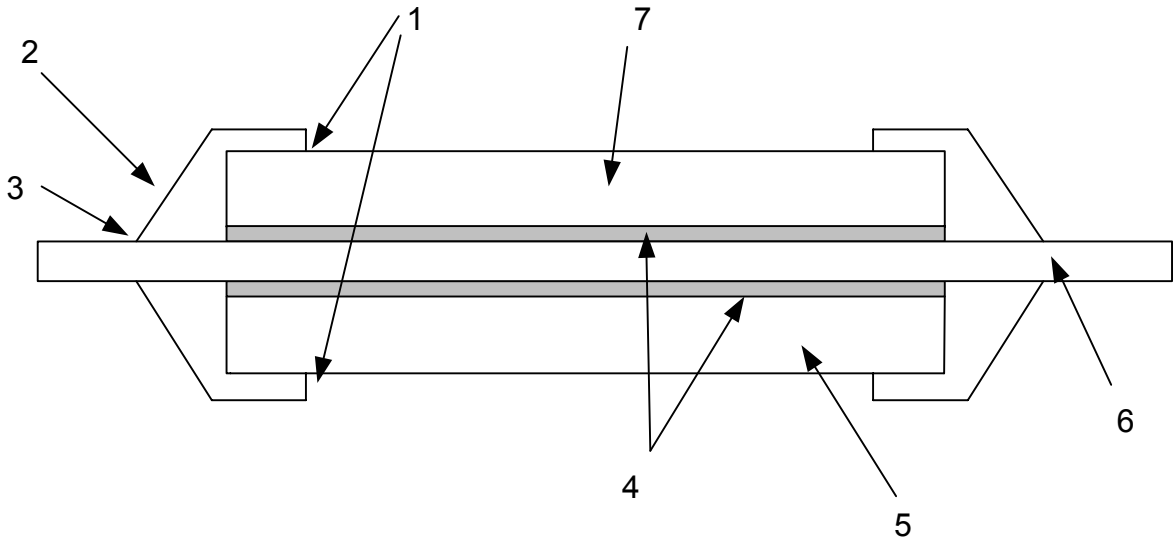


Fig. 6

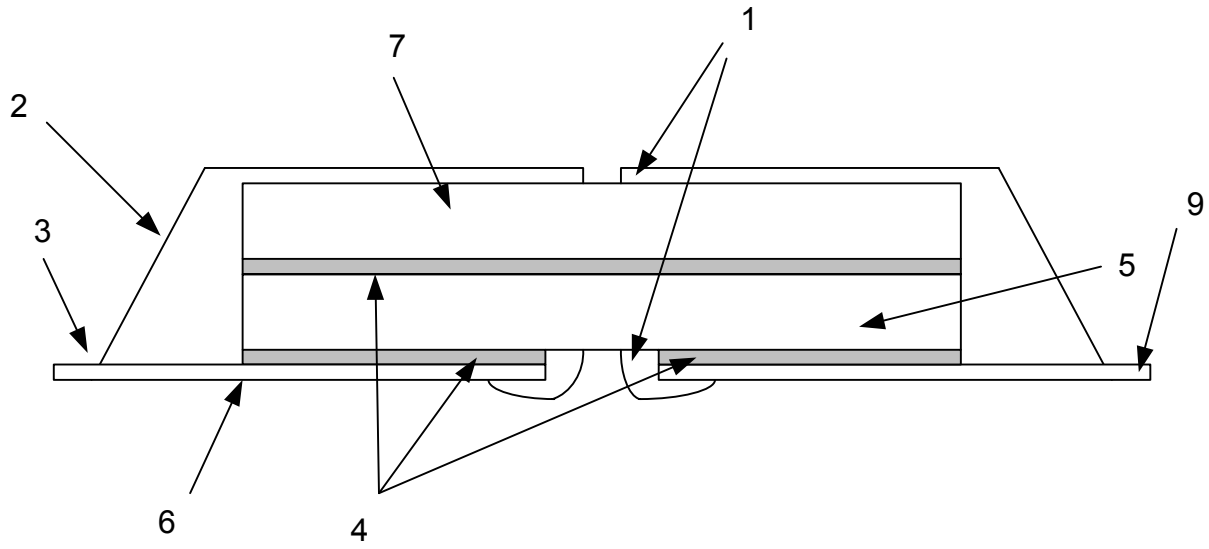


Fig. 7a

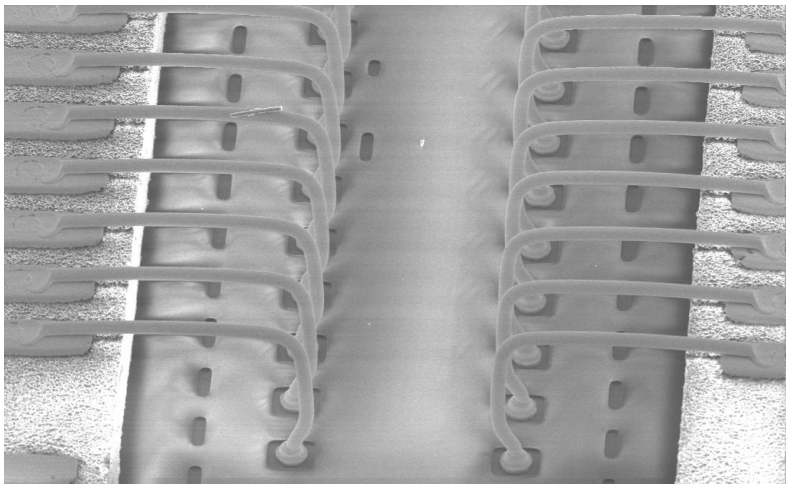


Fig. 7b

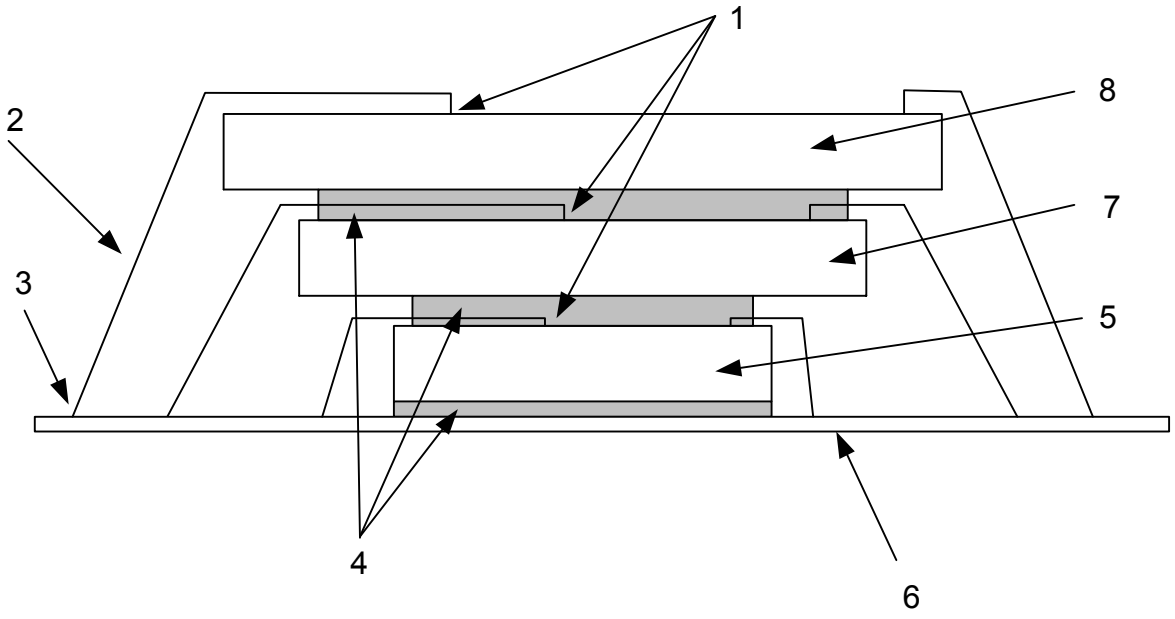


Fig. 8

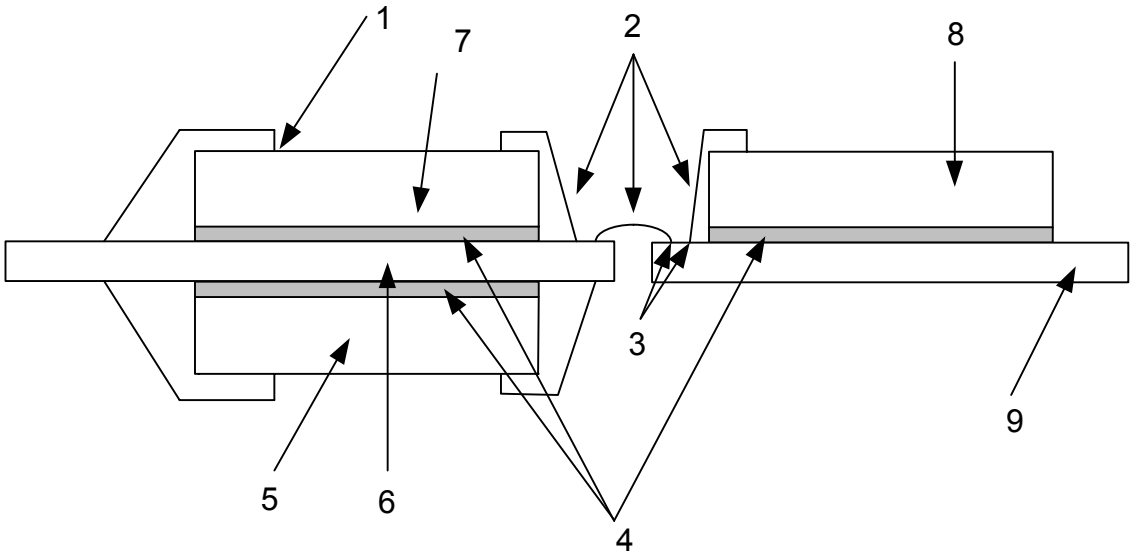


Fig. 9

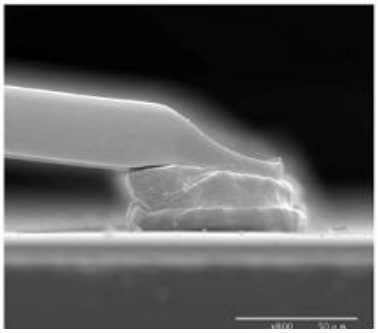


Fig. 10a

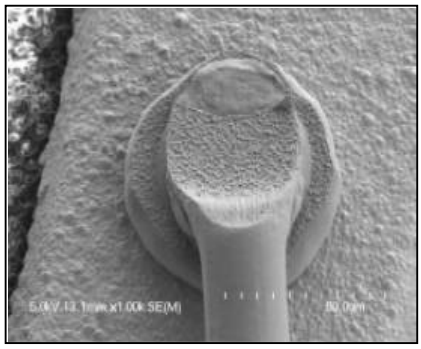


Fig. 10b

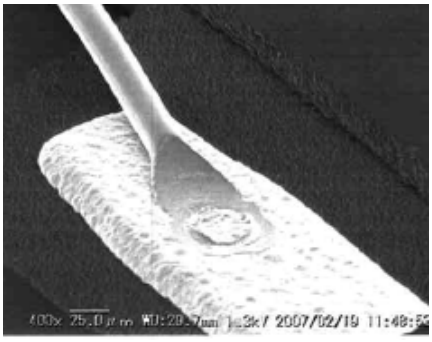


Fig. 11a

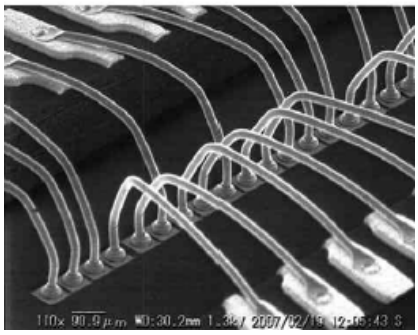


Fig. 11b

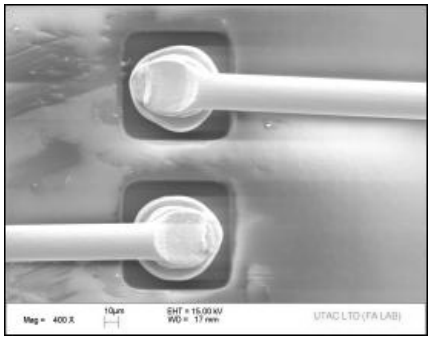


Fig. 12a

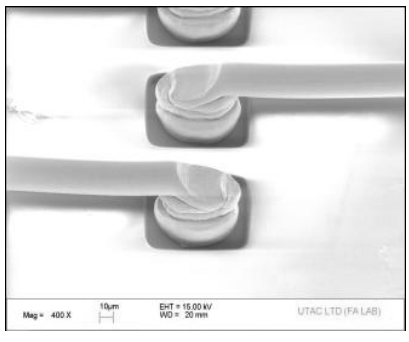


Fig. 12b

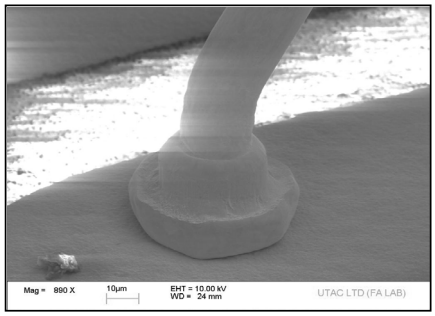


Fig. 13a

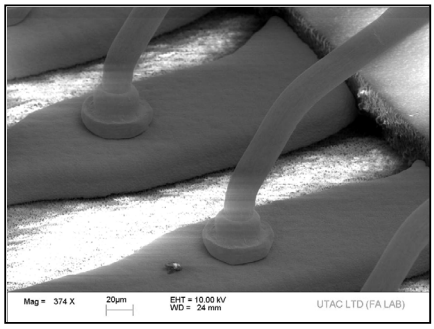


Fig. 13b

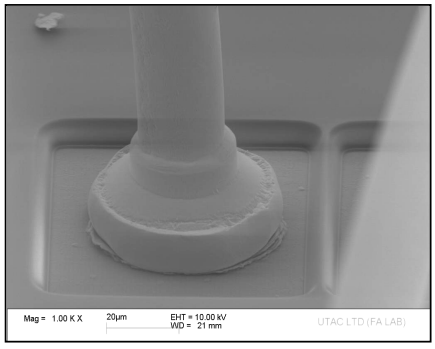


Fig. 14a

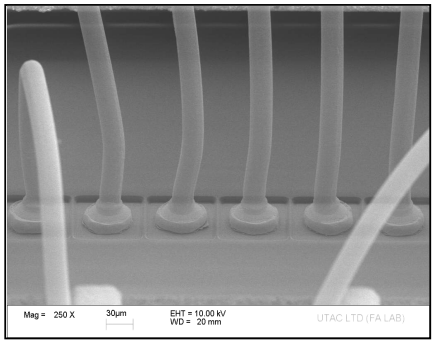


Fig. 14b

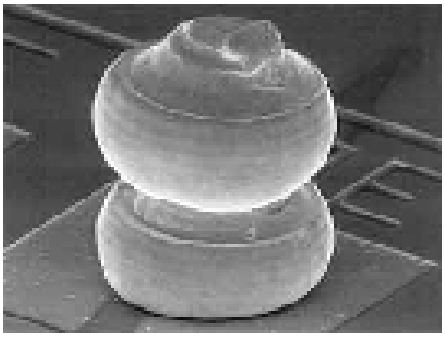


Fig. 15a

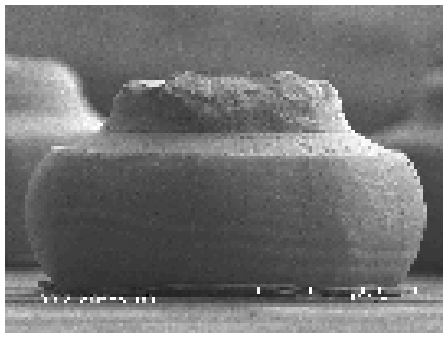


Fig. 15b

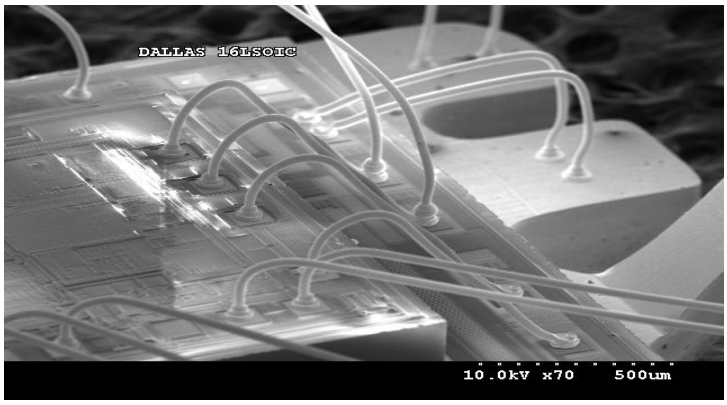


Fig. 16a

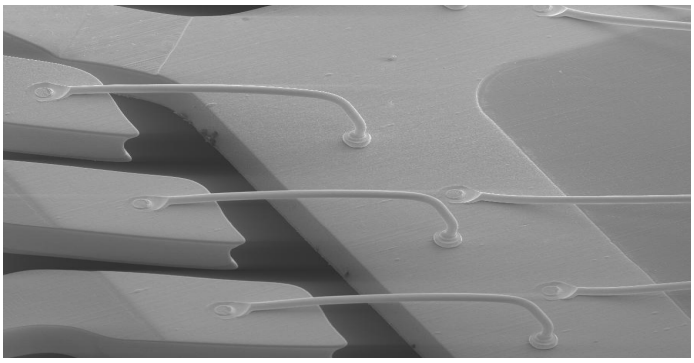


Fig. 16b

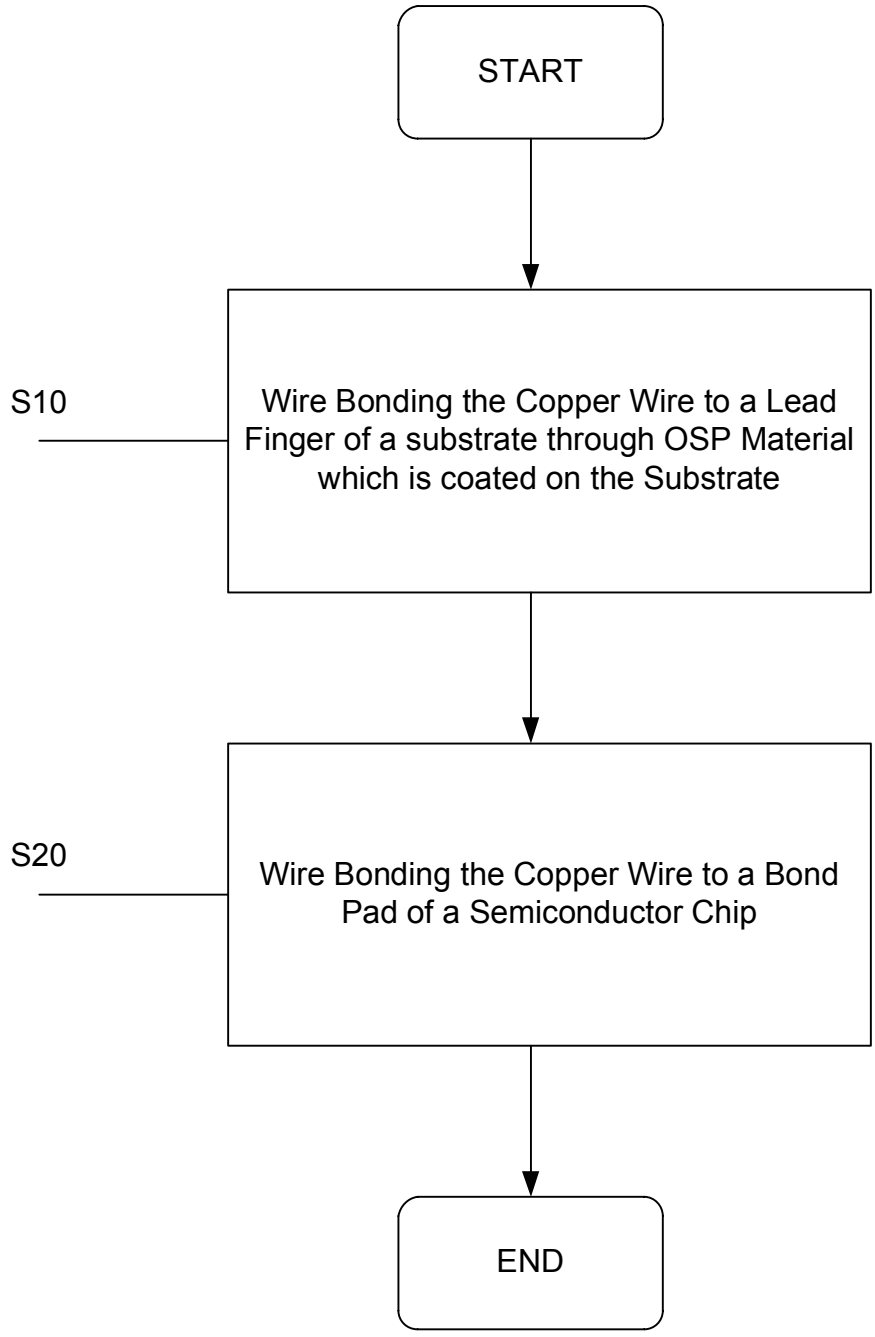

START
S10
Wire Bonding the Copper Wire to a Lead Finger of a substrate through OSP Material which is coated on the Substrate
S20
Wire Bonding the Copper Wire to a Bond Pad of a Semiconductor Chip
END

Fig. 17

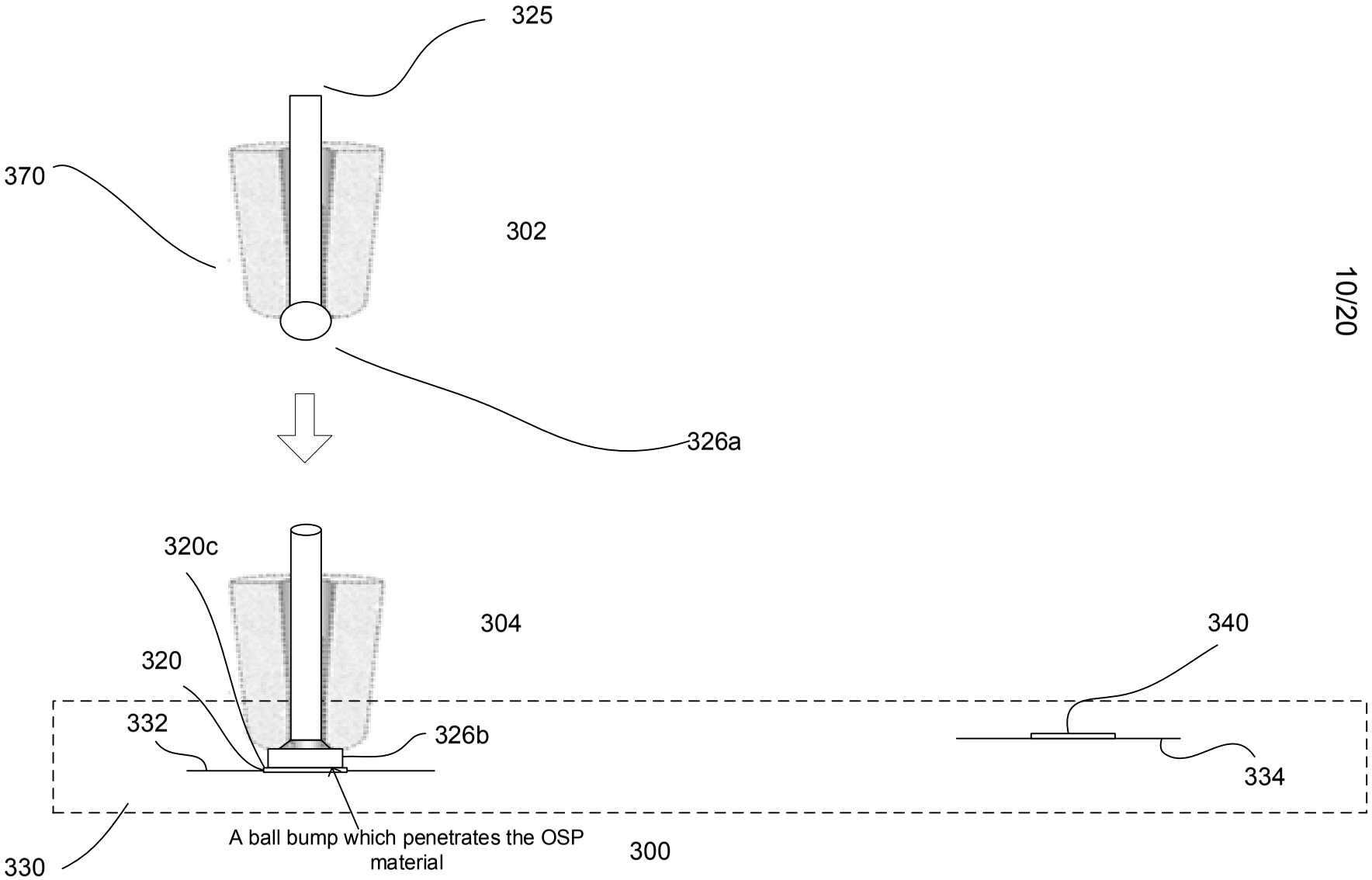

325
370
302
326a
320c
304
340
320
332
326b
334
A ball bump which penetrates the OSP material
330
300

Fig. 18a

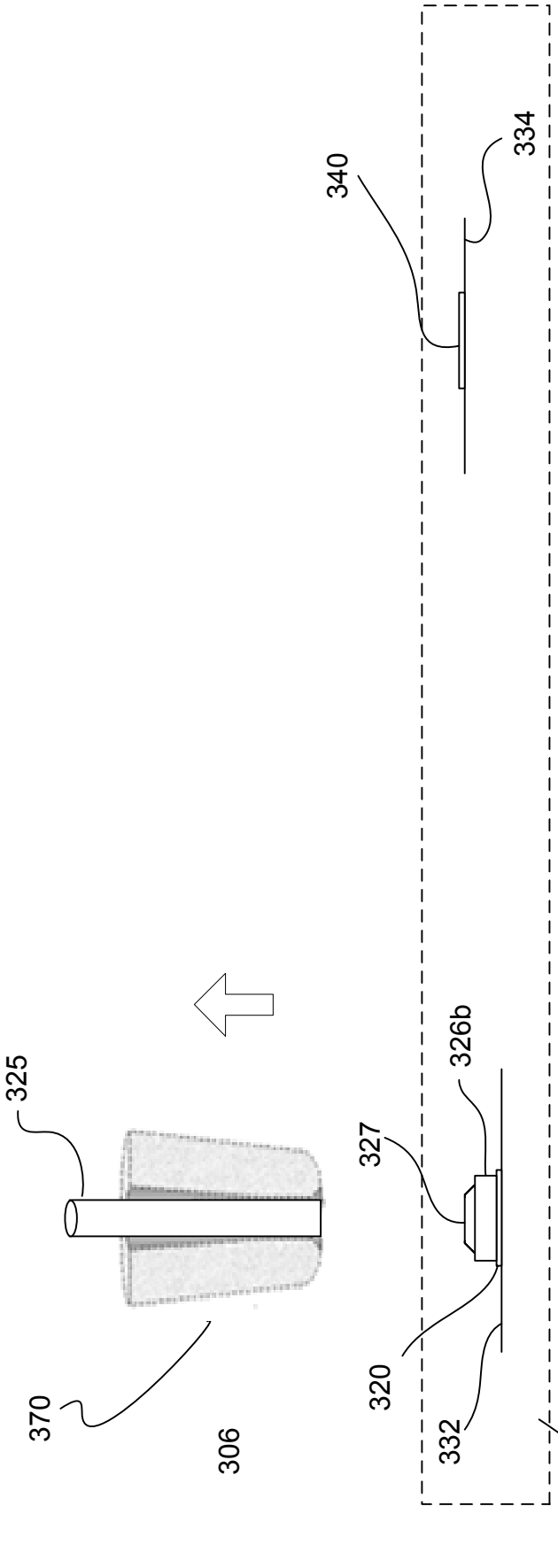


Fig. 18b

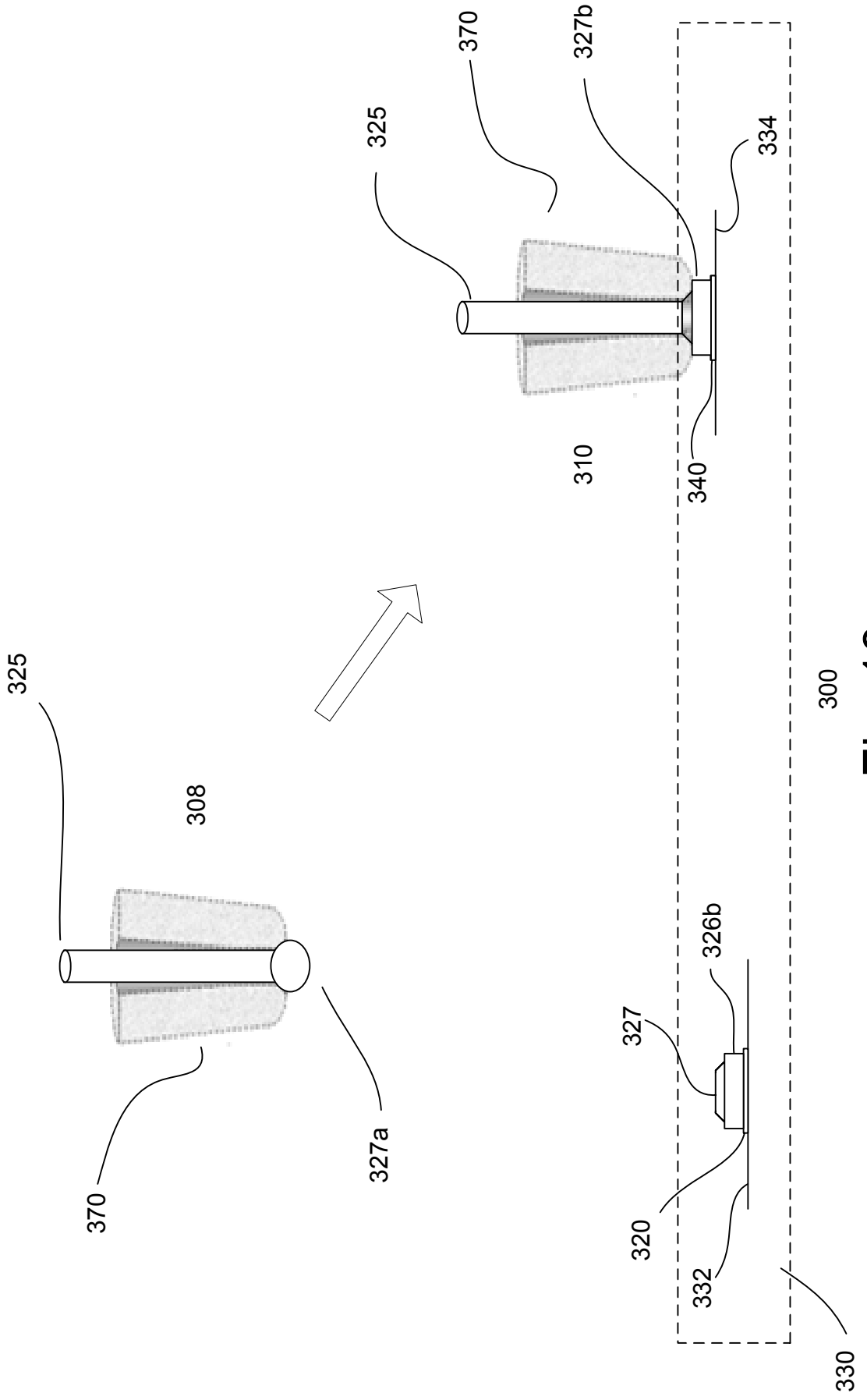

325
308
370
327a
370
325
327b
334
310
340
300
326b
327
320
332
330

Fig. 18c

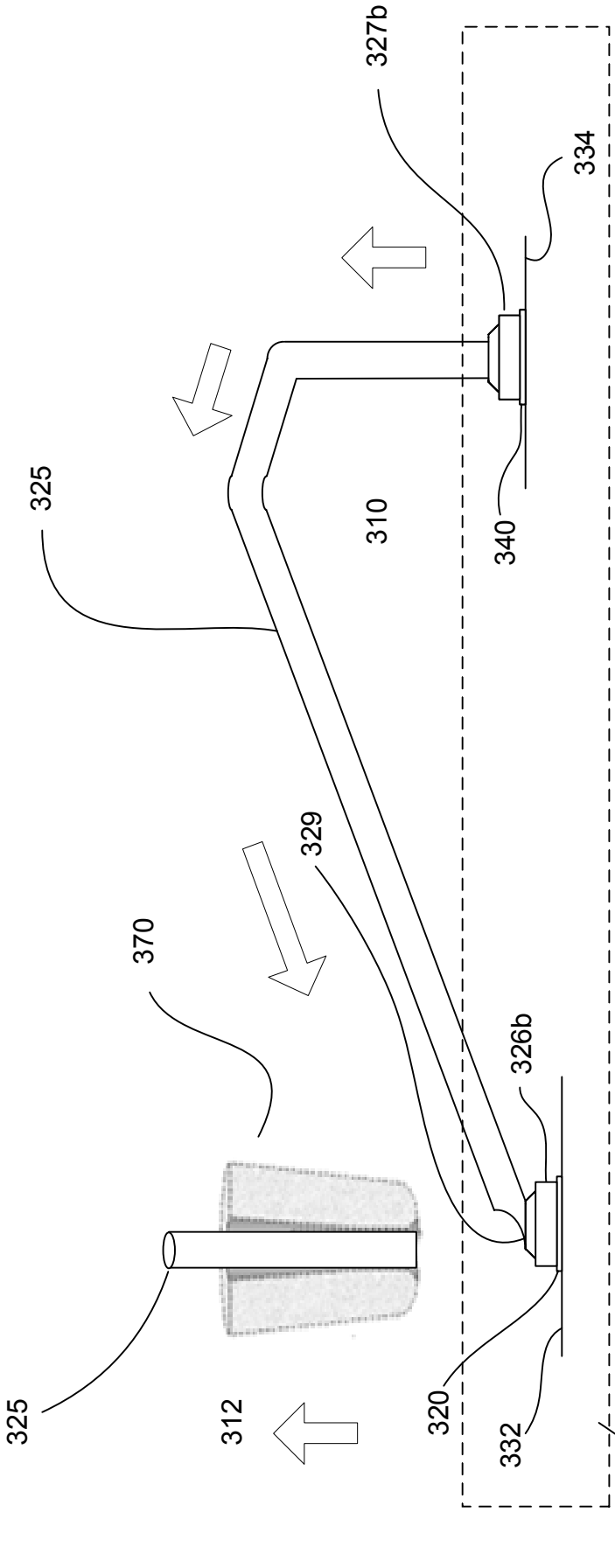


Fig. 18d

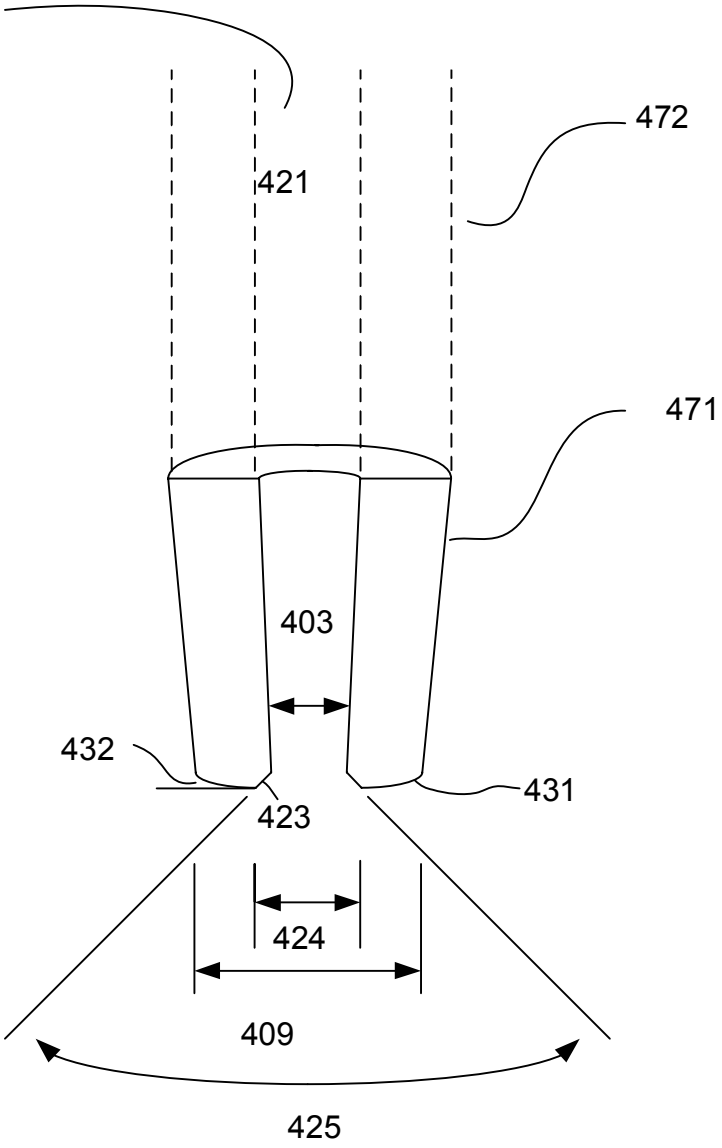


Fig. 19

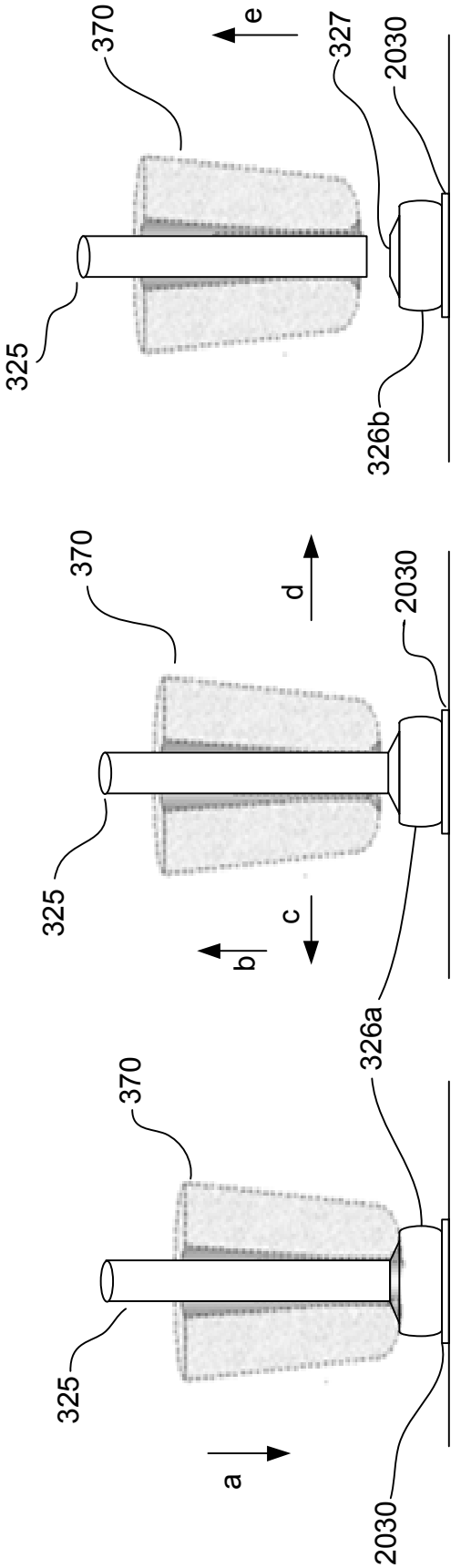


Fig. 20c

Fig. 20b

Fig. 20a

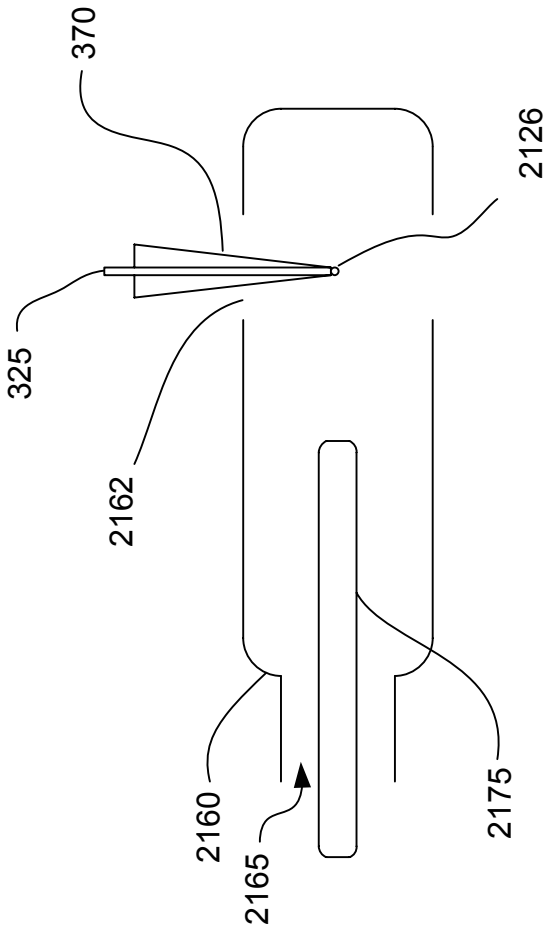
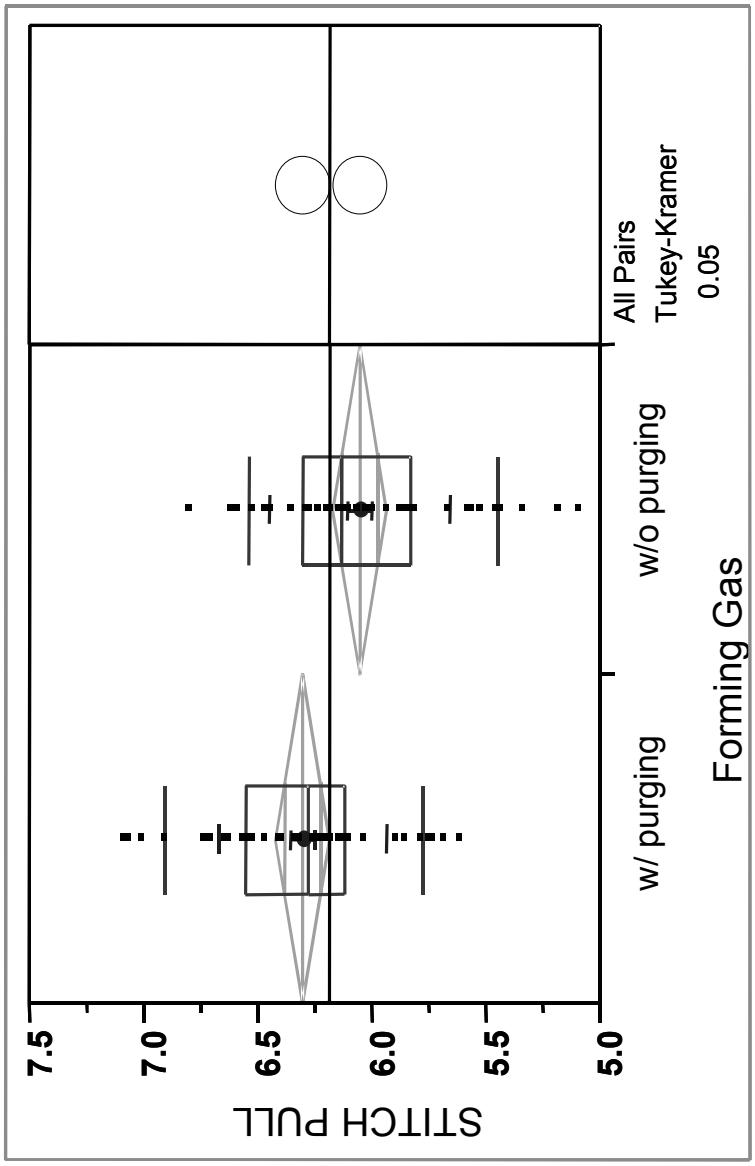


Fig. 21



	w/ Purging	w/o Purging
Ave	6.32	6.05
StDev	0.38	0.40
Min	5.63	5.12
Max	7.12	6.82
CPK @ 3 grams	2.94	2.52

Fig. 22a

	Ball Shear		Bump Size		Bump Height	Ball Shear		SSB Size		SSB Height
	w/o NVT	w/ NVT	X	Y		w/o NVT	w/ NVT	X	Y	
1	24.45	26.14	43	46	16	34.38	36.4	50	54	12
2	24.68	25.32	41	45	15	35.53	37.88	50	54	13
3	27.87	25.96	43	46	16	37.65	36.43	49	52	13
4	26	26.45	43	45	16	34.45	36.1	48	54	13
5	26.18	24.86	43	44	16	35.2	35.49	49	54	12
6	27.63	27.79	43	45	17	34.41	36.66	49	54	12
7	26	26.35	44	43	16	34.67	35.16	48	52	13
8	26.21	26.32	43	44	15	35.48	33.99	50	53	13
9	25.52	26.9	43	45	16	33.64	33.6	49	51	12
10	27.05	26	44	43	15	33.22	33.99	49	52	12
11	26.78	27.09	44	46	16	34.16	32.11	51	51	12
12	26.24	27.21	43	43	16	34.91	33.28	50	54	12
13	25.52	26.35	44	45	15	35.82	32.75	50	53	13
14	25.47	25.85	44	41	16	37.57	33.1	51	51	12
15	25.7	25.35	43	43	16	36.41	34.5	49	52	12
16	25.95	25.72	44	44	16	33.24	33.71	49	52	13
17	23.98	27.18	43	44	16	34.68	32.5	50	53	13
18	24.56	26.49	44	46	16	35.87	33.55	52	53	12
19	26.14	26.09	44	44	16	35.1	33.96	49	53	12
20	25.54	26.88	43	44	15	34.27	31.91	48	52	13
21	25.59	26.77				32.64	33.12			
22	25.07	27.09				35.03	33.59			
23	25.01	25.91				33.22	36.06			
24	24.02	25.99				34.24	36.05			
25	23.97	25.91				34.01	34.16			
26	24.69	25.23				34.11	32.41			
27	24.83	26.11				32.92	33.98			
28	24.44	25.27				29.97	35.13			
29	26.26	26.96				33.86	33.96			
30	25.03	26.15				35.48	31.96			
Ave	25.55	26.26	43.30	44.30	15.80	34.54	34.25	49.50	52.70	12.45
Stdev	1.01	0.69	0.73	1.30	0.52	1.49	1.57	1.05	1.08	0.51
Min	23.97	24.86	41.00	41.00	15.00	29.97	31.91	48.00	51.00	12.00
Max	27.87	27.79	44.00	46.00	17.00	37.65	37.88	52.00	54.00	13.00
CPK										

Fig. 22b

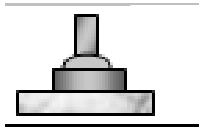
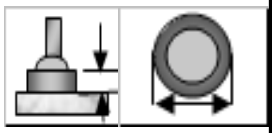
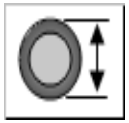
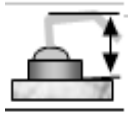
	BALL SHEAR TEST ON BALL		BALL SHEAR TEST ON BUMP		STITCH PULL		BALL SIZE X,Y,Z				LOOP H	
	UNIT1	UNIT2	UNIT1	UNIT2	UNIT1	UNIT2	UNIT1	UNIT2	UNIT1	UNIT2		
												
MIN	25.40	24.40	21.50	35.70	18.40	17.50	50.00	50.00	10.00	10.00	34.00	31.00
MAX	28.70	27.50	45.80	46.70	19.70	19.60	52.00	52.00	11.00	11.00	45.00	46.00
AVE	26.68	25.98	41.35	44.04	18.93	18.62	50.80	50.90	10.50	10.60	38.30	38.30
STD DEV	1.664	1.550	12.938	5.739	0.654	1.051	1.007	1.002	0.500	0.503	5.543	7.501
CPk	1.94		0.63		0.98		0.99		2.27		0.80	
SPEC	17gF				7 gf		47µm - 55µm		5µm - 14µm		25um-70 µm	

Fig. 23

Test Type	Test Condition	Duration	Result	Remarks
Moisture Sensitivity Level	MSL 3 (30°C / 60% RH, 3x Reflow @ 260°C)	192 hours	(2/150) Passed	Non-assembly related rejects.
Temperature Cycling (TC)	- 55 °C to 125 °C	500 cycles	(0/97) Passed	100% passed
		1000 cycles	(0/97) Passed	100% passed
High Temperature Storage (HTS)	150°C	500 hours	(0/50) Passed	100% passed
		1000 hours	(0/50) Passed	100% passed

Fig. 24