



1	(a)	(f)	1
2	(a)	(e)	1
3	(a)	(d)	2
4	(a)	(b)	3
5	(a)	(f)	4
6	(a)	(c)	5
7	(a)	(d)	6
8	(a)	(e)	7
9	(a)	(e)	8
10	(a)	(d)	8

11  
12  
13

14			TAB
15	(a)	(e)	9

16		9
17		9
18	(a)	(e)
19		

< >  
1 :  
2 :  
3 :  
4 :  
5 :  
6 :  
7 :  
8 :  
9 :







3  
 1, 2 가 (31) ( 6 , 625 $\mu$ m)  
 4 (a) (34) , Ni, Cr, TiN, TaN, Ta, Nb, WN (31) (34) (31)  
 , Ni-B, Ni-P (34) , Ni (34)  
 4 (b) (35), (36), (37), (39) 가 (34)  
 3 (31) (34)  
 , 1, 2 가 가  
 , 220 30 가  
 , 가  
 4  
 5 (a) (41) ( 6 , 625 $\mu$ m)  
 , (41) 100 $\mu$ m , 350 $\mu$ m  
 (10mm $\times$ 10mm)  
 5 (b) (44) (44)  
 , Ni, Cr, TiN, TaN, Ta, Nb, WN  
 5 (c) , 4d (41) (40)  
 5 (d) (44) (41)  
 5 (e) (42) (42) , SiN, SiO<sub>2</sub>  
 , BCB, 1 가 (41) (44)  
 , 220 30 가 , 5 (f)  
 (49)  
 5  
 6 (a) (51) ( 6 , 625 $\mu$ m)  
 (10mm $\times$ 10mm) (51) 100 $\mu$ m , 350 $\mu$ m  
 6 (b) (51) (54) , Ni, Cr, TiN, TaN, Ta, Nb, WN (54) , Ni (54)  
 , Ni-B, Ni-P (51)  
 , 4 5 (e) 5 (f) 가  
 30 가 (59) , 6 (c) 220  
 ,  
 ,  
 6 7  
 1 5 ,  
 7 (a) , 1 가 (61) (64)  
 , (65), (66), (67) , (68)  
 (68) , 100 $\mu$ m (65), (66), (67)  
 (64) (68) 가  
 7 (c) , 160 $\mu$ m 60 $\mu$ m (601) (603)  
 (601), (602)  
 7 (d) (601)

220 30 가 , Sn-Pb , Sn, Pb, Ag, Bi, Zn, In, Sb, Cu, Bi, Ge

6

7

8

8 (a) (71) (71) (6 625μm) (10mm×10mm)  
(71) 100μm , 200μm

8 (b) (71) (74)  
(74) , Ni, Cr, TiN, TaN, Ta, Nb, WN

8 (c) (75) (75)

100μm (75) (74)

8 (d) 8 (e) (75) (76)

, -65 (30 ) 25 (5 ) 150 (30 ) 1 . 3000

가

7

8

9 (a)

(81) (6 625μm) (81) 50μm , 60  
(10mm×10mm)

9 (b) (81) (84)  
, Ni, Cr, TiN, TaN, Ta, Nb, WN

9 (c) (85), (86), (87)

9 (d) (87) 20μm 50  
(88) (89) 16μm

9 (e) (87), (86), (85) (87) (88) (86)

(85) 4 (84) TAB

, -65 (30 ) 25 (5 ) 150 (30 ) 1 . 3000

8

가

(89) 8 (84) (85), (86), (87)  
10 (a) (d) (84) (85), (86), (87)  
(89)

9

15

15 (a) (601) (601)가 (603) [ (6 62  
5μm)] (601) 100μm , 200μm (10mm×10mm) 62  
(602) (1) 1μm

15 (b) (603) (604) , Ni, Cr, TiN, TaN, Ta, Nb, WN 1μm  
 (604)

15 (c) (603) (Al) (605) (601) 100μm  
 (604), (6)

05) 15 (d) 15 (e) (606) (605) (606)

3000 65 (30 ) 25 (5 ) 150 (30 ) 1  
 (606) (605) (607)  
 (605) (606) 16  
 (706) (704) (705) (705) , Ti, Ni, Cr,  
 TiN, TaN, Ta, Nb, WN (701),  
 (702), (704), (706), (707) 9 가  
 17 (802) (801) (804)

12 (204) (203)가 (202)가  
 (201) (204) (203) (201) (205)

8 (e) (76)가 13  
 (402) (401) (405) (401)  
 (404) (502) (503)가 (506)  
 TAB 14 (502) (501) (505) / /  
 (507)가

가 가

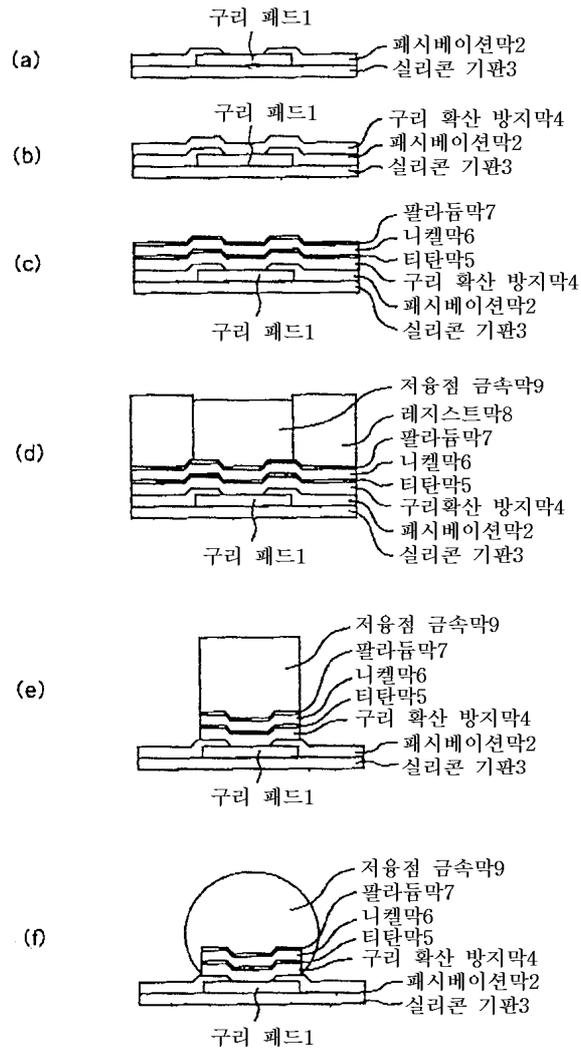
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- 1.
- 2.
- 3.

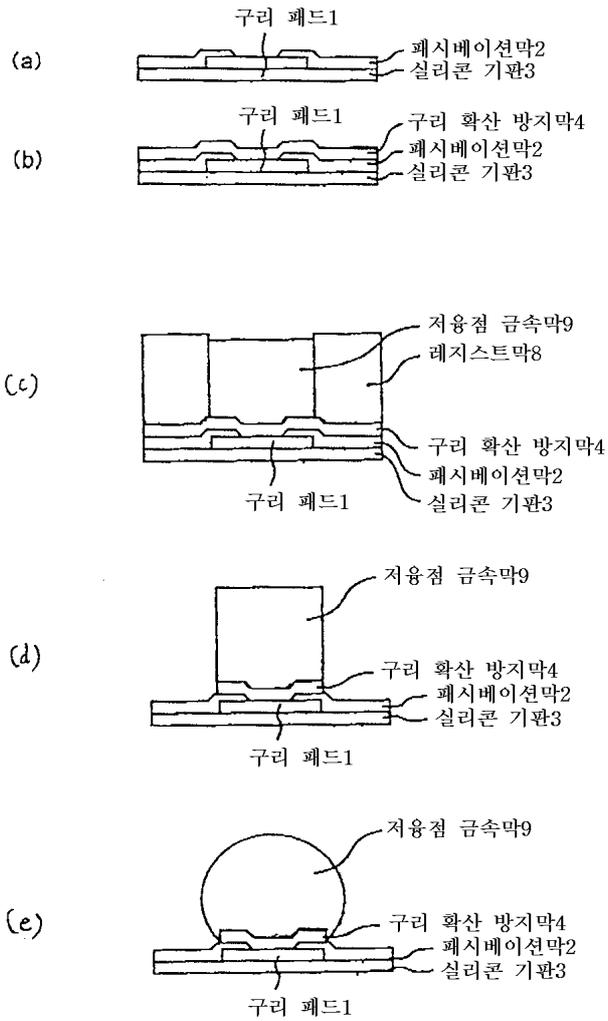




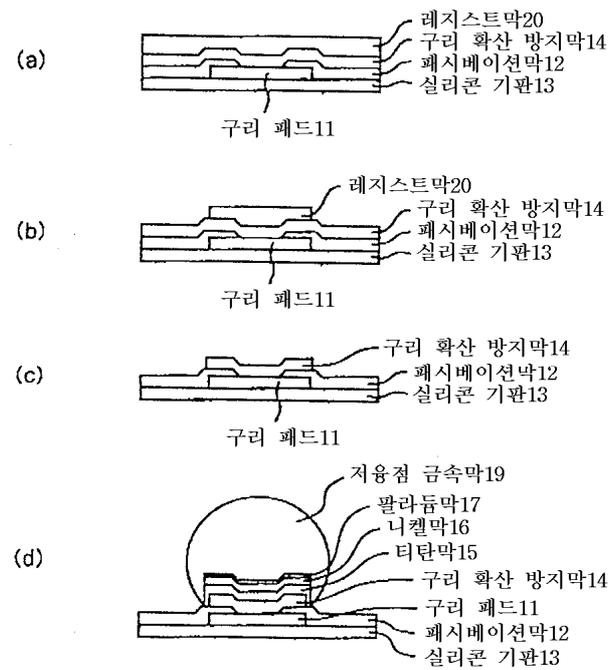
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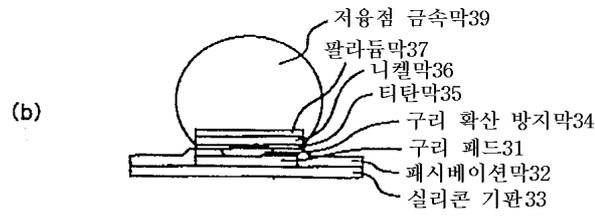
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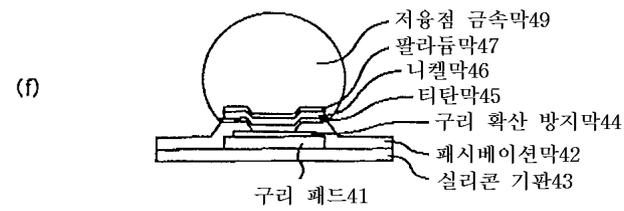
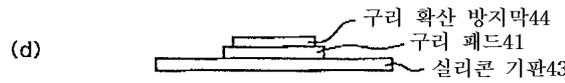
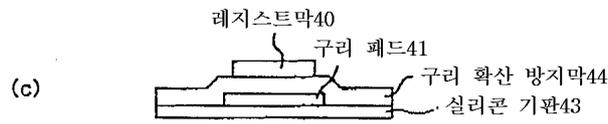
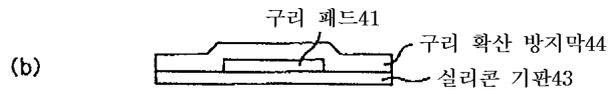
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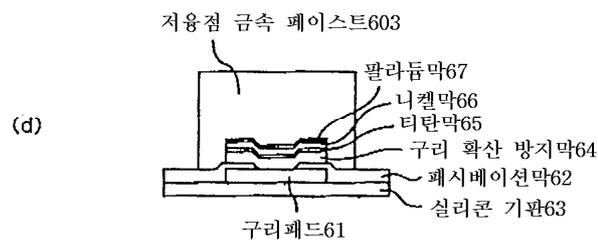
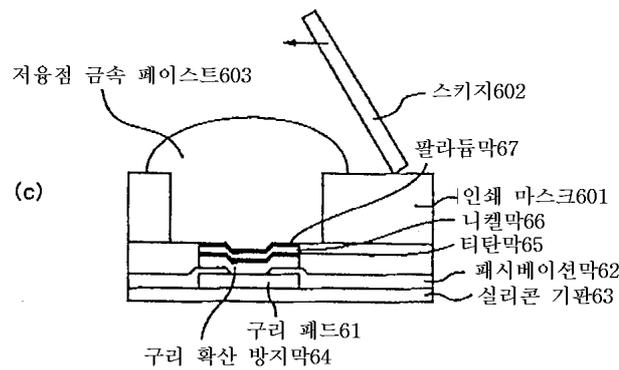
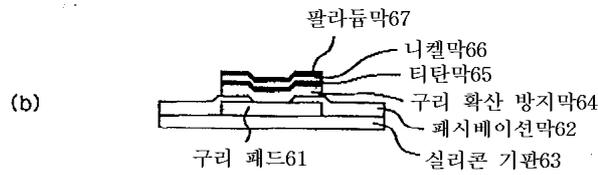
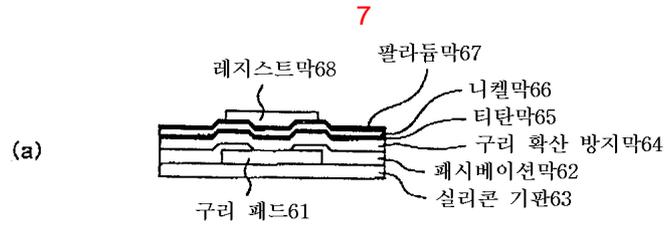
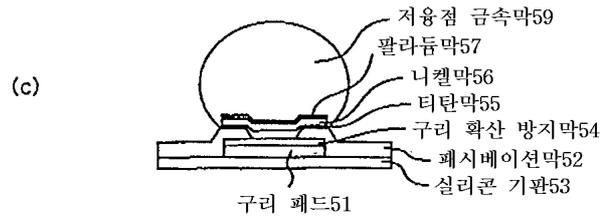
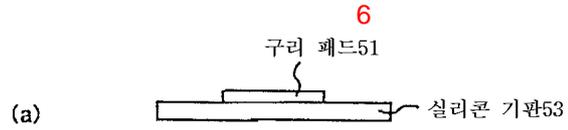


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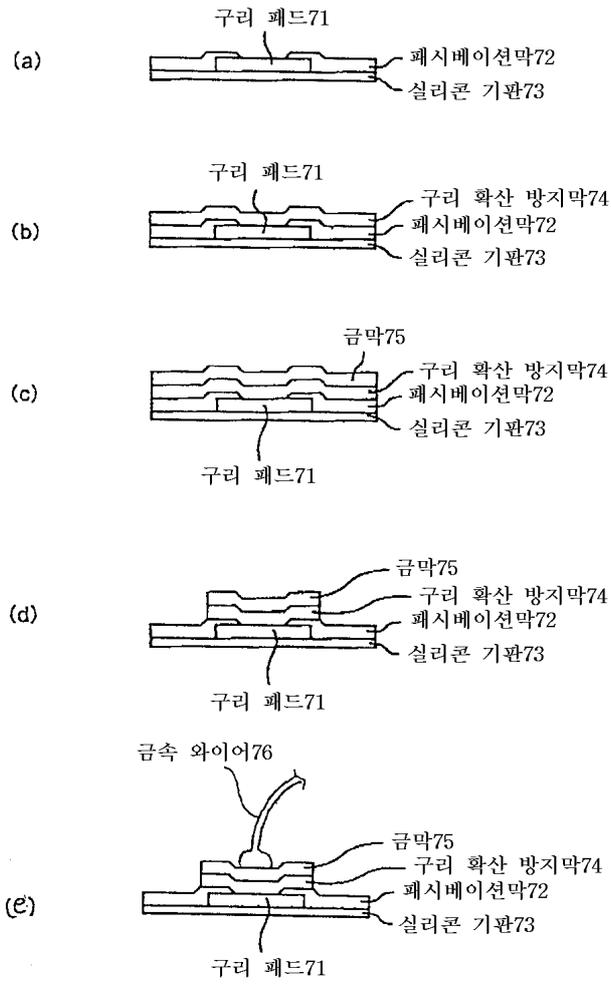


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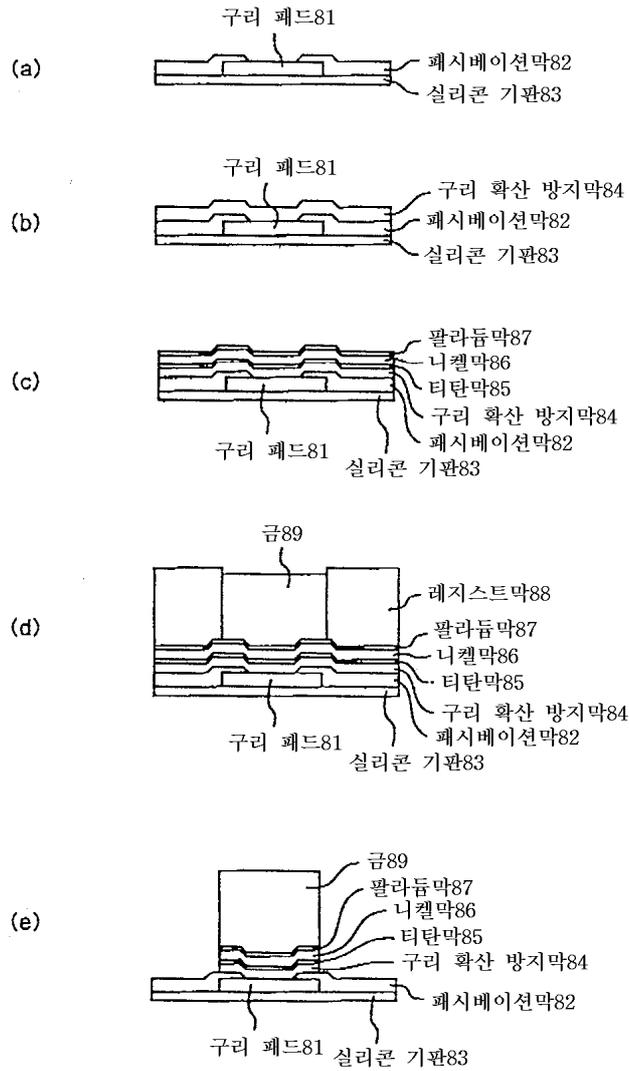




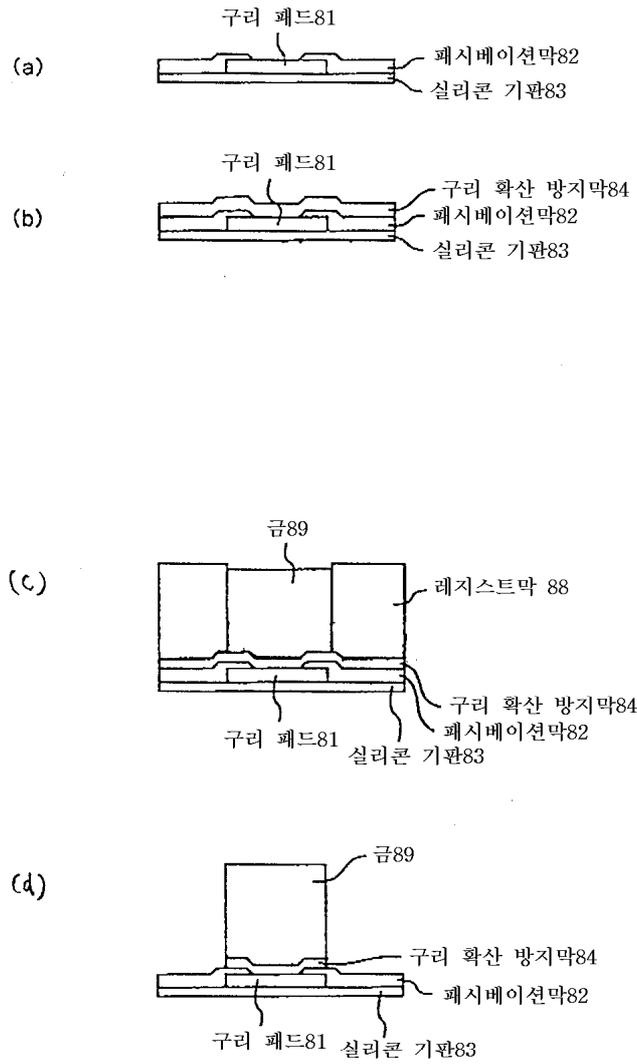
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9

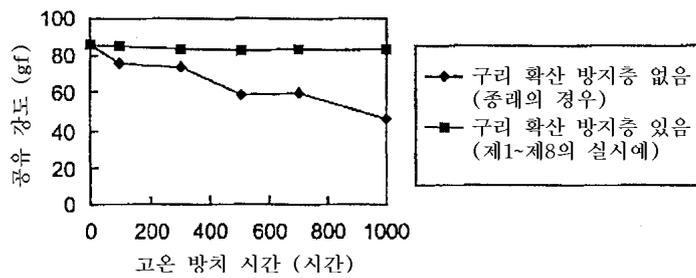


10



11

공유 강도의 변화(150°C 고온 방치)



12



