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10 - 0307651
2001 08 22

(21) 10 - 1998 - 0021618
(22) 1998 06 11

(65) 1999 - 0006860
(43) 1999 01 25

(30) 97 - 172866 1997 06 13 (JP)

(73) 가 가 가
가
5 7 1

(72) 5 - 7 - 1 ()

(74)

:

(54)

(divot) 가 2 (2 7) 1 가
가 2 (7a)

2a

1(a) 1(d) 1

2(a) 2(c) 1 .
 3 .
 4(a) 4(d) 2 .
 5(a) 4(c) 2 .
 6(a) 6(e) (shallow trench isolation, STI) .
 7 .

*

1, 8, 16 : 2, 9, 17 :
 3, 10, 18 : 4, 11, 19 :
 5, 12, 20 : 6, 6a,13,13a: 1
 7,7a,15,15a: 2 14, 22 :
 21, 21a :

olation) (STI: shallow trench is

6 , (17) (16) 300 (30nm) .
 (17) , (CMP : chemical mechanical polishing) (18) , 가 ,
 () CMP
 (CVD : chemical vapor deposition) 1000 (100nm) .
 (17) (18) (16)
 , (19) ()
 , (19) (18) (17)
 (16) 3000 (300nm) , (20)

(20) CVD, (19) 4500 (450nm), (20)

P, 6(c) CMP, (18), () (18) CM, 600 (60nm)

(18)

6(d), (18)

()

600 (60nm) (21a)

, 300 (30nm) (17)

(hydrofluoric acid - containing liquid), (hydrofluoric acid)

(21a), CVD

3, CVD

(20) (21a) 300 (30nm)

(22, divot)

(22, recess) 7, 7 6(d) 가 (rim)

300 (30nm) 가 (17), CVD (21a) 900 (90nm) (16)

, (等方的) 6(e), (22)

가, 7 1 3

, Andres Bryant (" C haracteristic of CMOS Device Isolation for the ULSI Age" IDEM Tech. Dig., P. 671, 1994)

() 가 가

(hump & kink)

가 (step difference)

가

) 가 가 (hump & kink)

가

가

(STI : shallow trench isolation)

1

가 , 가

(가)

, ()
, ()

1 , () 1 , () , ()
, 2 , () , () 2 , ()
, () 2 2 2

, 1 2 (CVD)

(CMP)

, 2

, 2

[]

가 , 1
, 2 , 2
1 2

(가) (1 1) (1a) (1 2)
(1 3)

() (1 3) (1 2) (1 5)
(1 1) , (1b) 1
(1 6)

() (1c) (1 3) 1 (1 6) ,
 () (1d) ,
 () (2a) 2 (2 7) ,
 () (2b) 2 ,
 () (2c) (1 2) .

, 1

, , , , 2

(가) (4 8) (4 9) (4 10)
 (4a) ,

() (4b) (4 12)
 1 ,

() (4c) 1 ,

() (4d) ,

() (5a) (4 9) ,

() () (5b) 2 (5 15) ,

() (5c) 2 .

, 1 2 CVD , CMP(
) 2 .

(step difference)

가

[]
 가 .

[1]

1 가 . 1 2 1
 . 1 2 .

1(a) , (2) (1) 300 (30nm)
 CMP (2) , CMP (3) , (1) 1000 (100nm) CVD
 (2) (1) (3)
 , (4) ()
 (3) (2) (4) (5) 3000 (300nm)
 (1)
 (5) CVD (4) 4500 (450 nm) 1 (6)
 , CMP 1(c) , () (4)
 CMP (3) 600 (60nm) 1 (6)
 a) (3)
 , (3) 1(d) ,
 () 600 (60nm) , 1 (6a)
 , 2 (7) 600 (60nm)
 600 (60nm) , 2 (7) 2(b) ,
 (underlayer)
 1 (6a) , 2 (7) 1 (2) , ()
 (7a) (2)
 2(a) 3
 , 600 (60nm) 2 (7)
 , $(\sqrt{2}) \times 600$ 850 (85nm) 2 (7) 45
 600 (60nm) 2 (7)
 , $(\sqrt{2}) \times 600 - 600$ 250 (25 nm) (7a)

(2) 2 (c) 1 (6a) 600 (60nm)
 , 1 (6a) 50 (5nm)

(2) (7a) (2)

, 2 (7) (7)

[2]

2 가 4 5

4 (a) (9) (8) 300 (30nm)
 () CMP

(9) (8) CMP (10) , CMP

(11) ()

(10) (9) (4) (12) 3000 ()
 300nm) (1)

(12) (11) 1 (13) (5) CVD
 4500 (450nm)

, CMP () (10) , CMP ,
 (10) 600 (60nm) (10) 1 (13a)

(10) 4(d) () 600 (60nm)

, 1 (13a)

, 300 (30nm) 5(a)

, 300 (30nm) 가 (14) 1 (13a)

CVD 5(b) 1000 (100nm)
 2 (15)

1000 (100nm) 가 , 2 (15) 5(b)
 (underlayer)

(14) 1 (13a) 가 , 2 (15a) ,
(divot - free shallow trench isolation)(STI)가 . ,

가 ,
가,

(57)

1.

(가)

()

() 1 ,

() 1 ,

() ,

() , 2 ,

() 2 , 2 ,

() 2 .

2.

1 , 1 2 (CVD : chemical vapor deposition)
,

3.

1 , (CMP : chemical mechanical polishing) ,
.

4.

2 , 2 , .

5.

3 , , .

6.

4 , 2 , .

7.

1 , 1 , , 2 , , 1 , ,
(divot) , 2 , 2 , , 1 , ,
2 , , .

8.

1 , 1 , , ,
, 2 , , (divot) , ,
(STI) , ,

9.

- (가) ,
- () ,
- () 1 ,
- () 1 ,
- () ,
- () , 2 ,
- () 1 2 2
- () ,

10.

(가)

()

()

()

()

()

()

()

11.

7

,

1

2

(CVD)

,

.

12.

7

,

(CMP)

.

13.

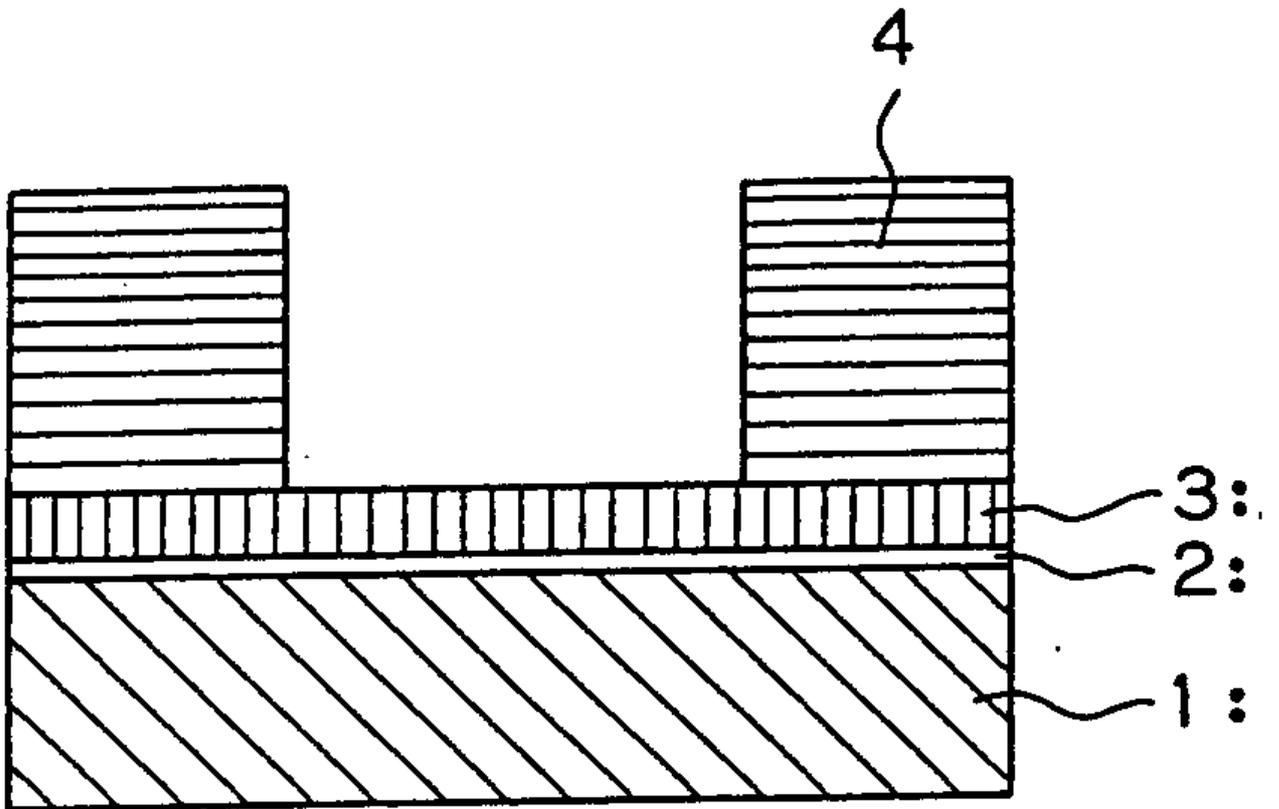
7

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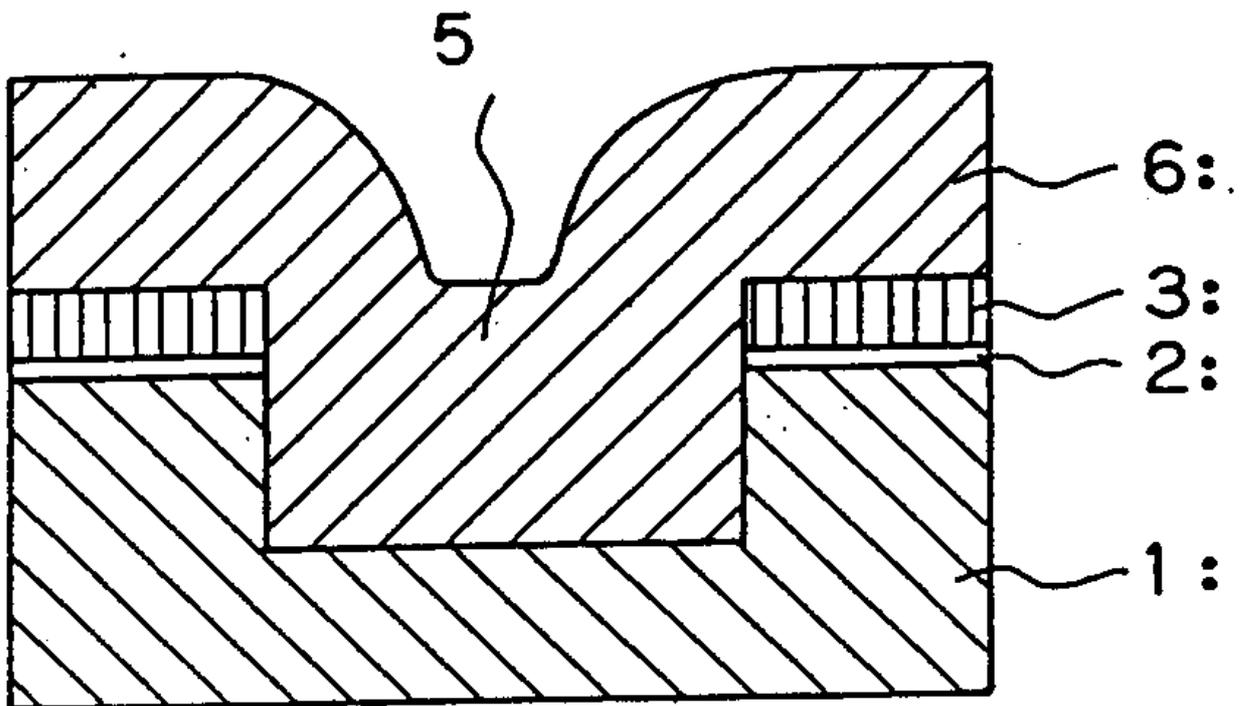
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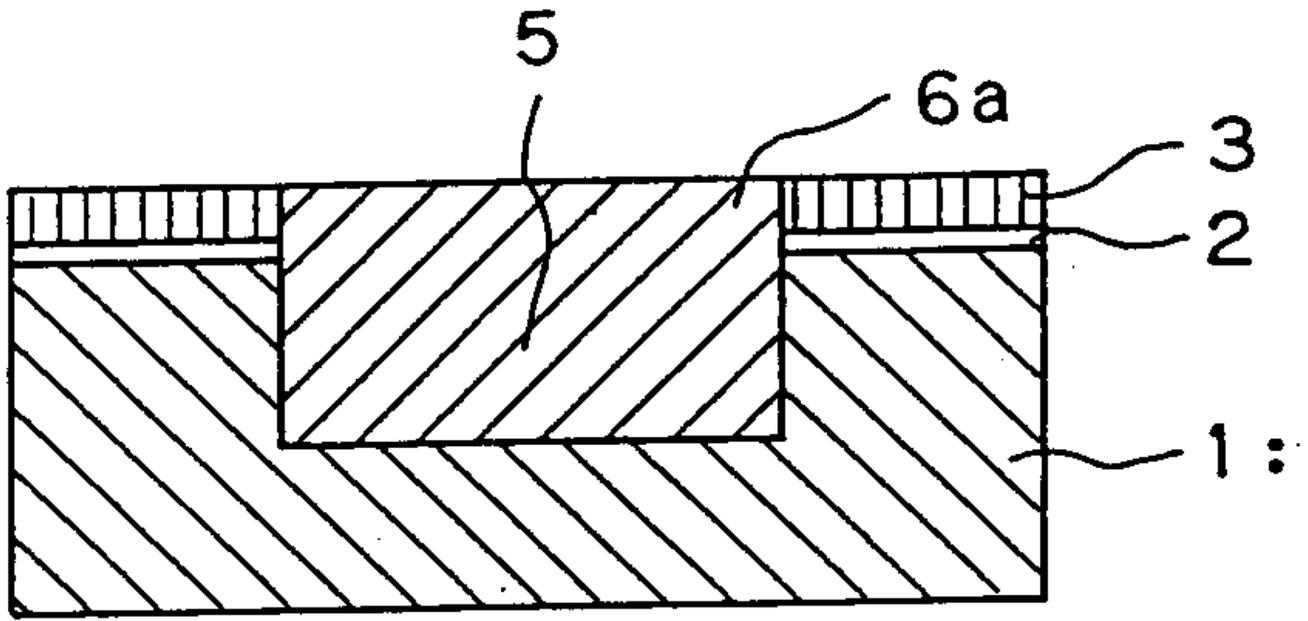
1a



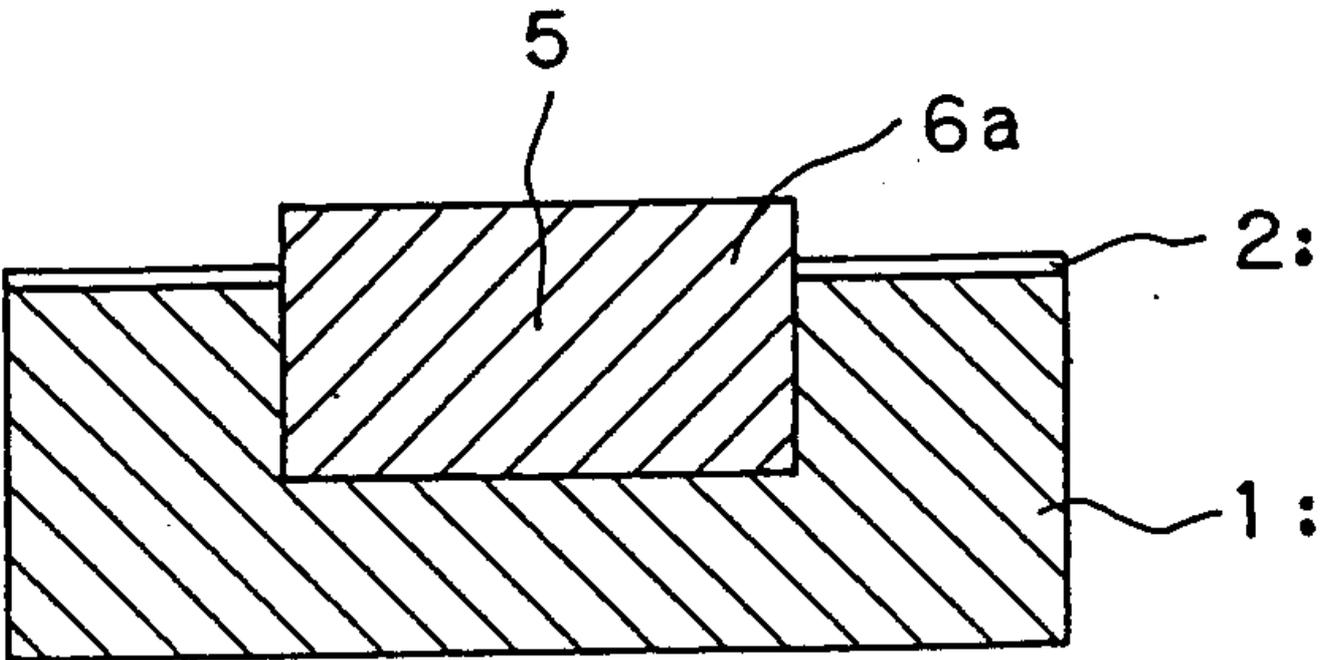
1b



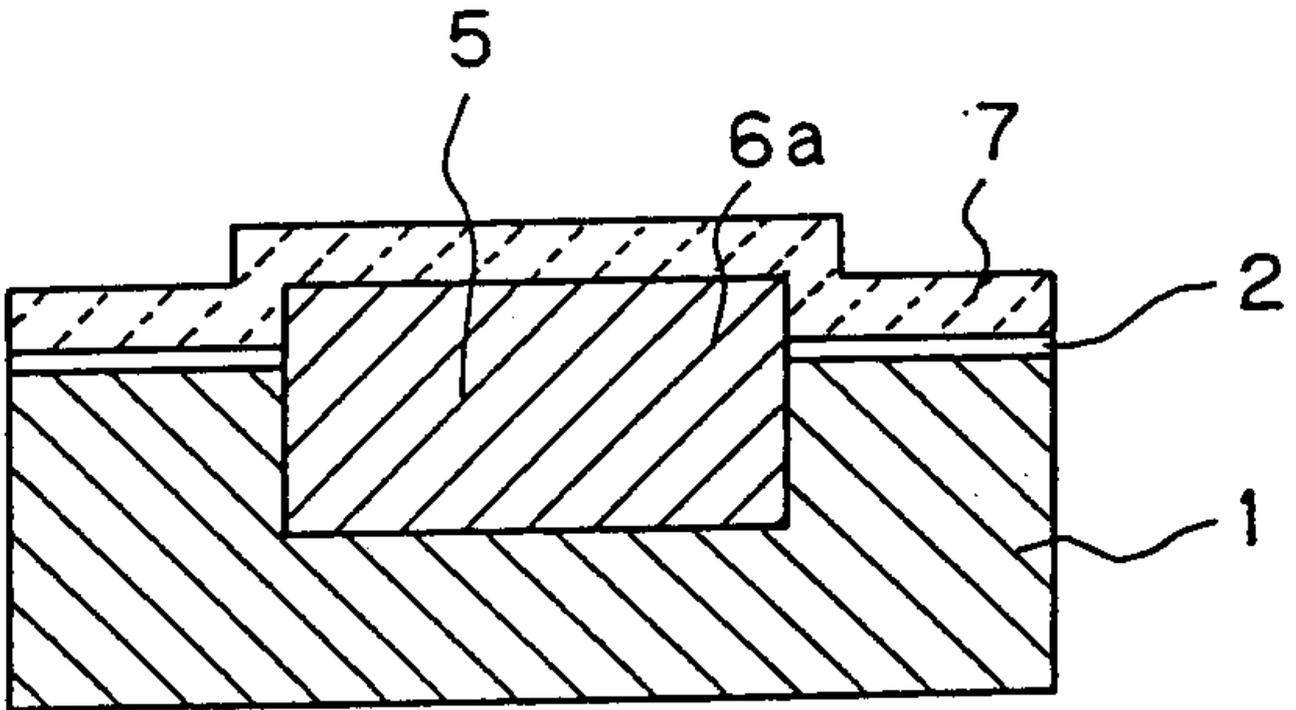
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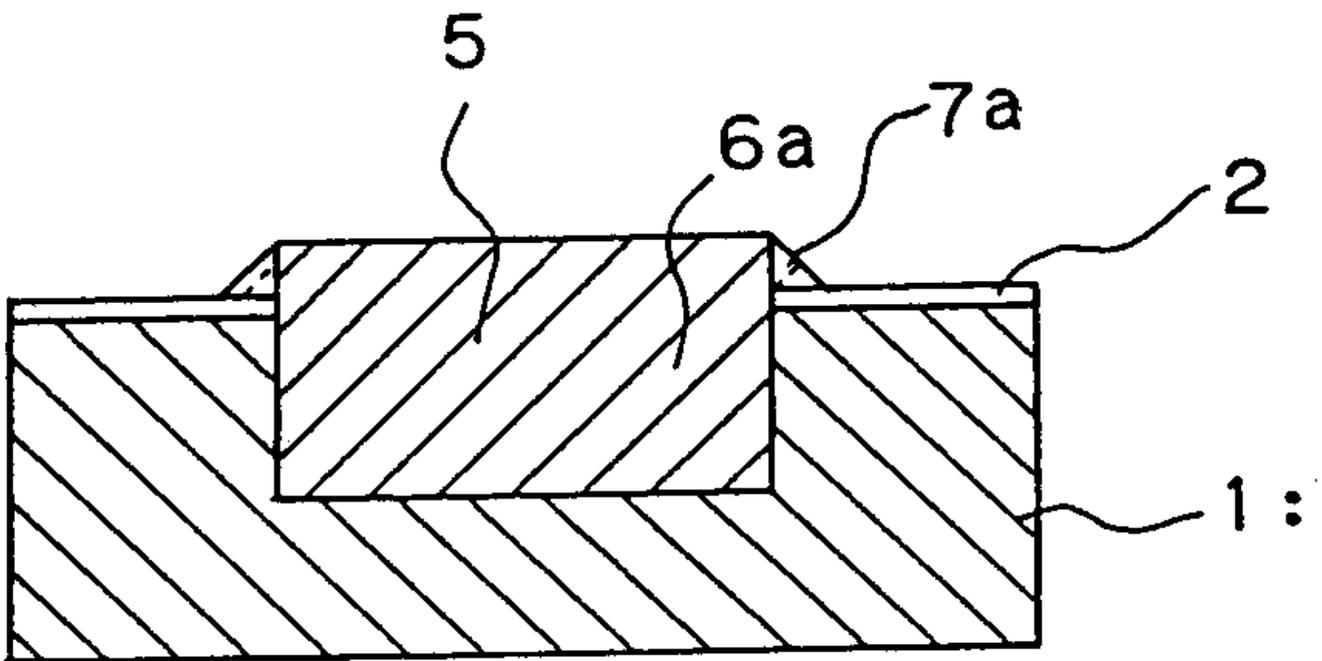
1d



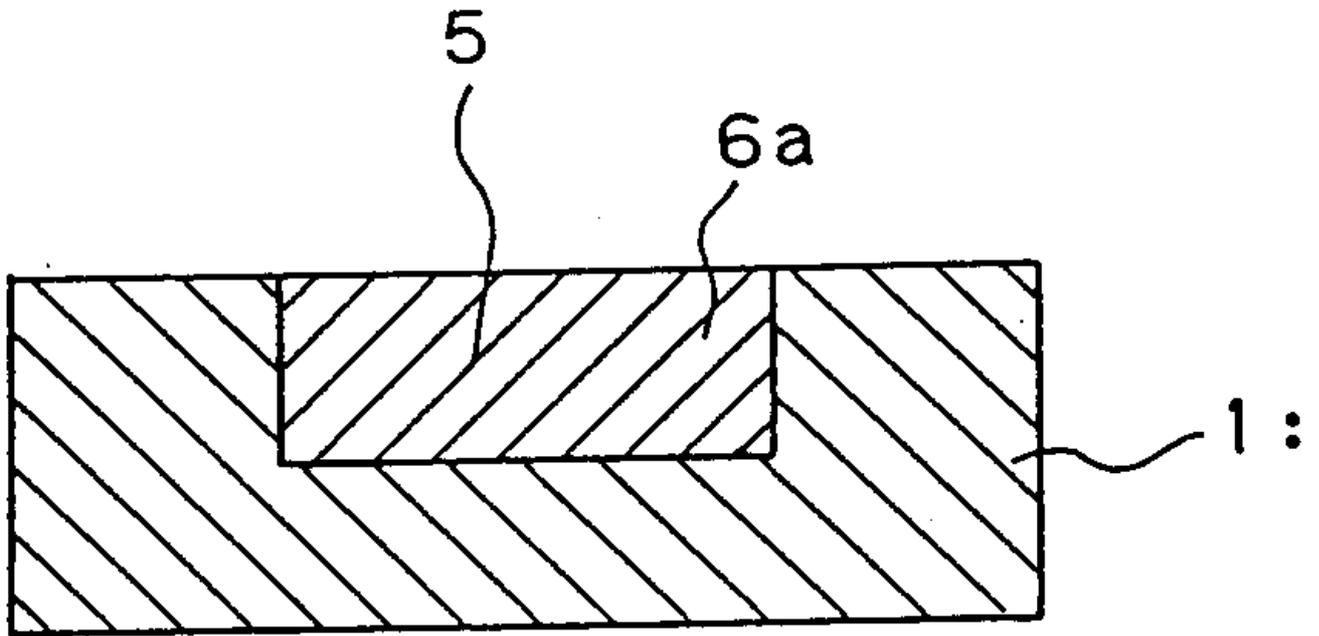
2a



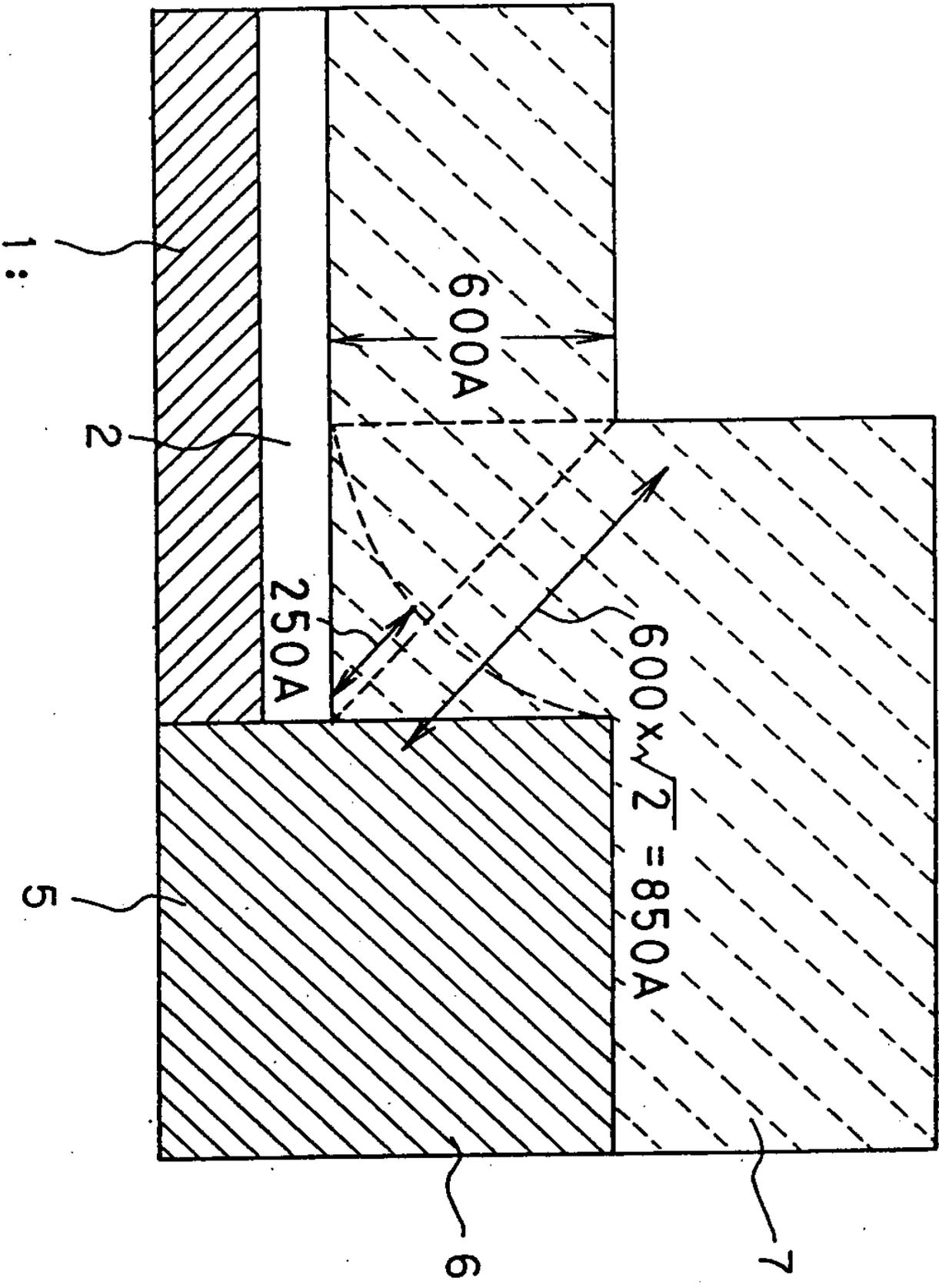
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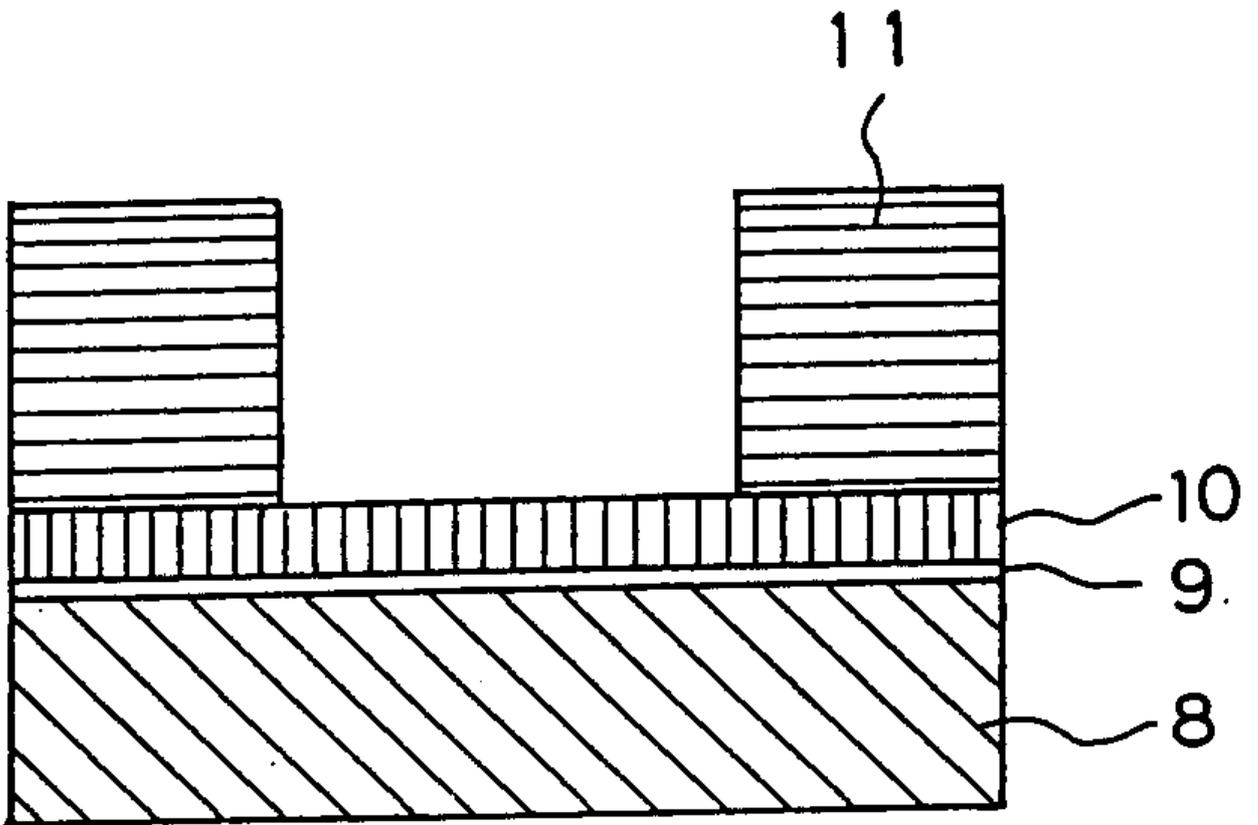
2c



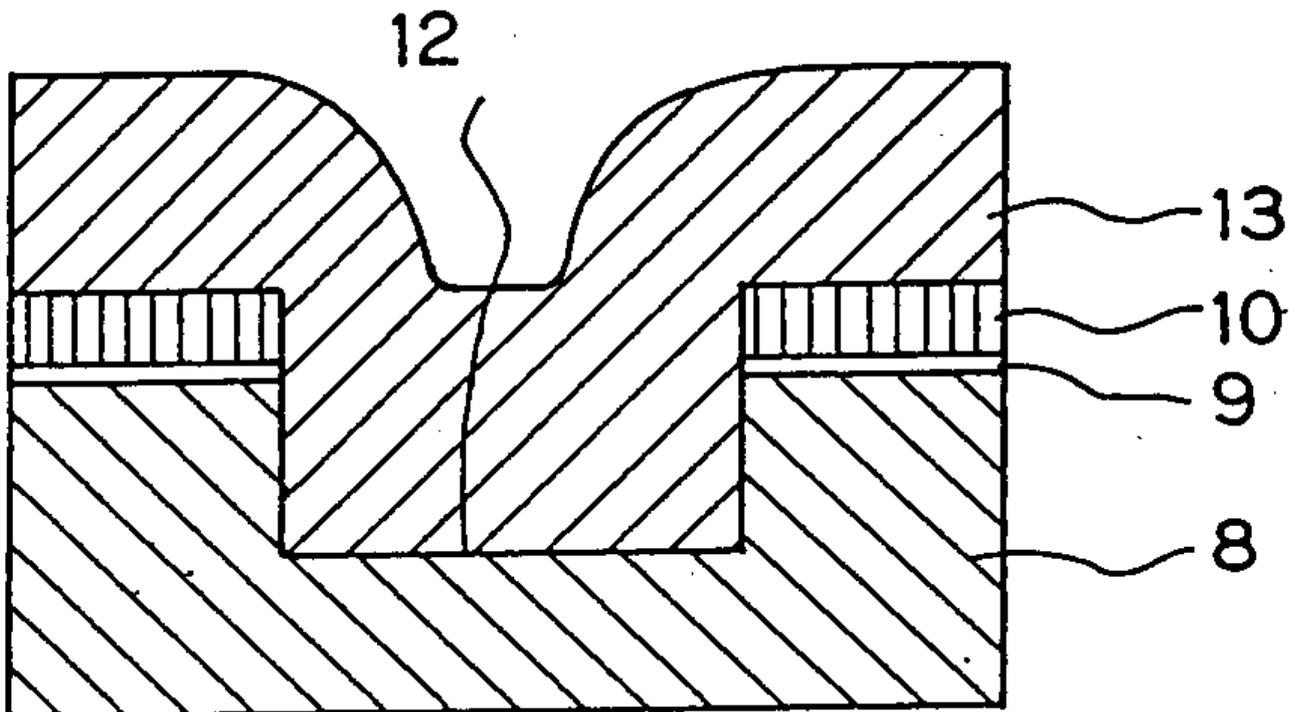
3



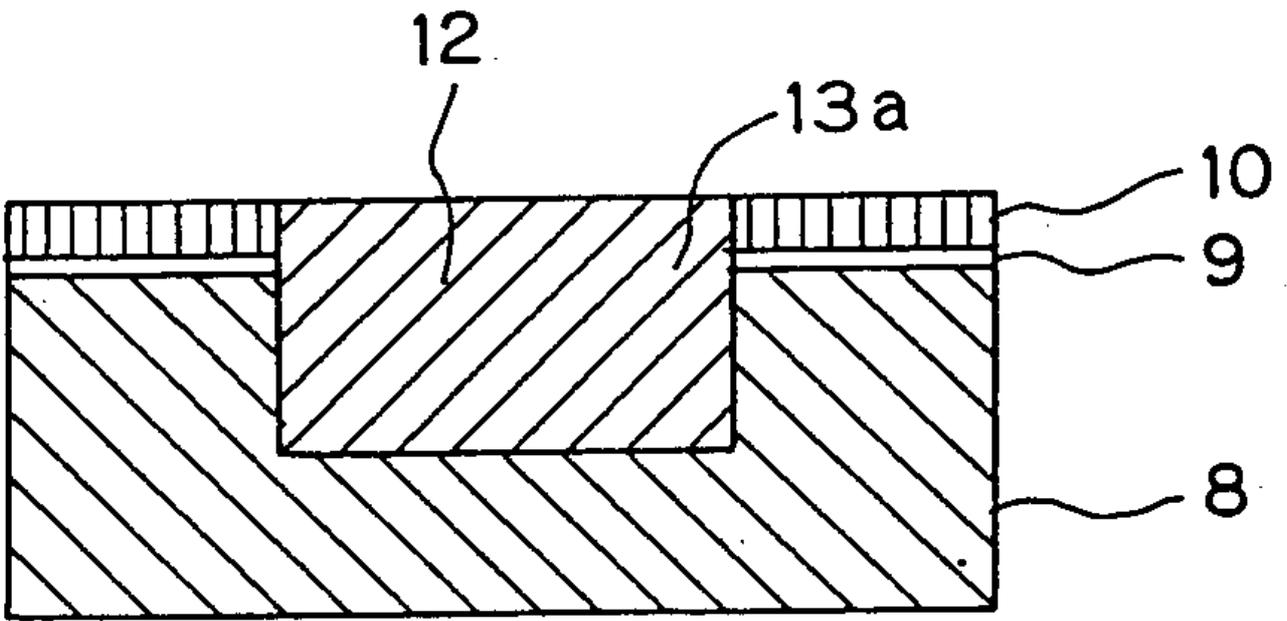
4a



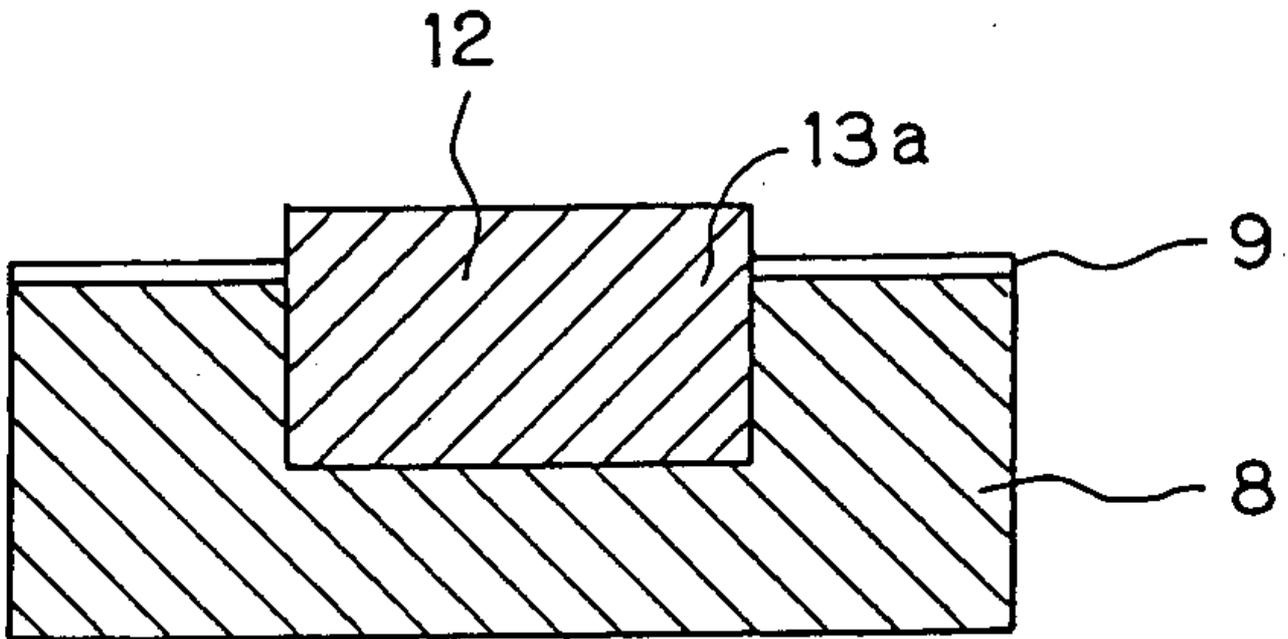
4b



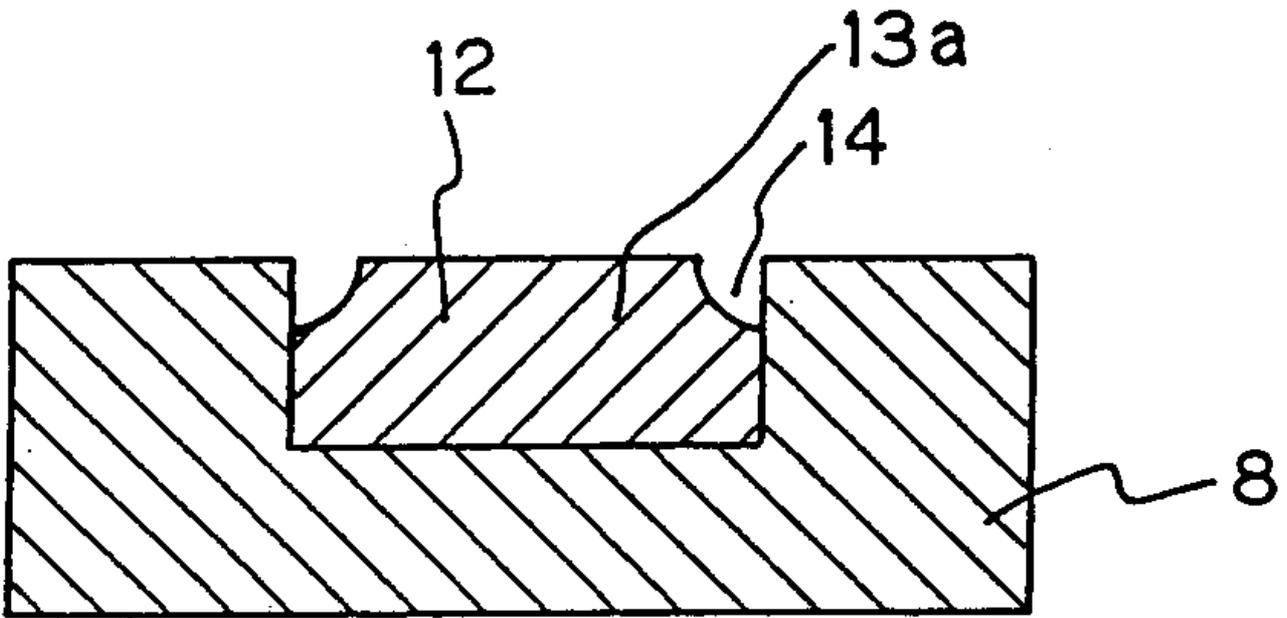
4c



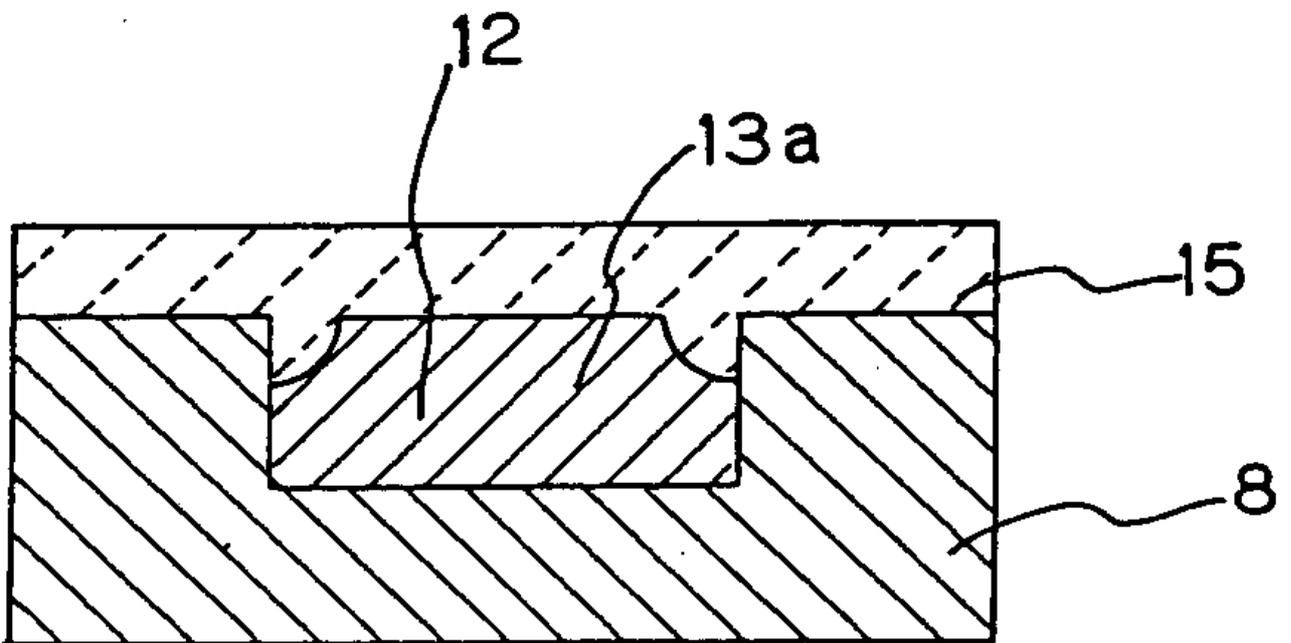
4d



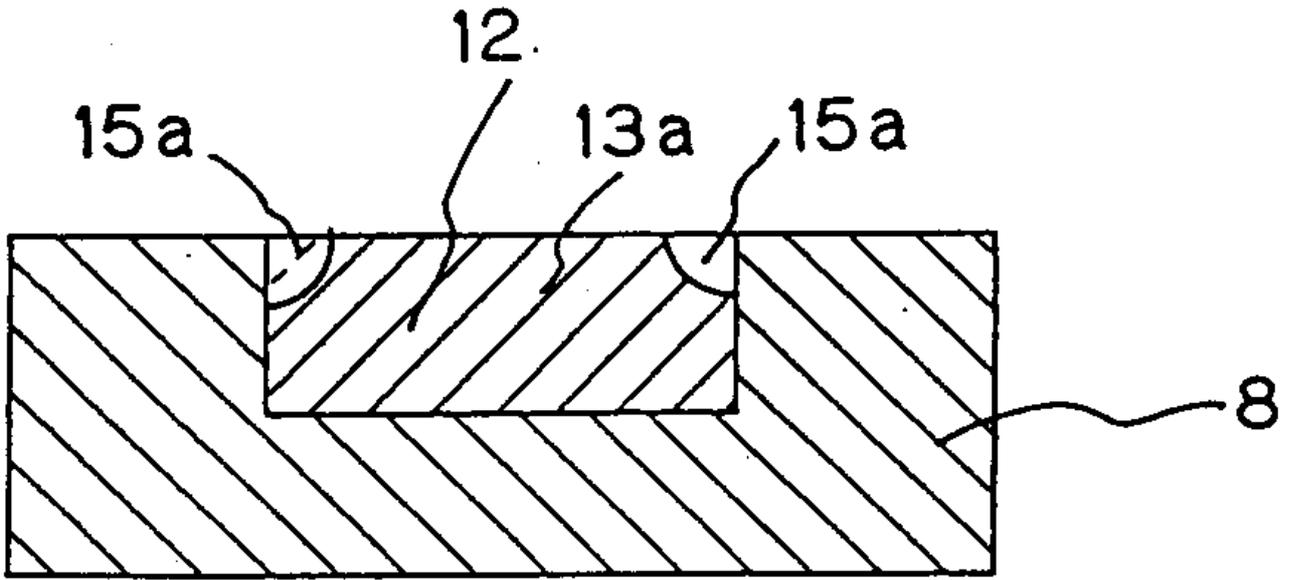
5a



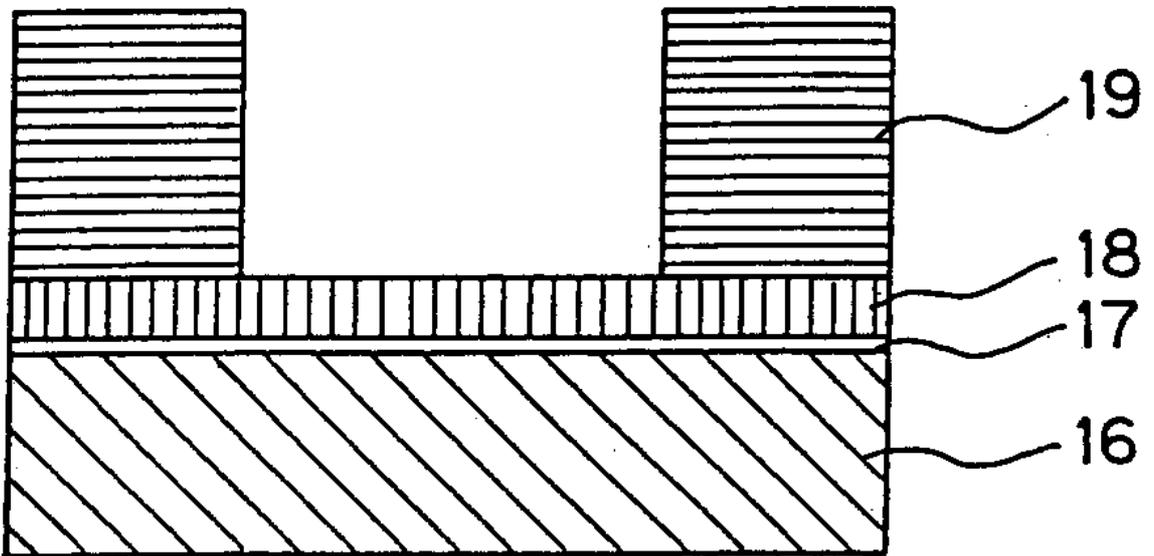
5b



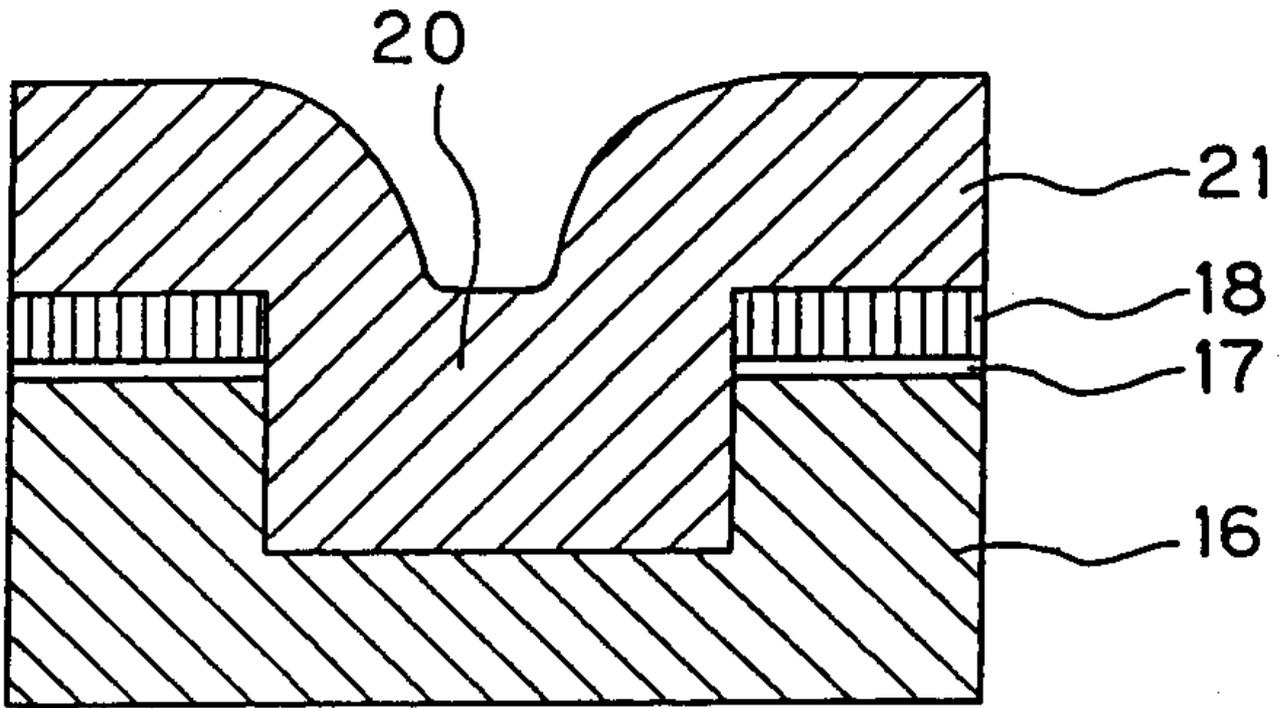
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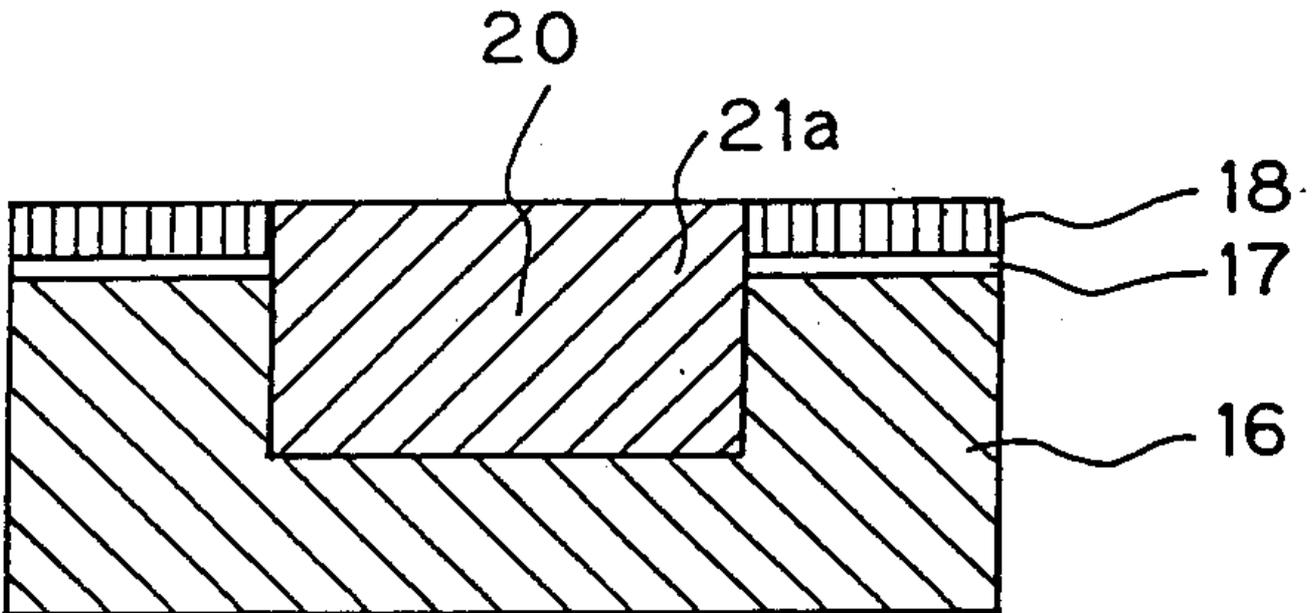
6a



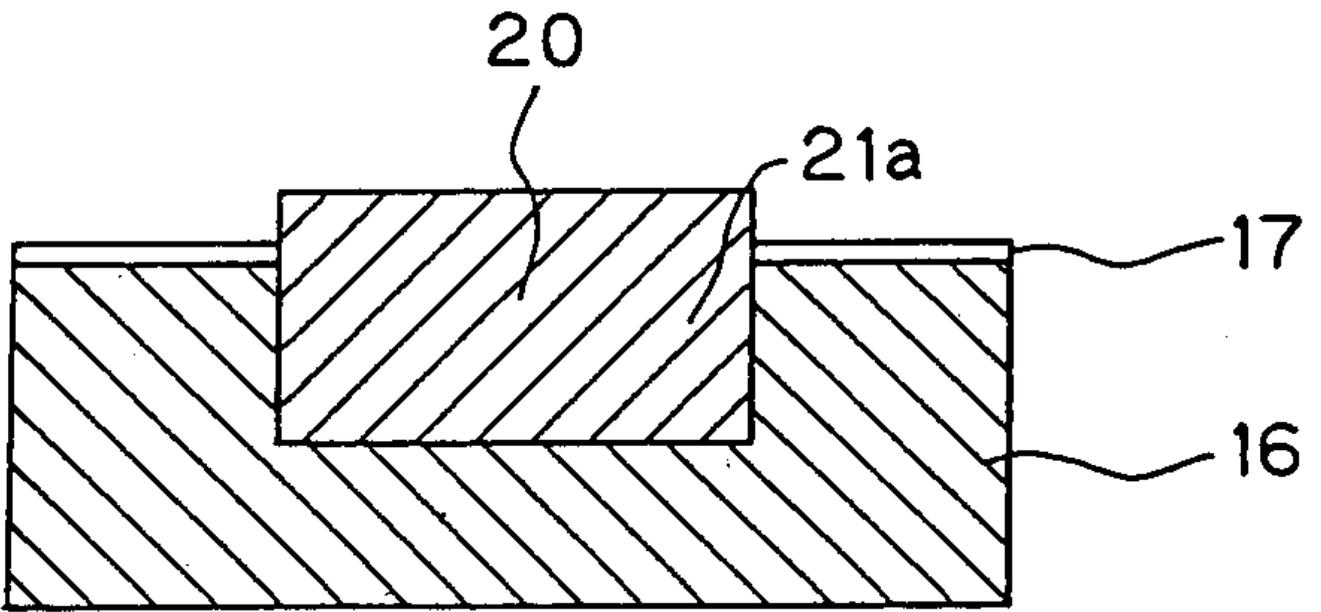
6b



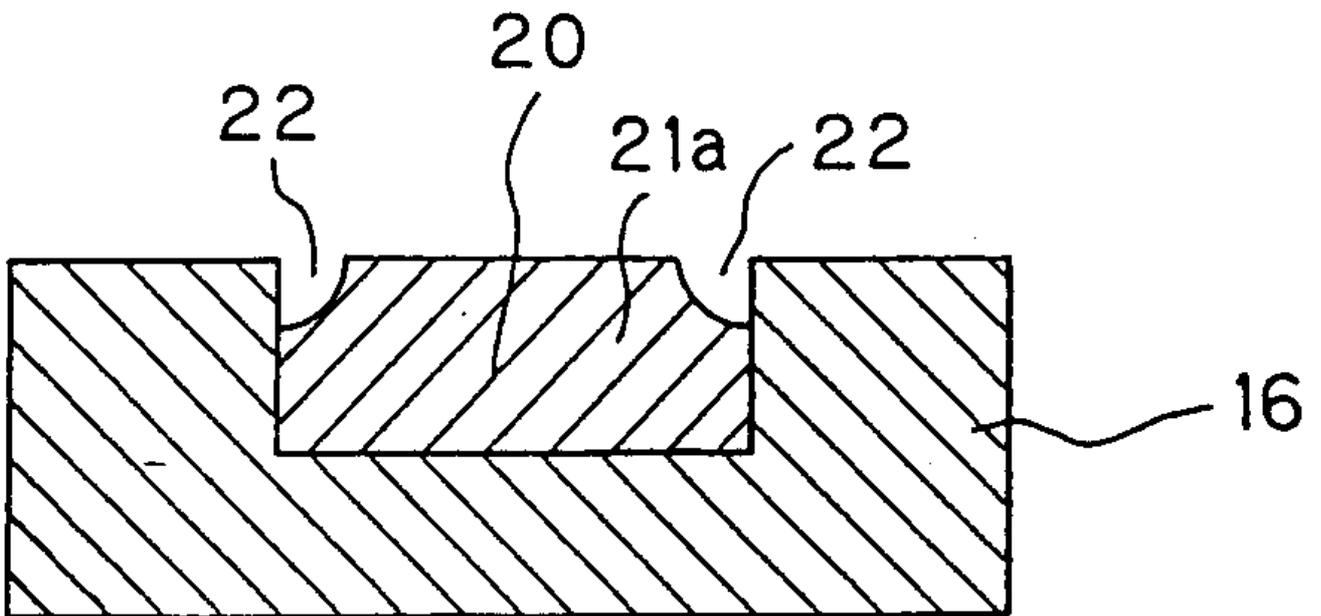
6c



6d



6e



7

