

(19) (KR)
(12) (B1)

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 (24) 2001 05 04

(21) 10 - 1997 - 0073299 (65) 1998 - 0064586
(22) 1997 12 24 (43) 1998 10 07

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(74)

(54)

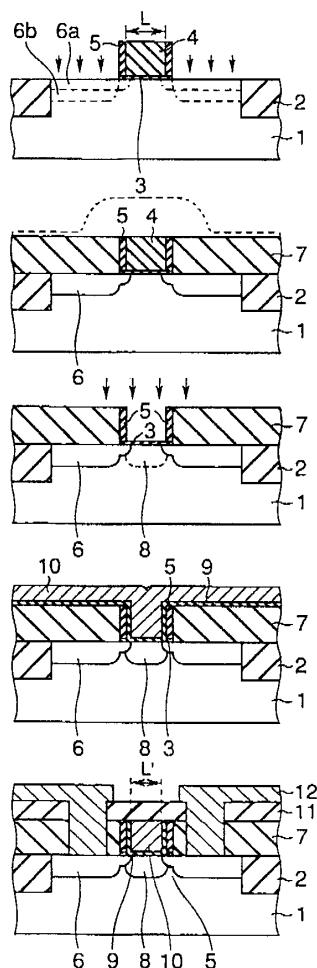
$$(4) \quad (1) \quad (1) \quad / \quad (4) \quad (6) , \quad (4) \quad (7) ,$$

(4)

(10)

(9)

(9)



1	1
2	1
3	2
4	2
5	3
6	4
7	5

8		6
9		6
10		6
11		7
12		
13	2	1
<		
1 :		
4 :		
6 :	/	
7 :		
9, 9a	9e :	
10, 10a	10d :	

(SiO_2) MOS

,
800 1000
) Si
 (/

12a 12b (31)
, (32) STI(Shallow Trench Isolation) , (33)
(34) , (35) /
, / (35) , / (35) (34)
, 12a (34) , (35) / (35) ,
SiO₂ (33) 가
, (34) / (35) (34)
가 (33) 가 가 (900, 30)
,
,
,
,
MIS ,
,

, CVD

, Ta_2O_5 , Ba, Sr Ti
 Ba, Sr Ti
 . SiO_2 Si_3N_4 , Ta_2O_5 , Ba, Sr Ti
 SiO_2 , CVD - $SiON$, CVD - Si_3N_4 (Ba, Sr) TiO_3
 2 CVD -

, p 가 n 가

MIS

MIS

11

，
三

1

/ 가

RIE CMP
가 CMP RIE
. , /

가

	2a	2e	13a	13e	1
	2a	2e	13a	13e	A - A'

, 2a 13a $5 \times 10^{15} \text{ cm}^{-3}$ p (1; n
 p Si p n Si $1\mu\text{m}$ p () , p
 n () , n

, RIE Si (1)
(2) 0.2μm STI)

, 5nm SiO₂ (3) SiO₂ (3) (4) Si₃N₄ Si₃N₄
 300nm RIE 가 (7;
 SiO₂) Si RIE SiO₂ (3) Si (1) R
 IE 가 (4) (2)

, LDD 70KeV, $4 \times 10^{13} \text{ cm}^{-2}$ (4) Si₃N₄, SiO₂, (P⁺)
 RIE (4) 20nm SiO₂ (5), LDD
 (A₆⁺) 30KeV, $5 \times 10^{15} \text{ cm}^{-2}$, n⁻ (6a) (6b)

, LDD (6a) (6b) / L L L

, 2b 13b , CVD - SiO₂ (2b)) , 30
 0nm / (6) , 800 N₂ 30 (densify) .
 CMP , 950 10 RTA (Xj) 750

, 2c 13c , (4) (7) (5) (2)
 SiO₂ (3) , (B⁺) 10KeV, $5 \times 10^{12} \text{ cm}^{-2}$ 0.7V (Vth)
 SiO₂ SiO₂ SiO₂ (3) p
 , RTA 800 , 10 (8)

, 2d 13d , SiO₂ (3) , Si
 (9) Ta₂O₅ 20nm , Si RTP
 NH₃ 가 Si (1nm) SiO₂ () Si₃N₄ () CVD - SiO₂ CVD - SiON
 CVD - Si₃N₄ (Ta₂O₅, (Ba, Sr) TiO₃) , , 1000 , 10
 RTP , Si 가 가

, [10; Ru, TiN, W, (WN_x)
] , CVD - SiO₂ CVD - SiON, CVD - Si₃N₄
 Si

, 2e 13e , CMP (10) (9) L'
 (4) , L (9) 2 , 2e
 2a 가 L(0.15μm 가), 2 , 2e
 2 , 0.02μm × 2 = "0.04μm " 가 0.02μm
 L 0.11μm 가 0.15μm

, (11) SiO₂ 200nm / (6)
 (10) Al 1 가 .
 /
 , 가

, 가 RIE CMP 가 (, 가
 RIE) (,)

, / , /
 , (Vth) /
 , /
 , 가 2

, CVD STI Si
 () 가

, 2 3 4
 3a 3b 1 2b 2c , 2

2 1 Si₃N₄,
 (7) SiO₂ (4) RIE Si₃N₄ (4) Si Si (1) S

, 3 LDD / (4') / Si / (6)
 . . /
 , Si 1 /
 LDD 4a 4b 2b 2c /
 Si (4') (5) Si_3N_4 (3) Si_3 (5')
 N_4 가 (L')
 , 3 5
 5 1 2a 2c , 2
 2 1 SiO_2 (3) (8) () / (6) (8)
 (8) /
 , 4 6 , 2
 2 1 / / (6) (14) /
 (6) (14) (600, 30) (14) (14)
 , 5 7 , 2
 2 1 / / Si / Si / Si (15)
 , 50nm Si /
 Si (15) (15) (15) (15)
 700 Si Si (15) (1000) Si Si (15)

6

8a 6 , 8b

1
 (21) 8a 1 8b
) 1 m ,

, 9a 10d , 2

, 9a 1 1 2b
 CMP , (4) , (Vth) 3 (5) (8a, 8b)[
 (8a, 8b) / (6) / RTA , 800 , 10
 , 1 ,

, 9b (4; Si₃N₄) ()(hot) (4; Si₃N₄)

, SiO₂ (3) Si (1) , (9a) (9b) (9a) (9b)
 (9a) Si (1) 2nm Ta₂O₅ , 1nm
 Si₃N₄ , Bi₄Ti₃O₁₂ , PZT, PLZT, BiSr₂TaO₉, BaMgF₄ 20nm (Ba, Sr) TiO₃
 (CeO₂) , (10a) , Pt, Ru, Au, TiN, W, TiW , (Pd, Ir, Rh, Os)

, 10c , (10a) (9a, 9b) CMP
 , (4; Si₃N₄) ()
) , SiO₂ (3) Si (1) , (9c)
 , Ta₂O₅ 20nm , Si (1) , 1nm SiO₂ Si₃N₄
 [Ta₂O₅ (Ba, Sr) TiO₃] , b; Pt , Ru , TiW , WN_x , TiN , W , (10)

, 10d (10b) (9c) CMP
 . () Al SiO₂ 200nm ()

, 1
 () 가

, 7 11
 , 6 (8) 6
 , 9
 , 11a 11a 9a 9b

, (4) (8d) (8d)
 , 6 CMP (10c) (9d) 9
 / (6) (8c)

, 11b
 , (9e) CVD - SiO₂ CVD - Si₃N₄ (8e) (10c)
 + Si , 800 가 /
 , (8e) 가

, /
 가 , 2
 , 가

, /
 RIE CMP RIE

(57)

1.

,
 1 ;
 ;
 1 ;

2.

1 , 1 가

3.

1 , 1 SiO_2

4.

1 , 1

5.

4 , SiO_2

6.

1 , 1 $\text{Ba}, \text{Sr}, \text{Ti}$

7.

6 , 1

8.

7 , SiO₂

9.

1 , 1

10.

1 , 2 ;

2 , 2 , 1 SiO₂ 2

11.

1 , 2 ;
2 2 , 2 1

12.

11 , 2

13.

1 , 1 2 ;
2 2

14.

1 ,

15.

14 , Si₃N₄ , SiO₂

16.

1 , 1 , , 1

17.

1 , / LDD (Lightly Doped Drain)

18.

,
1 ;
;

1 1 - 1 Ta_2O_5 -

;

1 ,

1 , , 1 , ,

19.

18 , 1 가

20.

18 , 1

21.

20 , SiO_2

22.

18 , 1 Ba, Sr, Ti

23.

18 , 1

24.

18 , 2 ;

2 , 2 , 1 2
 SiO_2

25.

18 , 2

26.

25 , 2

27.

18 , 1 2 ;

2

28.

18 ,

29.

28 , Si_3N_4 , SiO_2

30.

18 , 1

31.

18 , / LDD

32.

33.

32

가

34.

32

/

35.

32

/

36.

32

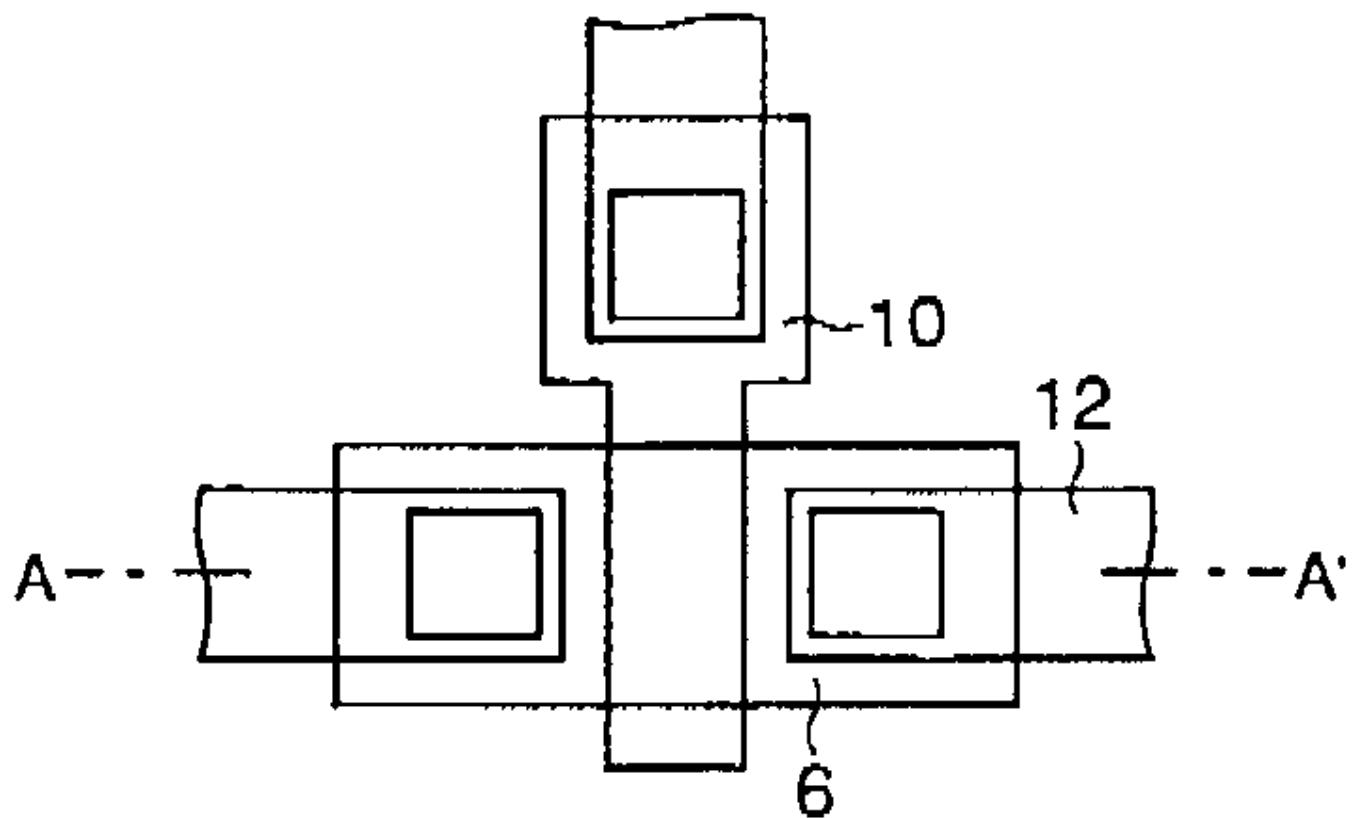
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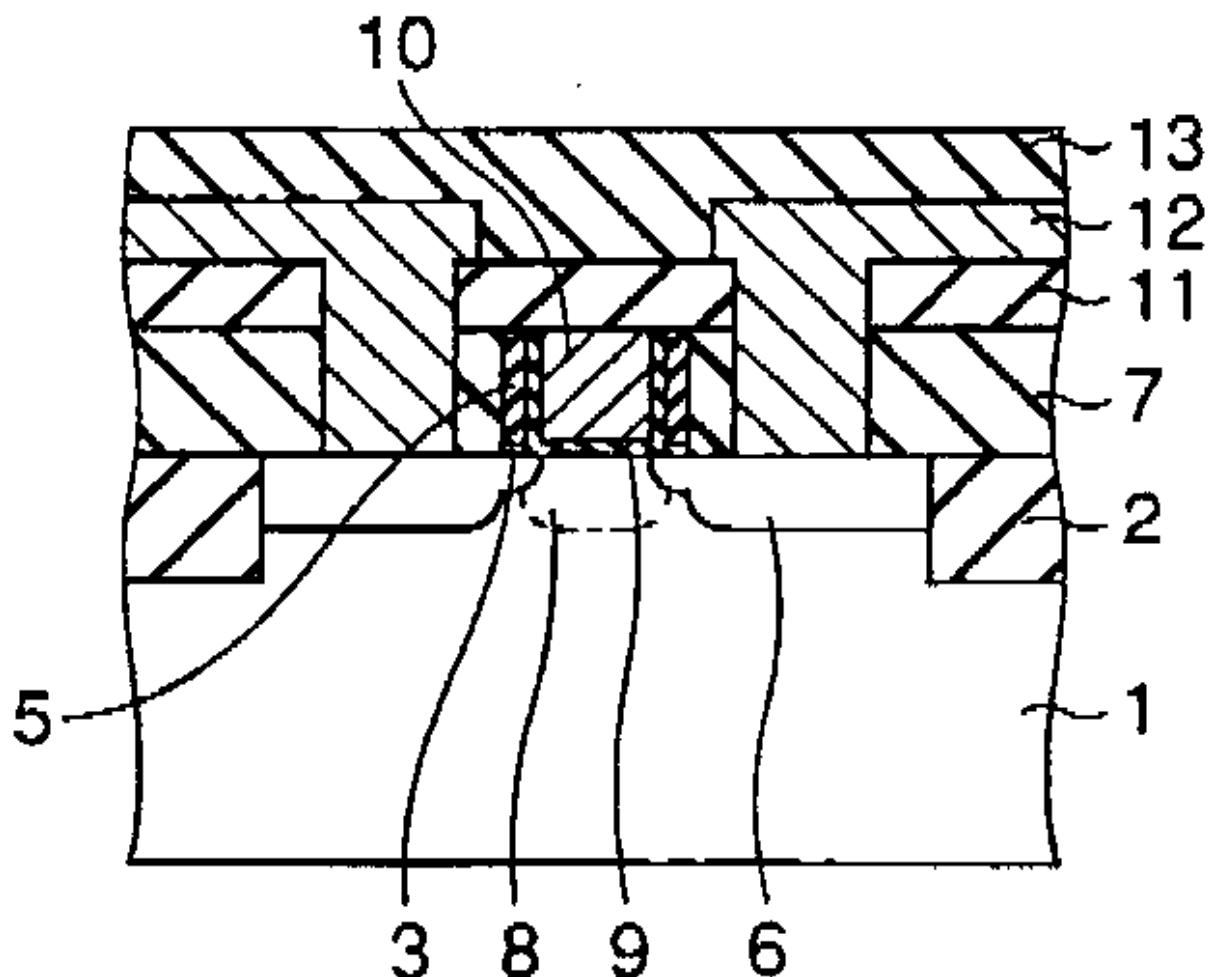
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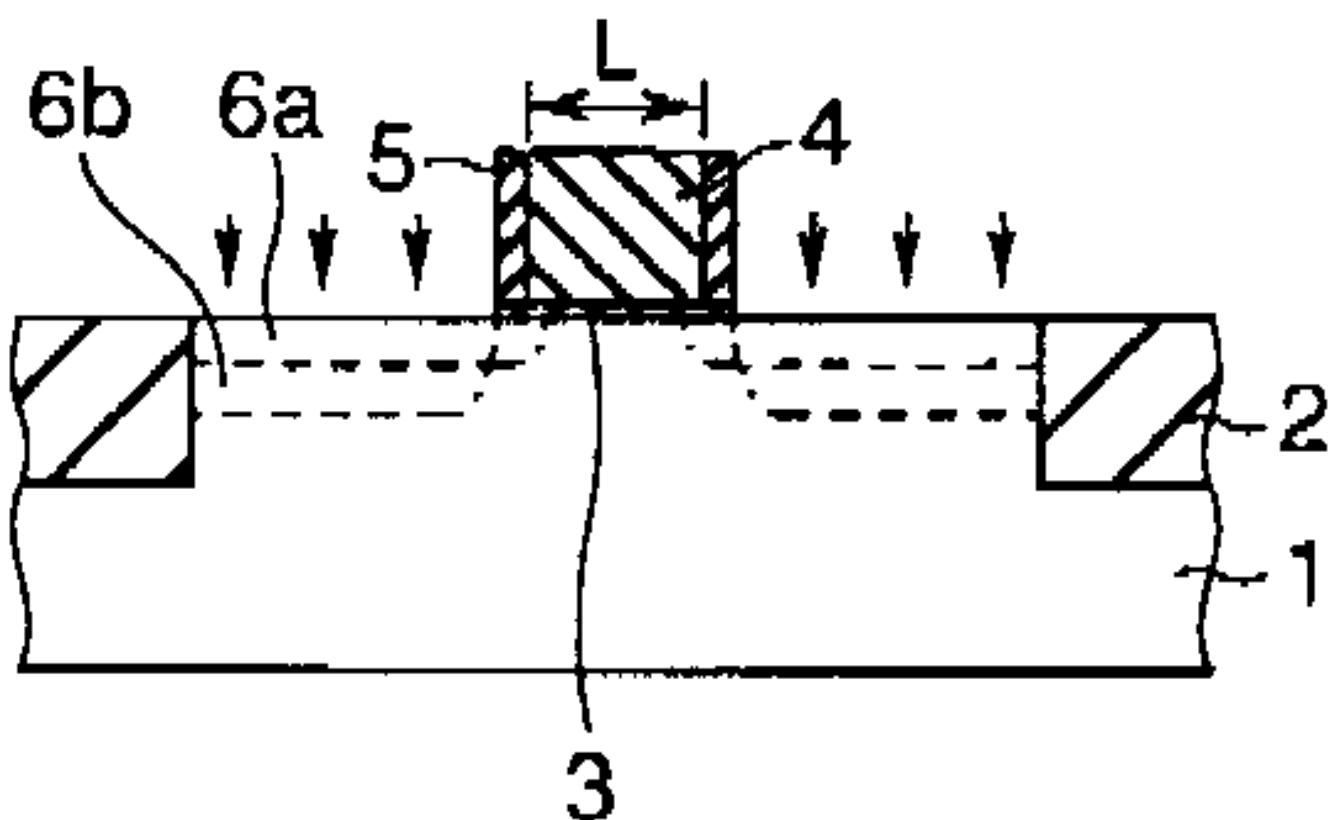
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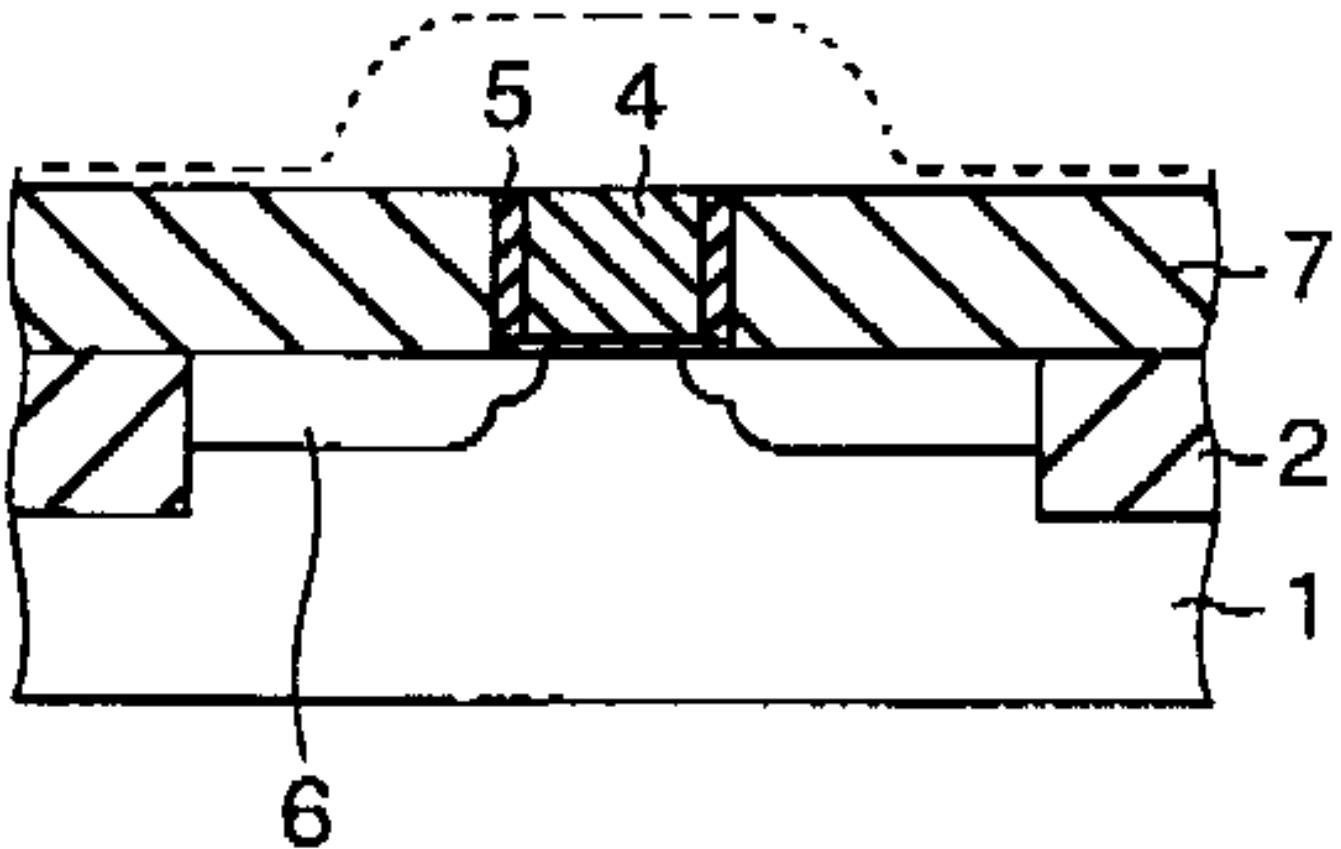
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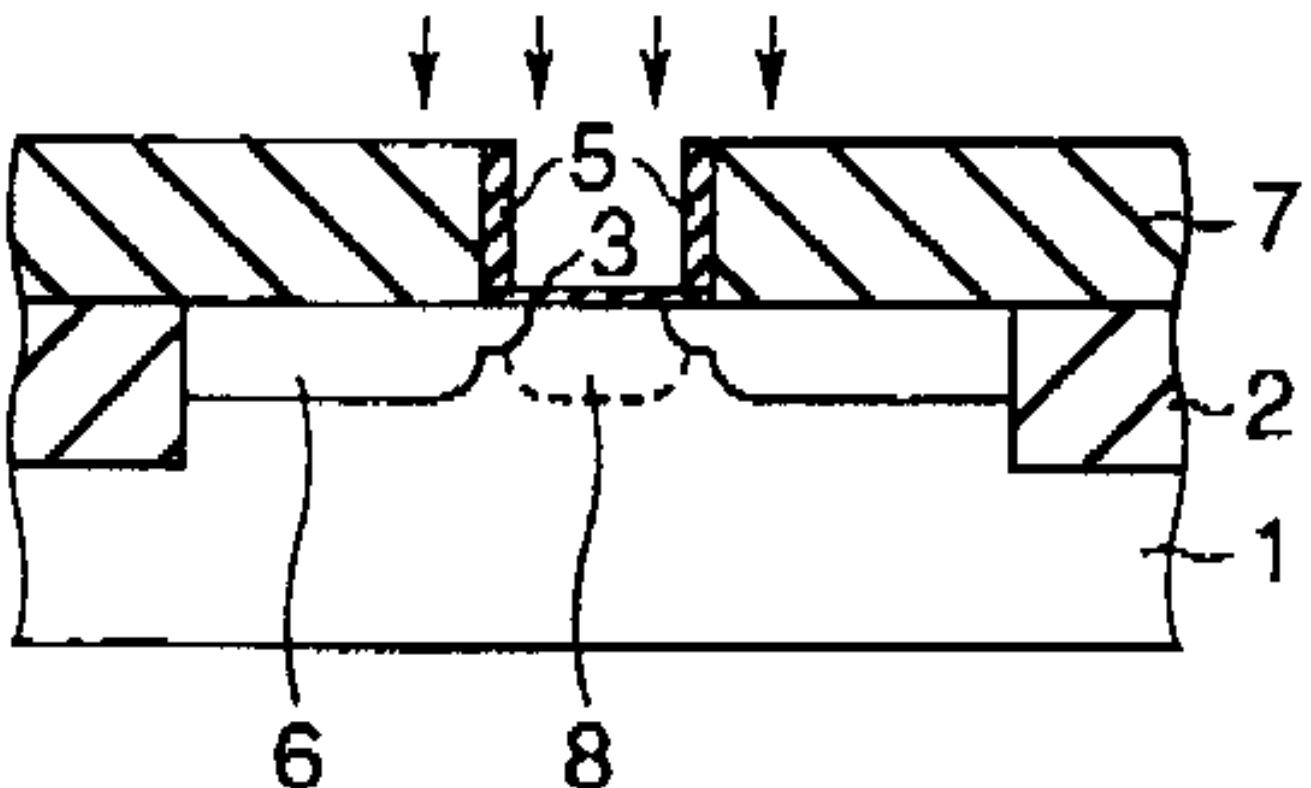
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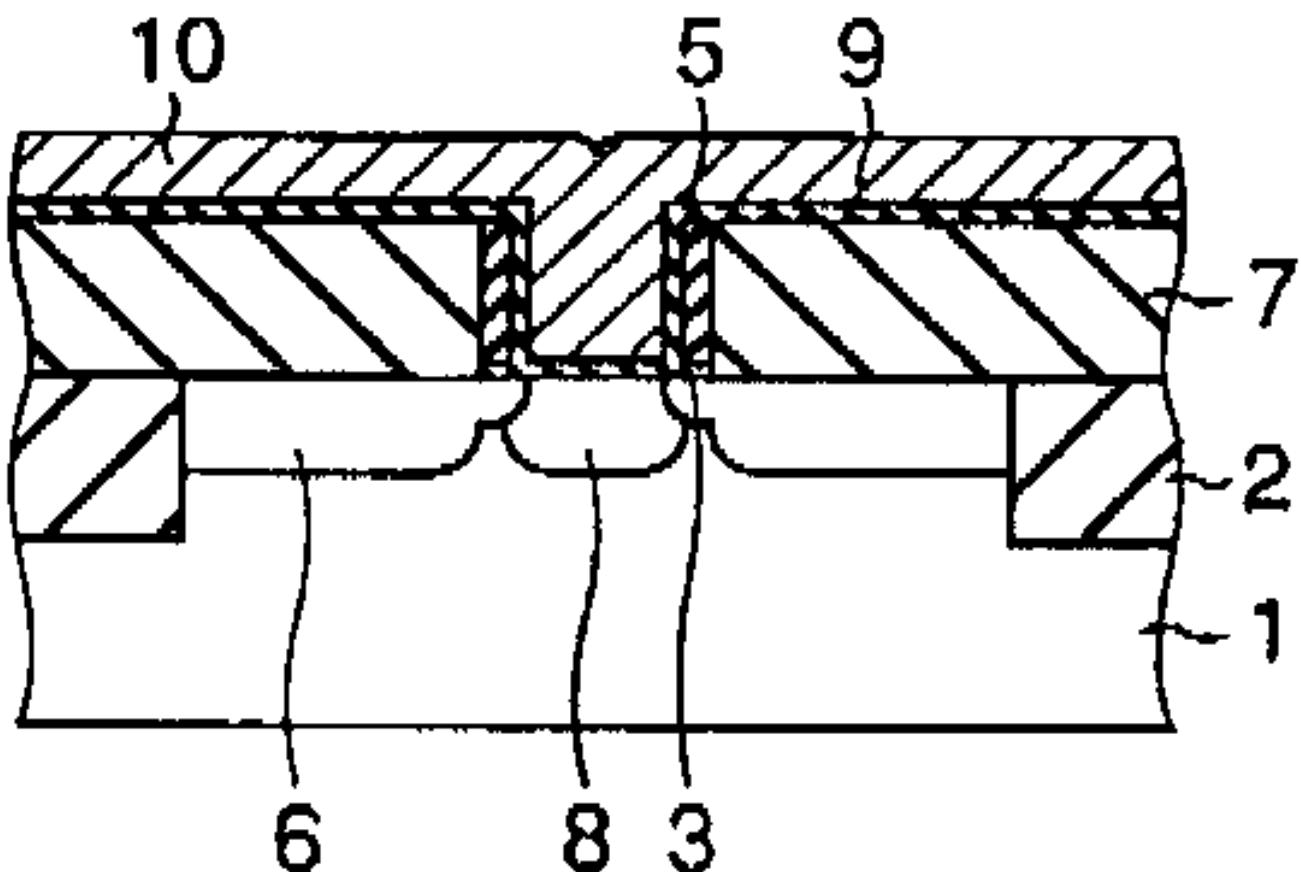
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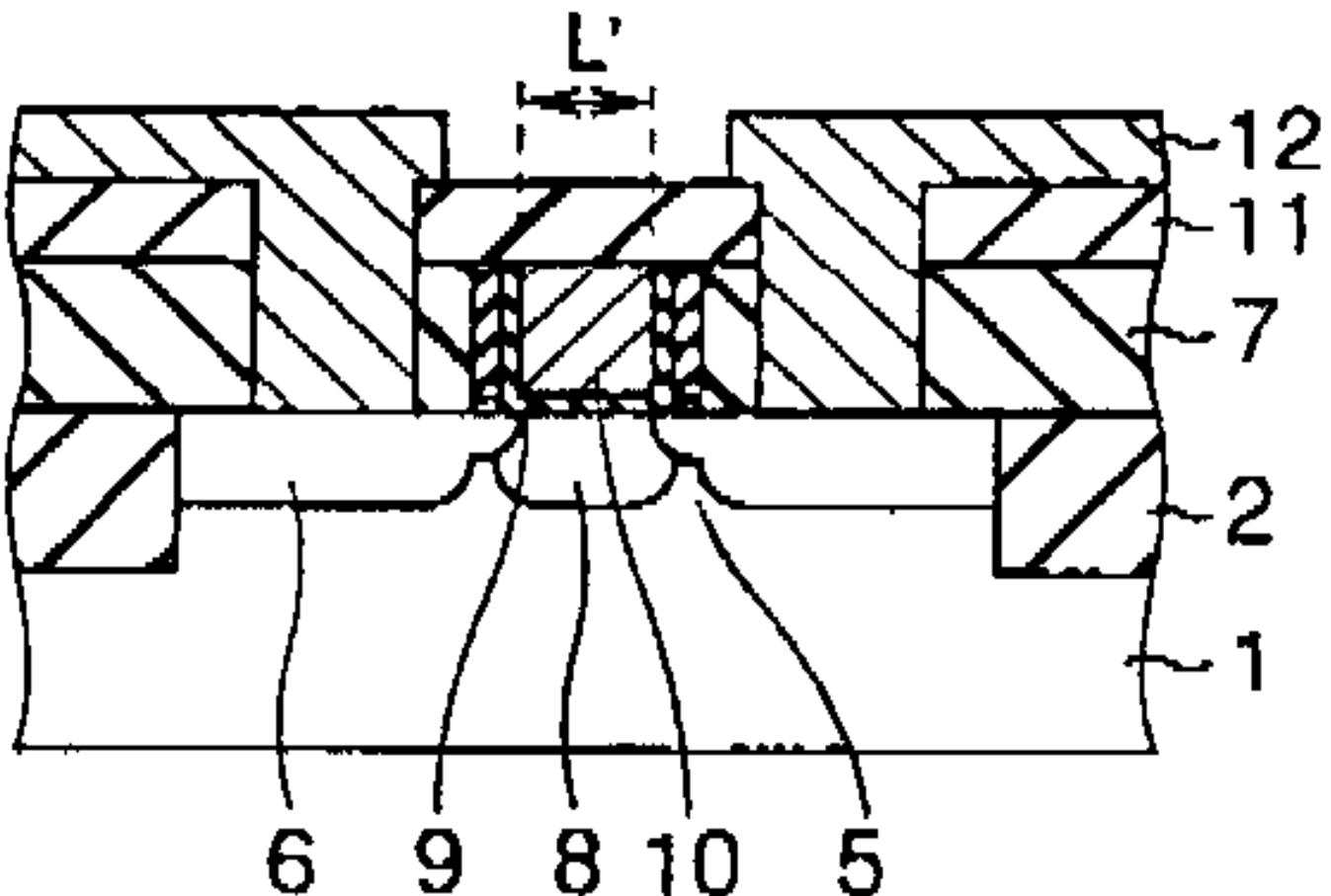
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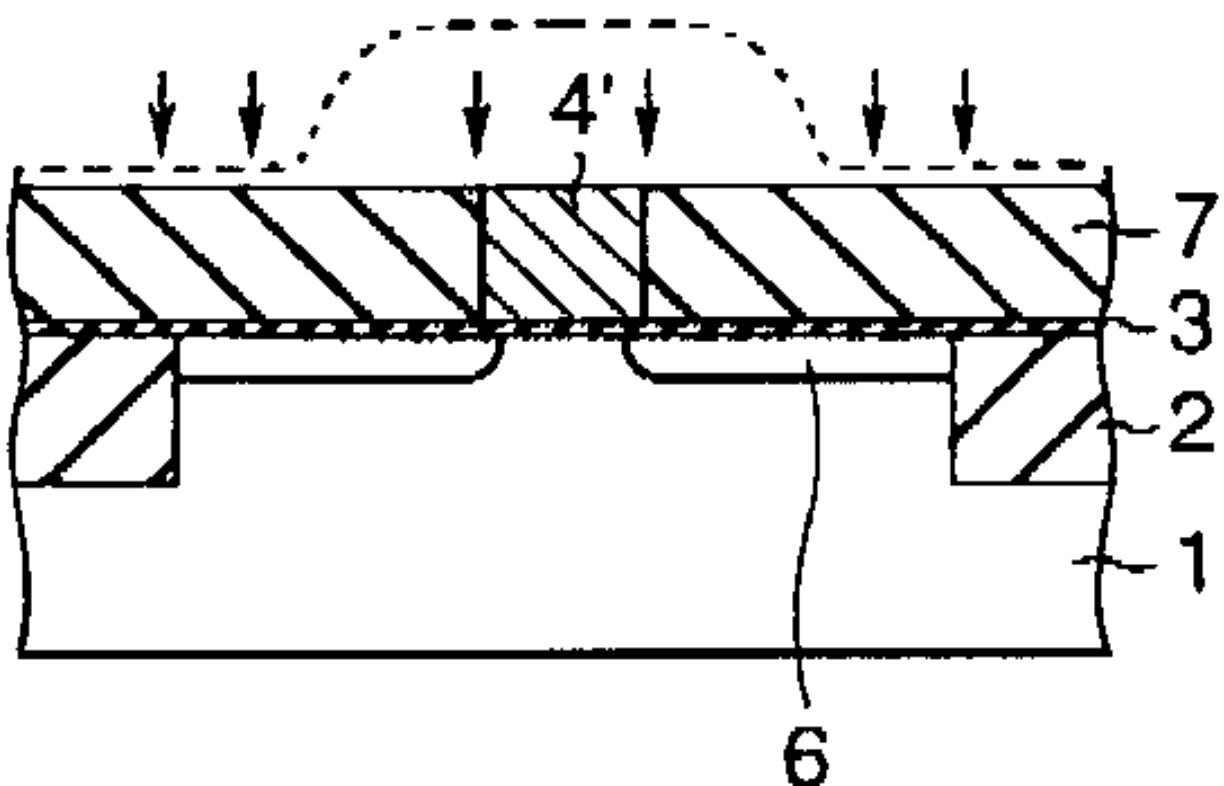
2d



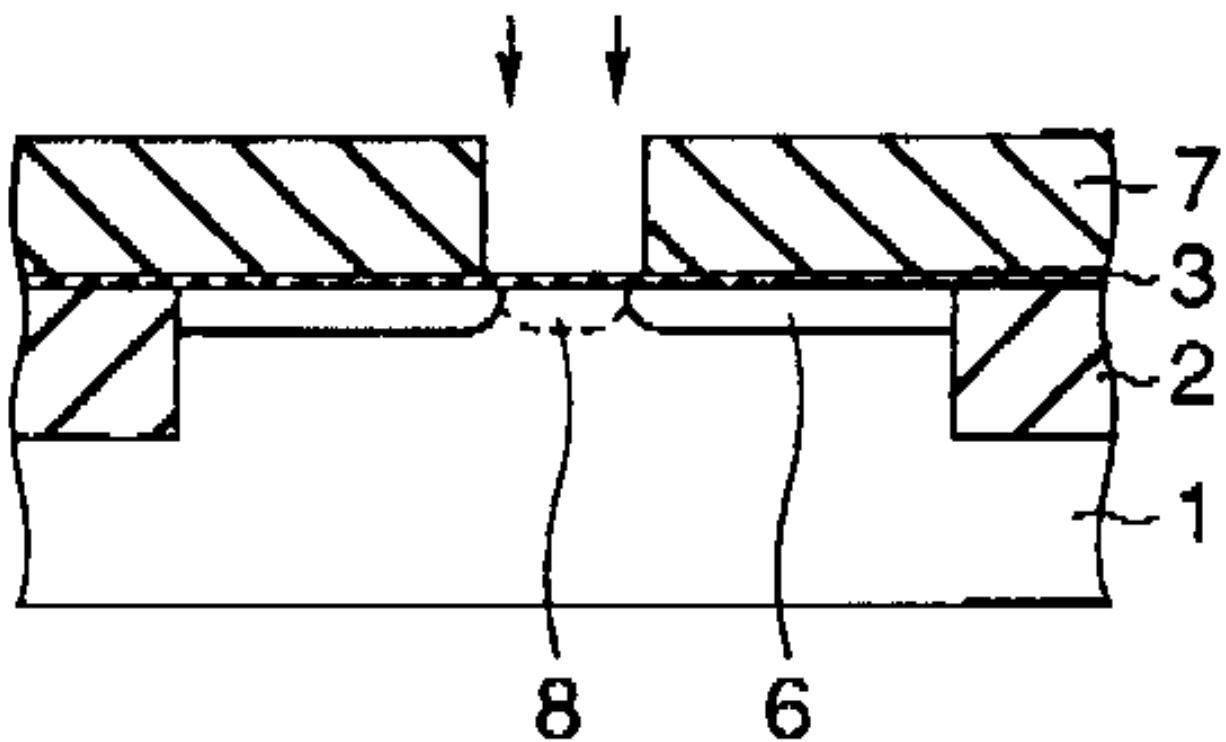
2e



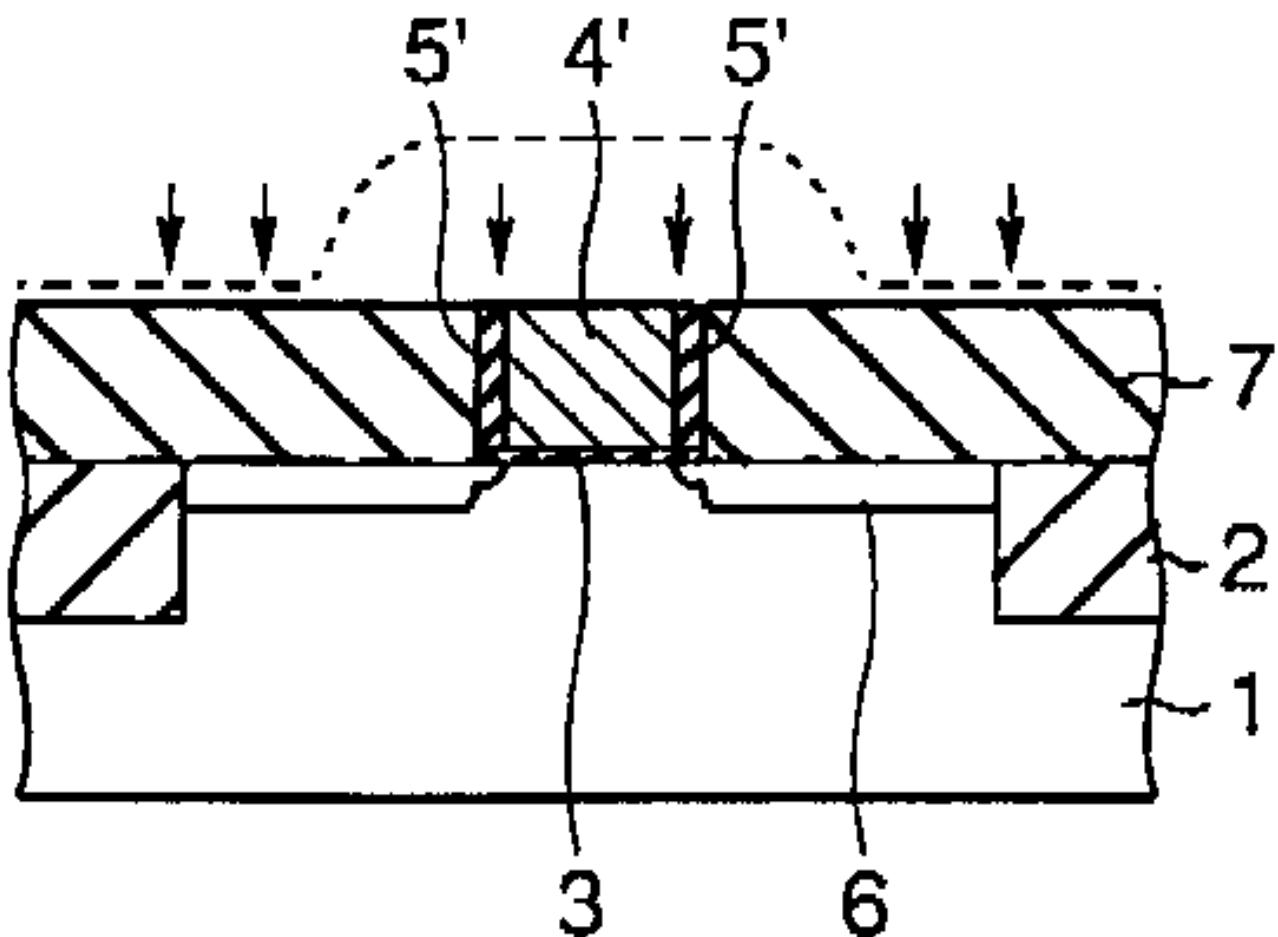
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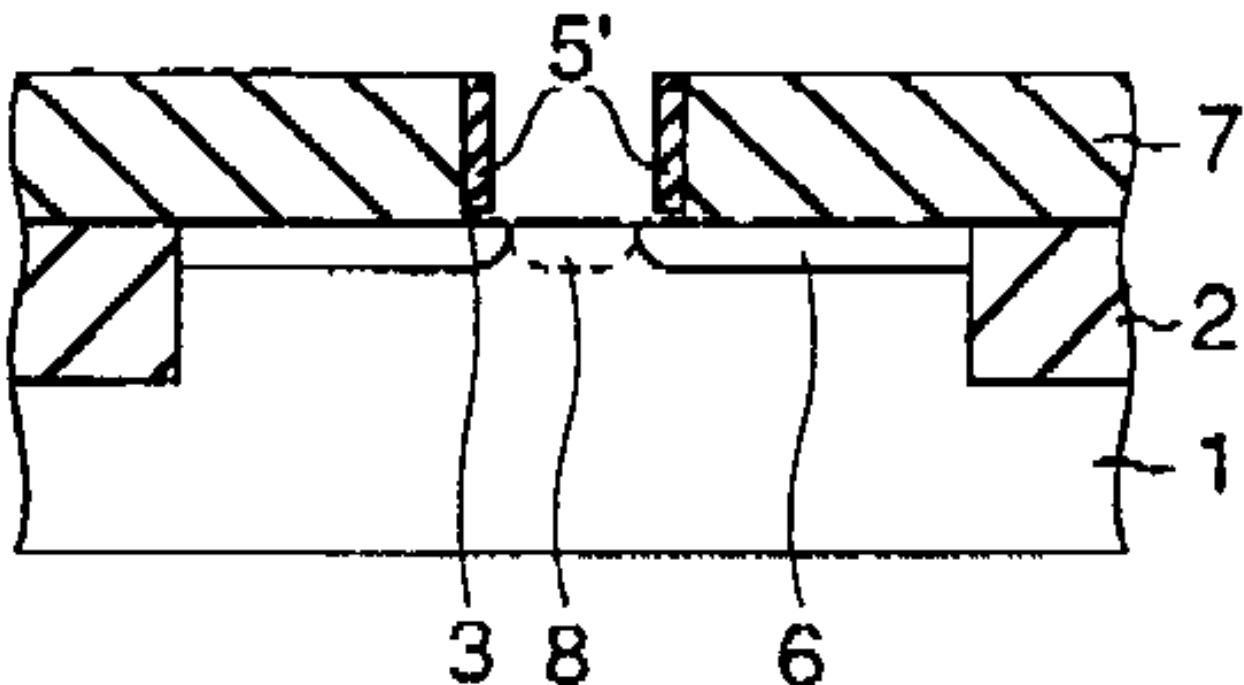
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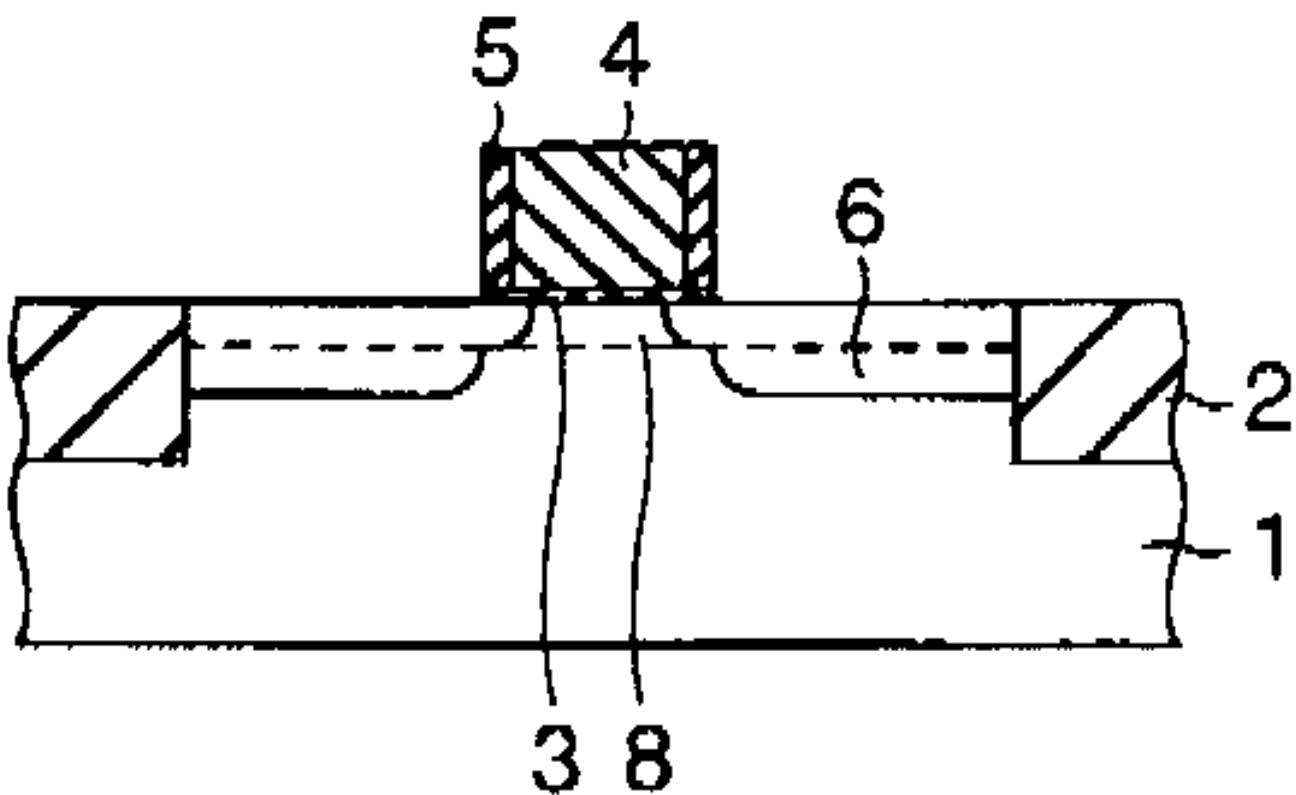
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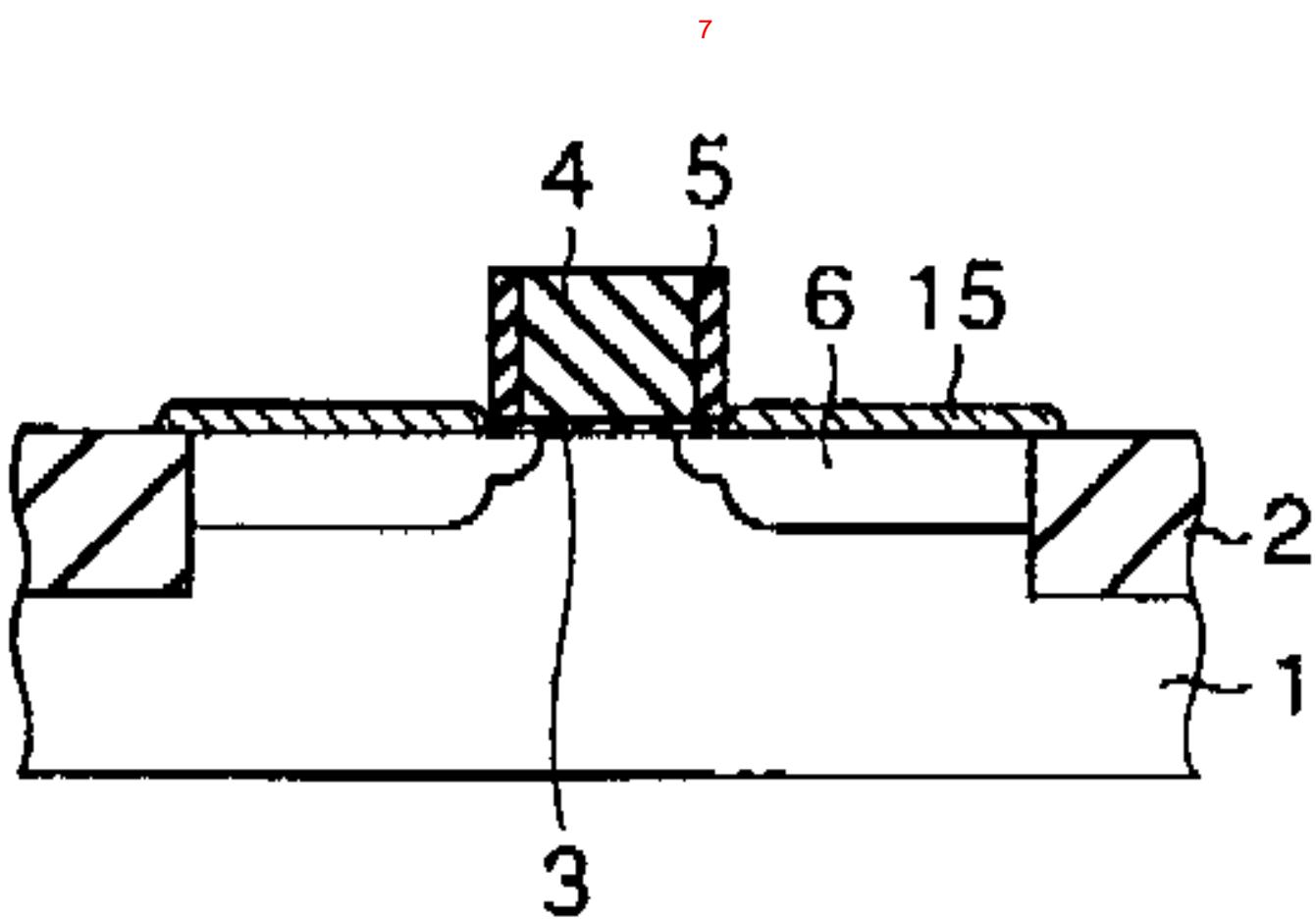
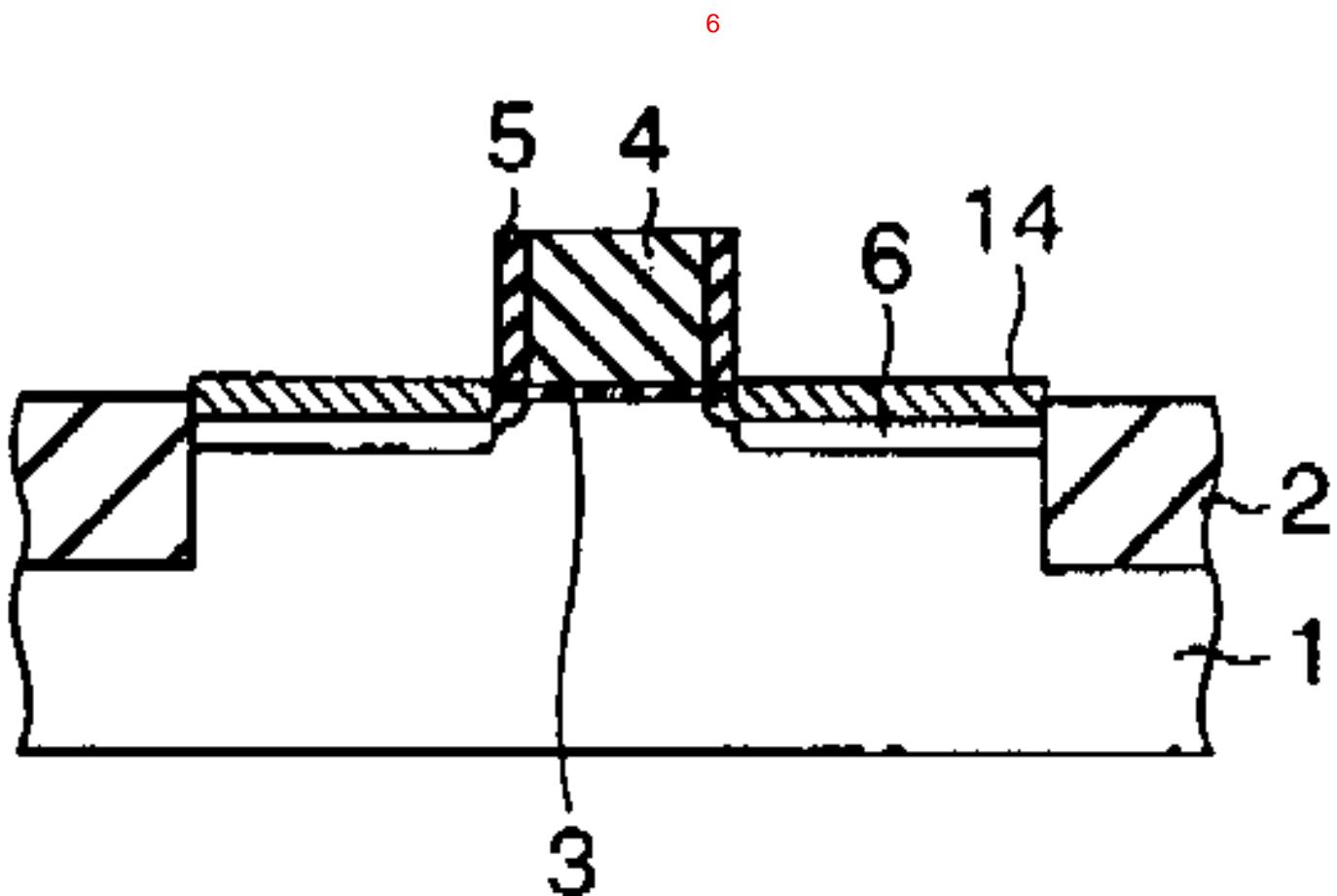


4b

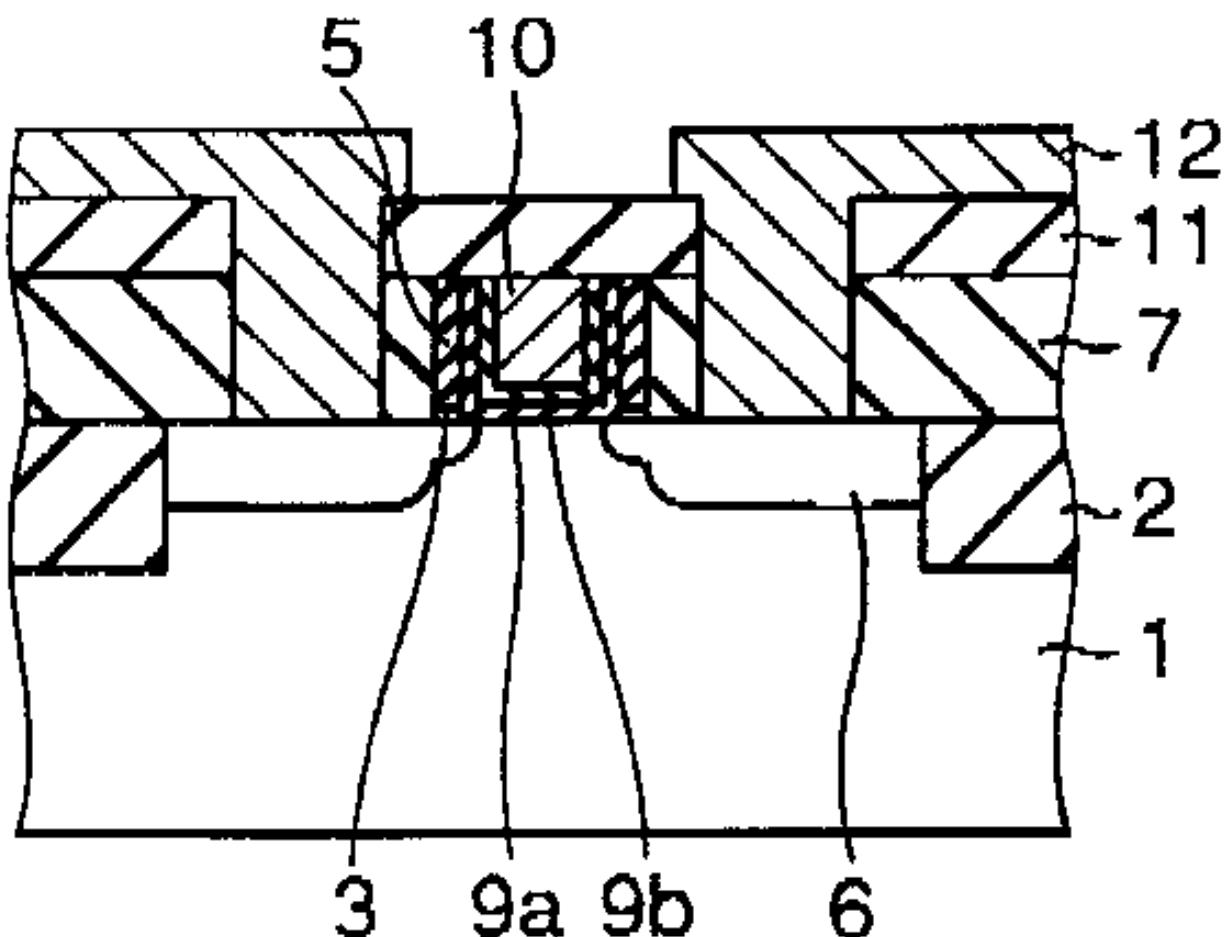


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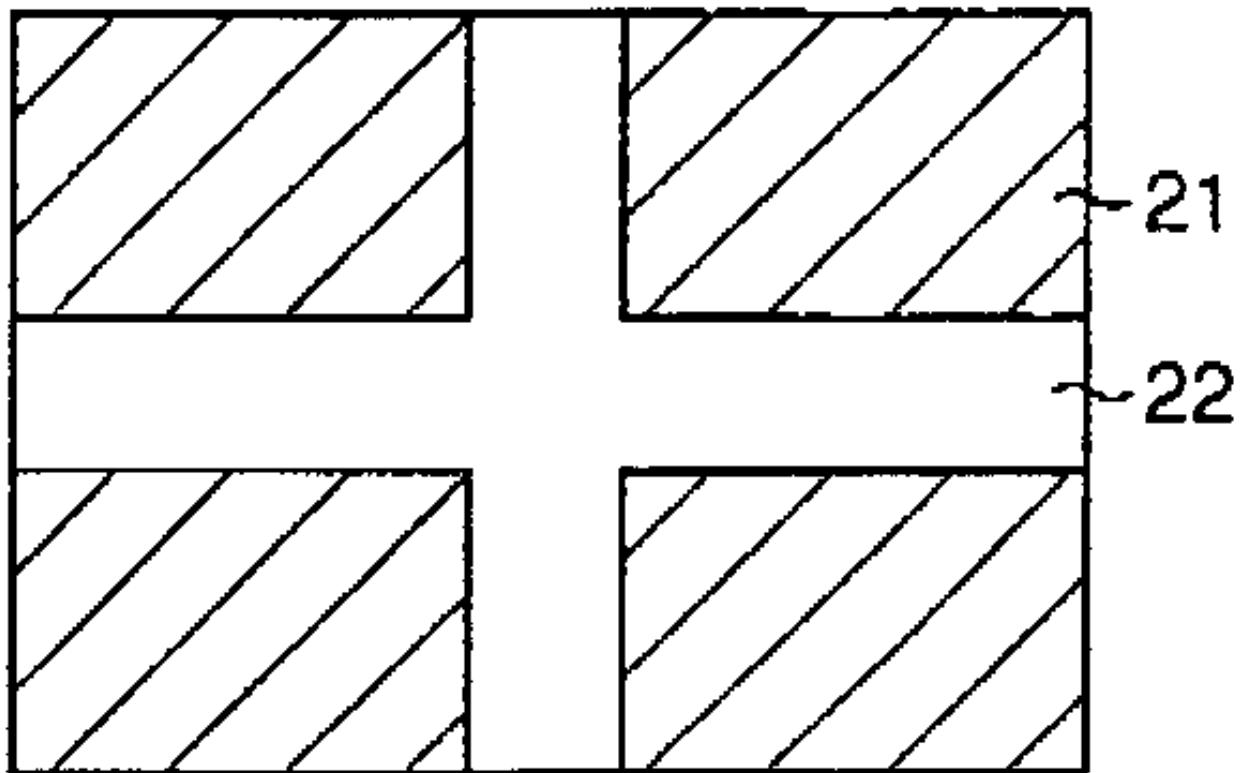




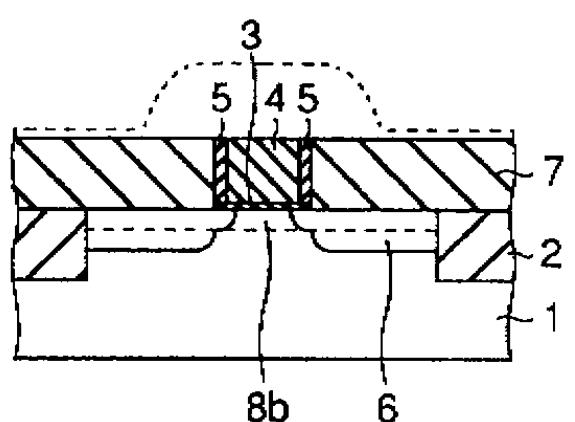
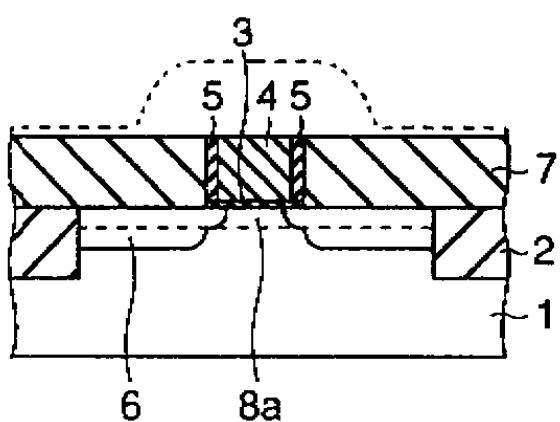
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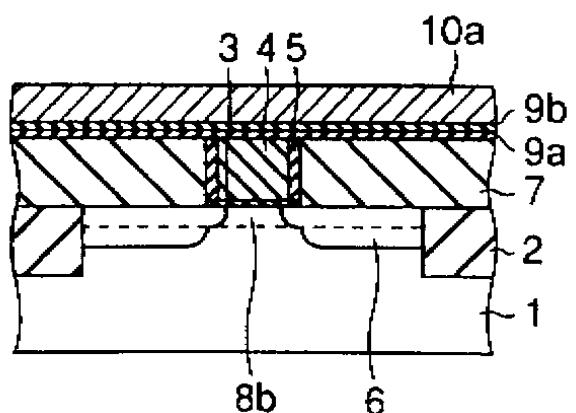
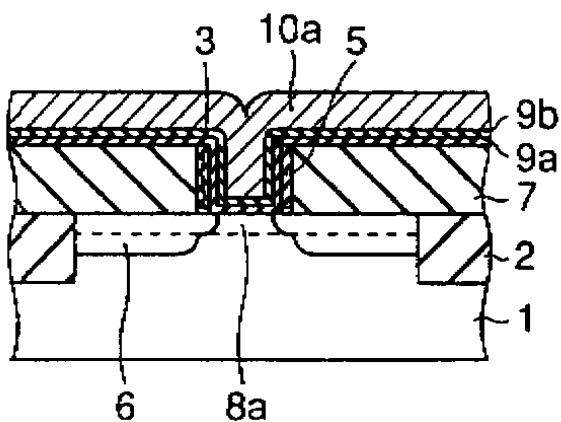
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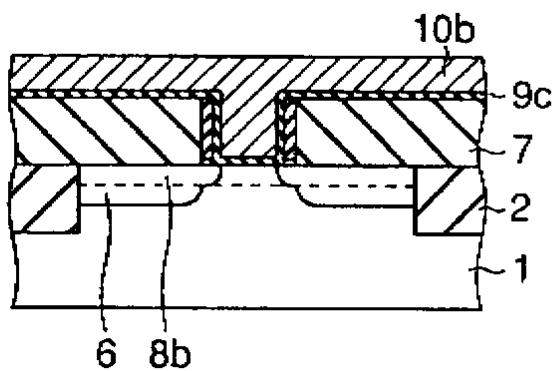
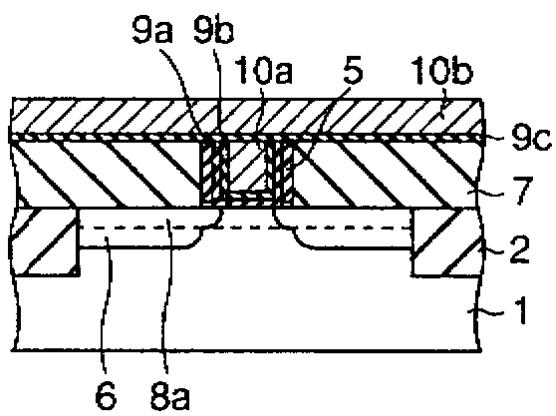
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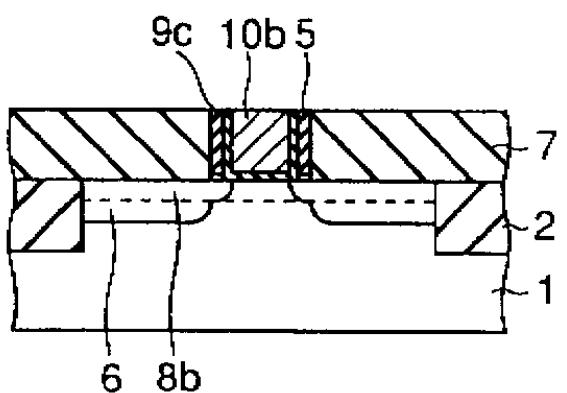
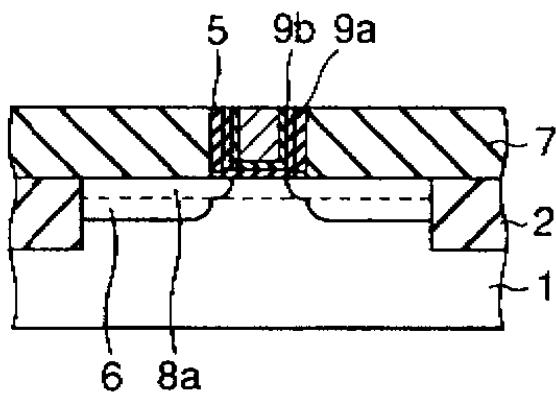
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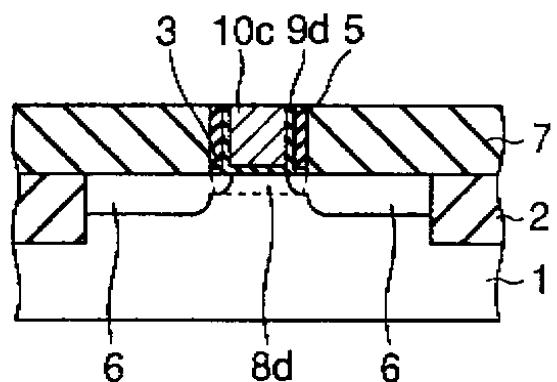
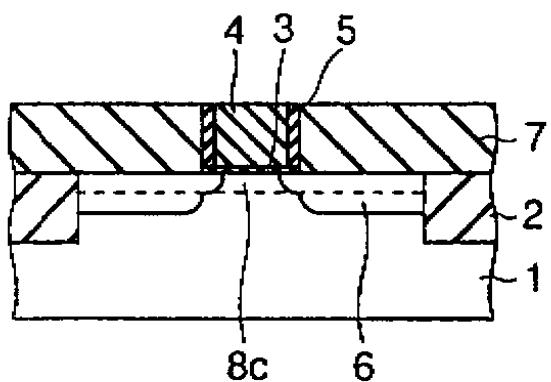
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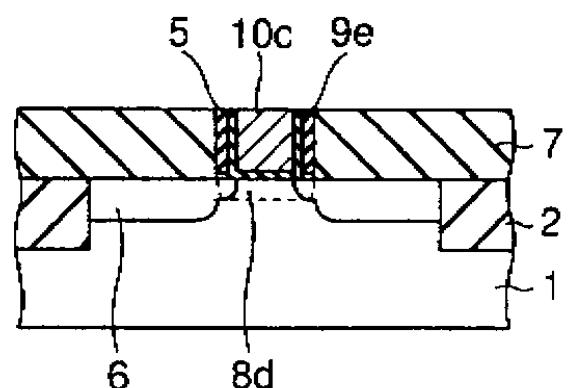
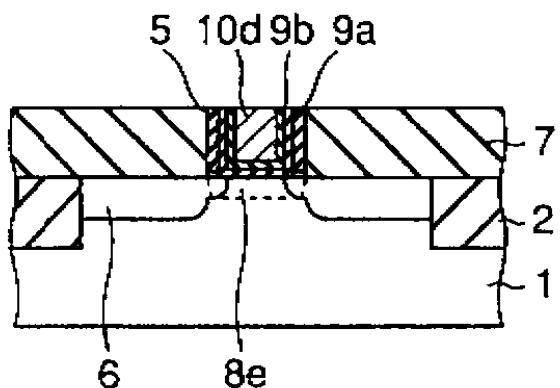
10b



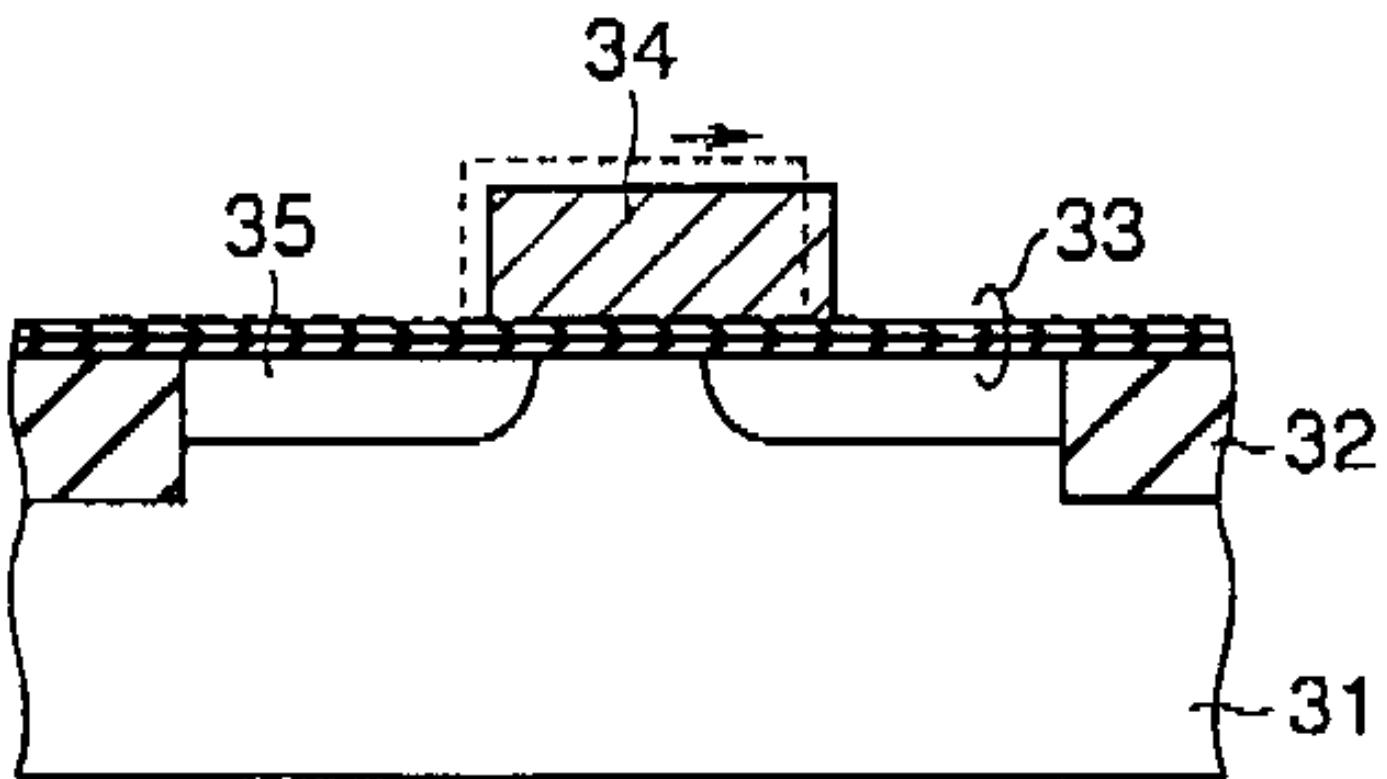
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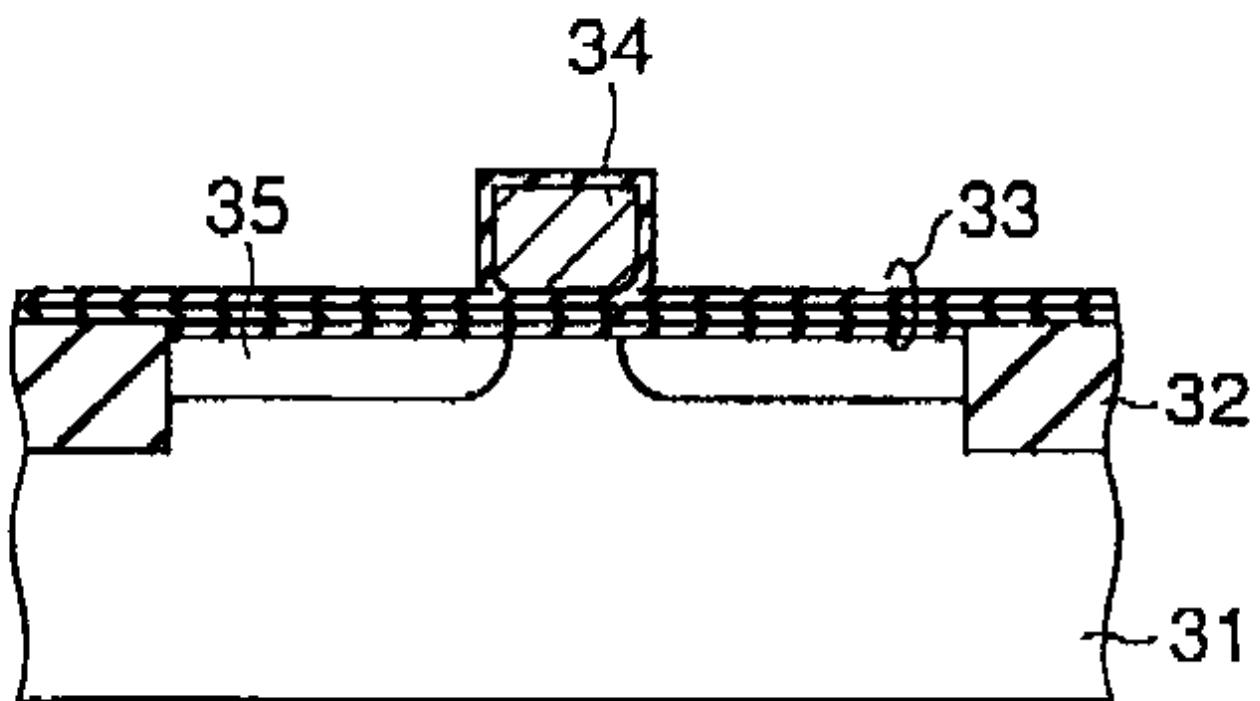
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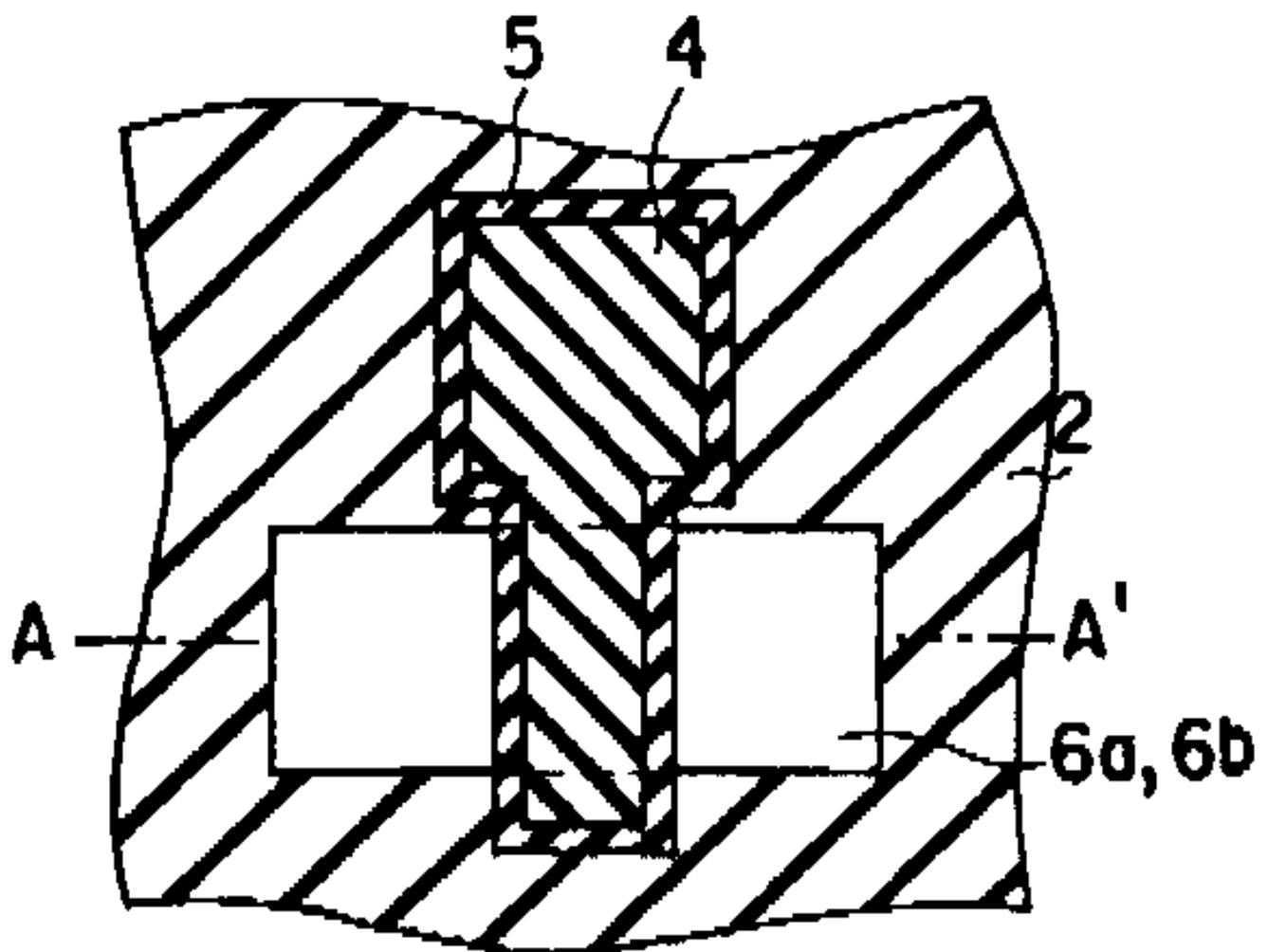
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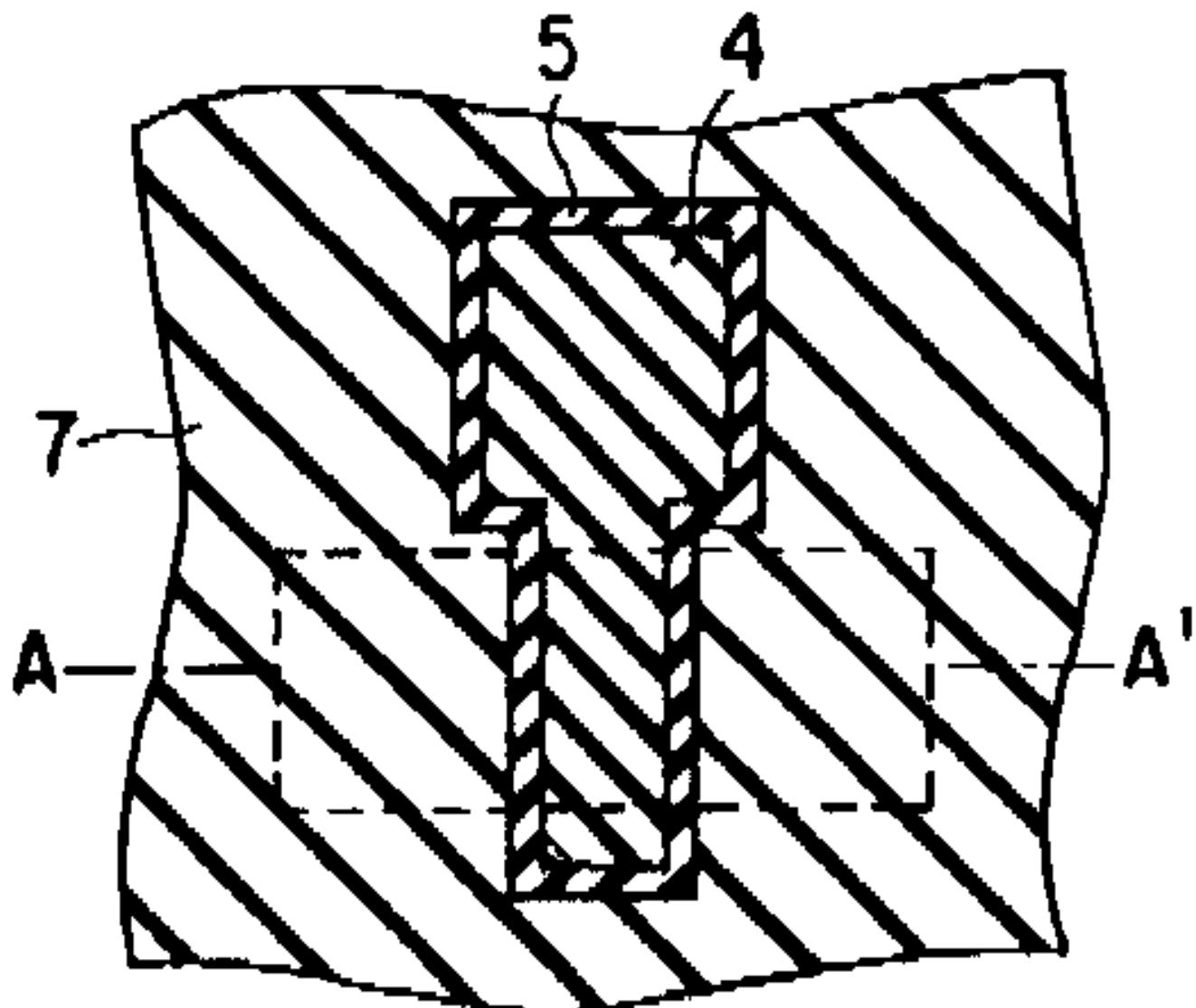
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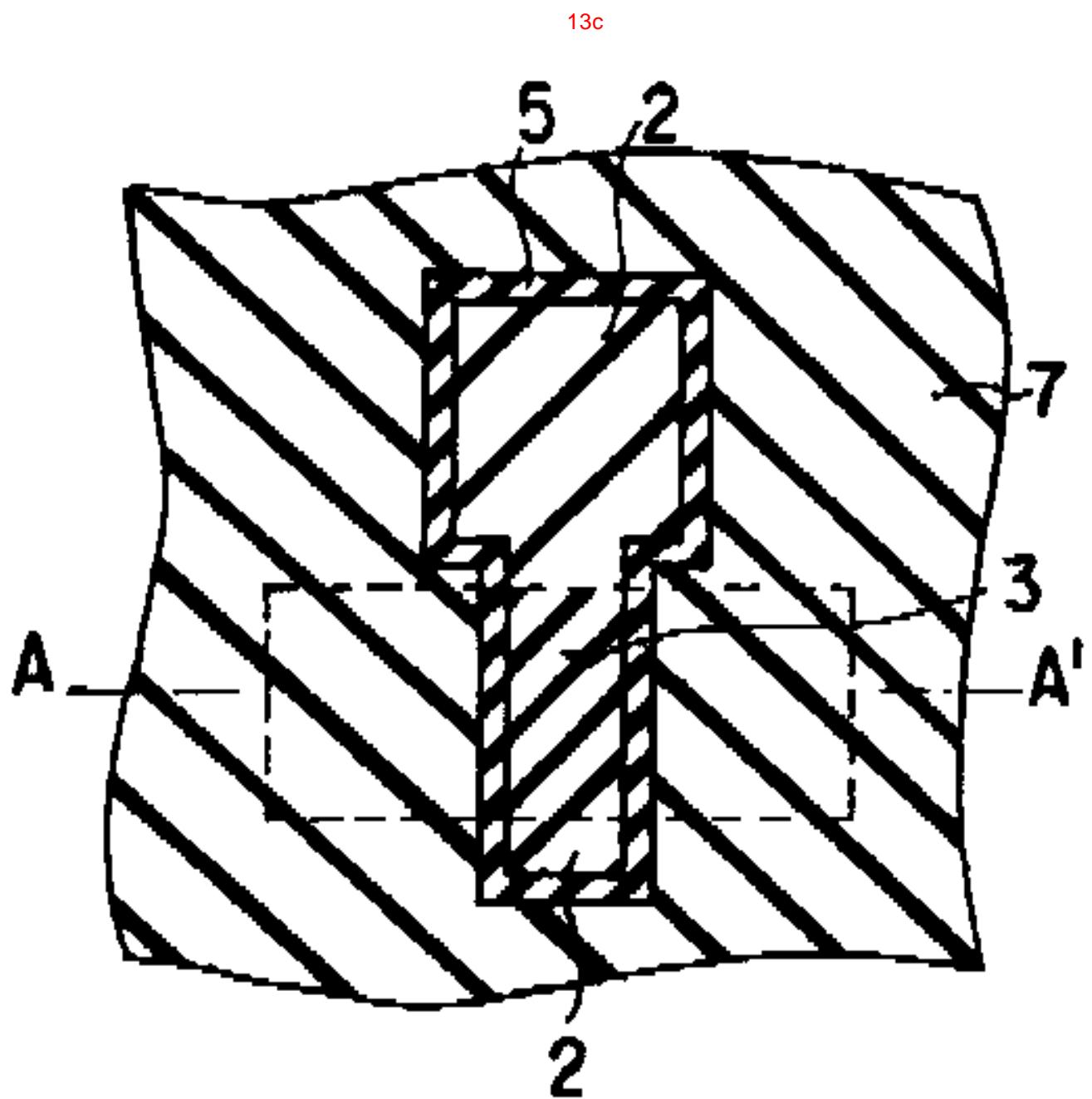


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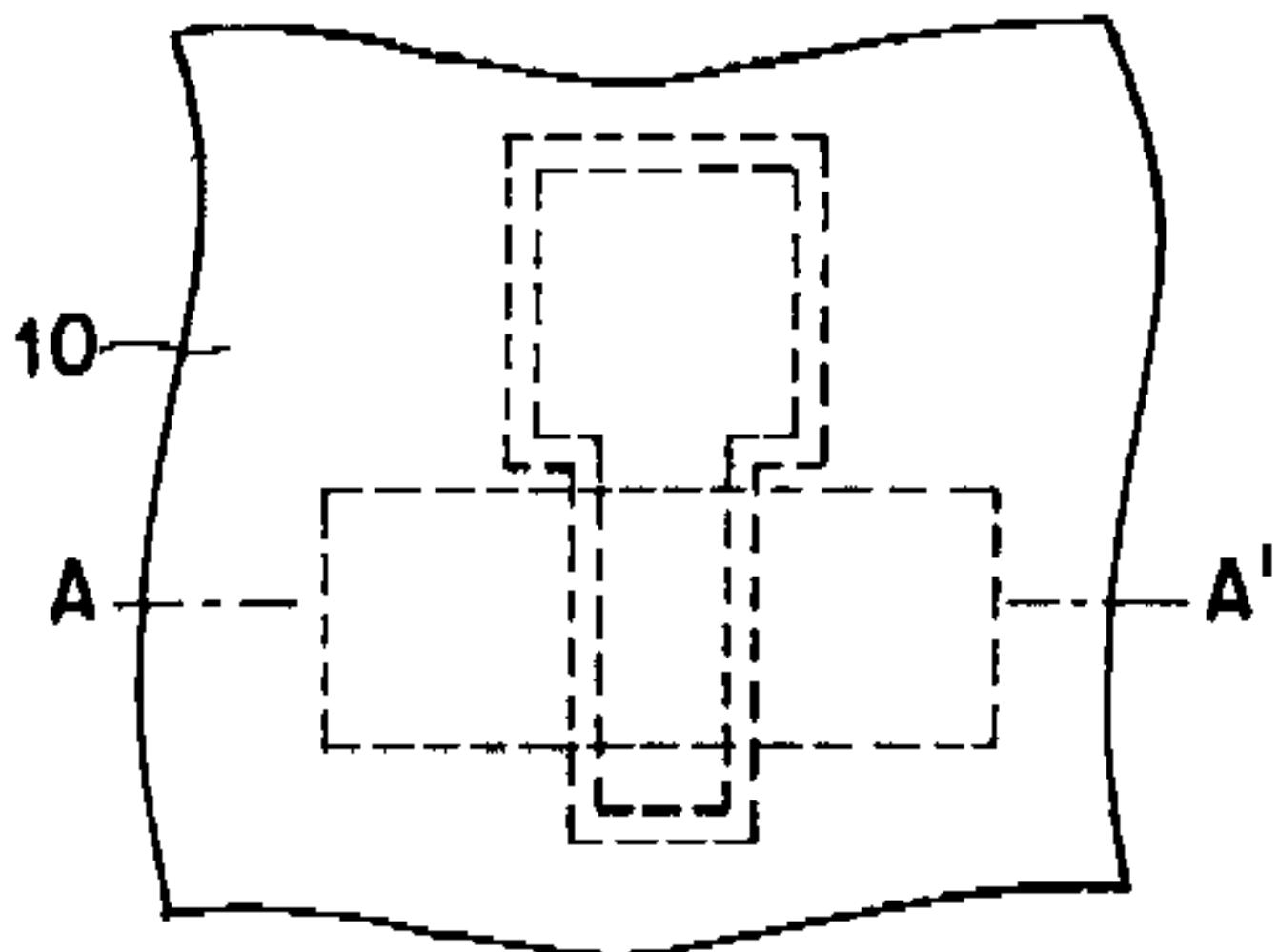


13b





13d



13e

