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2004 03 02

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(22)	2003 06 30
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(86)	PCT/US2001/050214
(86)	2001 12 20

(87)	WO 2002/59938
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(30)	09/751,423	2000 12 29	(US)
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(71) 101

(72)

,	55447,	,	. #131 2210
,	55441,	, 28	1 2320

(74)

• •

(54)

(10) 가 (54,70,90) .
(54,70) 가 ,
(90) ,

(90) ,

1

(optoelectronic device), (resonant reflector), (mode control), (optical cavity)

가 10
 가 ' (VCSEL)' . (1990 3 Optical Engineering 29 (pp. 210-214) 'Surface-emitting microlaser for photonic switching and interchip connection' , 'Top-emitting Surface Emitting Laser Structure' 1992 5 19 Yong H, Lee 5 ,115,442 , 'Integrated Laser Power Monitor' 1995 12 12 Mary K. Hibbs-Brenner 5,475,701 1990 5 24 Electronic Letters 26 (pp. 710-711) 'Top-surface-emitting GaAs four-quantum-well laser emitting at 0.85 μ m').

1 2 , , , , VCSEL (interleaved) , () 1/4 , VCSEL AlGaAs VCSEL , / , (MOVPE) , (MBE) VCSEL , VCSEL (dP, Gbits/s) (, 1000m) / , VCSEL VCSEL (, transverse) , 50 μ m 62.5 μ m GRIN (2)가 (10) (lateral) 가 - , 가 VCSEL 5 μ m 가 1 μ m ,

[illegible]

[illegible]

1. , 가 , GaAs/AaAs

2 가 1 , 가 , GaAs/AaAs

3A-3D 2

4 가 2 , 가 , GaAs/AaAs

5a-5d 4

6 가 , 가 , GaAs/AaAs

7a-7d 6

8a-8e 6

9a - 9e 6

10 5a-5d

11 5a-5d

12 8a - 8e

1 (GaAs) (14) 가 , GaAs/AaAs (10) . n-
 16) (14) (12)가 (14) 1 (, n) . n ((20) (16) (18)가 (18) (22) (24) (26) (24) . p (28) (26) . (30) .

(29) (27) . (29) H⁺ 가 . 'g' p (26) , VCSEL(10) (29) 'g' teral straggle) (29) 가 , 'g' (la

(18) (16) (26) GaAs GaAs가 (22) (, =980 nm) , AlGaAs InGaAs (16 ,26) (DBR) , AlGaAs (GaAs) ((16) AlGaAs (14)(,n) (16) AlGaAs (,p) .

(12,28) (10) (22) (26) (10) (12) (28) , (22) (26) (31) .

VCSEL () . VCSEL 62.5 μ m GRIN / , 50 μ m (2) , (10) 가 . VCSEL

가 가 'g' 가 VCSEL 5 μ m 가 . 가 1 μ m VCSEL

(50) 가 , GaAs/AaAs 2 . 2 1 , (58) (50) VCSEL(54) 1 (56) (52) . 1 (56) . 2

1 (56) 2 (58) , 1 2 (56,58) (54) (52) , 1 (56) SiO₂ , 2 (58) Si₃N₄ TiO₂ , (52) AlGaAs , 1 (56) (60)(3) , 1/4 (/4) (58) (50) 가 VCSEL(5

4) .

(50) , 3a , 1 (56) (52) 3b (56) , 1 (56) VCSEL(54) . 3c (60) , 2 (58) 1 (56) (60) 1 (56) , 2 (58) (62a,62b) , (52) , 3d (52) , (64) , (52) . (64) (52) .

, 1 (56) . ,
 (52)
 , 2 (58) . 2
 , 2-3 (56) (53) , (cross-hatch) 가 ,
 (52)
 (70) , 가 , GaAs/AaAs . 4 1 ,
 (70) (72) , /4 (M
 UTIPLE)
 (72) (78) (70) 가 (76)
 DBR (72)
 , 5a-5b , (72)(
 (74) (74)
 (74) (70)
 , 5c , (76) (72) , 가 ,
 (72) / (76)
 (lift-off) 5D , (76) (76)
 (80) (72) (80) (72)
 (90) 6 가 , GaAs/AaAs 6 1 ,
 (90) (90) 가 가
 (90) (94) 2 2 (96) (92)
 1 (94) 1 , 2 2 (100) , 1
 2 (98)
 (106) 가 , DBR , (102)
 (90) (102) (104)
 (104)
 (110) X (110) 가 (110) Y
 'R' , (90) DBR
 (106) (90) 'R'
 (90)
 1 (112) (90) DBR 1 (112)
 (106)가 (90)
 (102)
 (90) (edge) 2 (114) 가 , 2 (114)

(90) DBR (106) 2 (96)
 , (90) (90) 1 2 가
 , (90) 가 (116)
 , (90)
 , (90)

7a 7d 6
 4) 1 (94) DBR (104) (10)
 1 (94) TiO₂, Si₃N₄, (104) AlGaAs
 (BCB)

1 (94) 7a (94) (reflow) 가 7b (98)
 1 (96) 2 (96) 1 (94) 2 (96)
 (105) , 1 (96) SiO₂, 1 2 (96)
 2 (96) (105) 2 (96) , 2 (96)
 (flowing) , 2 (96) , (CMP)
 (105)

2 (96) (102)
 2 (96) (104)
 D , (106) 2 (96) (106) 7
 DBR

8a 8e 6
 , 1 (94) DBR (104) 8a
 (104) AlGaAs (104) 1 (94)
 (110) 1 (94) TiO₂, Si₃N₄

8b (110) 가
 (110) (110) 1 (94)
 , 8c (110) 1 (94)
 (110) 1 (94)

8d , 2 (96) 1 (94) 2 (96) 1
 (94) 2 (96) 2 (96) (102)
 (102) (104) (102) (104)
 2 (96) 8E (106) DBR 2
 (96) (106) (106)

9a 9e 6
 , 1 (94) DBR (104) 9a
 , (104) 1 (94)

9B , 1 (94) (118) (118) (12)
 0) (116) 1 (94) (114) (118), (12)
 0) (116)) 1 (94) (116) (118)
 , (114) 1 (94) (118)

(116) (120) 가 .

, 9c , (114) (114) 1 (94) .

(114) (114) 1 (94) (94) , 1

(94) (120) (120) ,

(122) .

2 (96) , 9D 2 (96) 1 (94) ,

1 (94) (102) 2 (96) (96) ,

(102) (104) 2 (96) (96) ,

.

9e , , (106) 2 (96) . (106)

DBR , ,

10 5a 5d DBR 가 ,

(110) , 가 ,

/4 . 5A 5D , 가 (112) ,

, (110) ,

(114) (110) ,

(112) (114) ,

.

11 5a 5d (116) (110) (112) 10

, ,

12 8a 8e .

1 (120) 2 2 (122) , 1 (120) 1

2 (122) 2 , 1 2 8a 8e

, (124) ,

(124) .

가

가

(57)

1.

(54) (50) ,

1 가 , (60) , (60) 2

2 1 (56); ,

1 (56) , 3 (52)

2.

1 ,

1 2 , 1 2 3
.

3.

1 ,

(60) (50)

4.

3 ,

(60) (54)

5.

(56) (50) ,

(52) 1 (56) ;

(60) , 1 (56) ;

(60) 1 (56) 2 (58)

6.

(54) (50) ,

(52) ;

(52) (58)

7.

(70) ,

(74) (74) (78) 가 ,
(74) 1 ;

(74) (78) 2 .

8.

(100) (10) (90) ,

(10)
2 (96) , 1 (94) 2 , 1 (96) 1 (94) 2
(98) (92) 가 (100)

9.

8 ,

1 (94) , (100) 가

2 (96) 1 (94)

10.

(10) (90) ,

1 (94) ;

1 (94) (110) ;

(110) , (110) 가 ;

(110) 1 (94) (110)
1 (94) ;

1 (94) 2 (96) .

11.

(10) (90) ,

1 (94) ;

1 (94) ;

(98) , 1 (94) 가 ;

1 (94) 2 (96) .

12.

11 ,

2 (96) 2 (96) 가

13.

(10) (90) ,

1 (94) ;

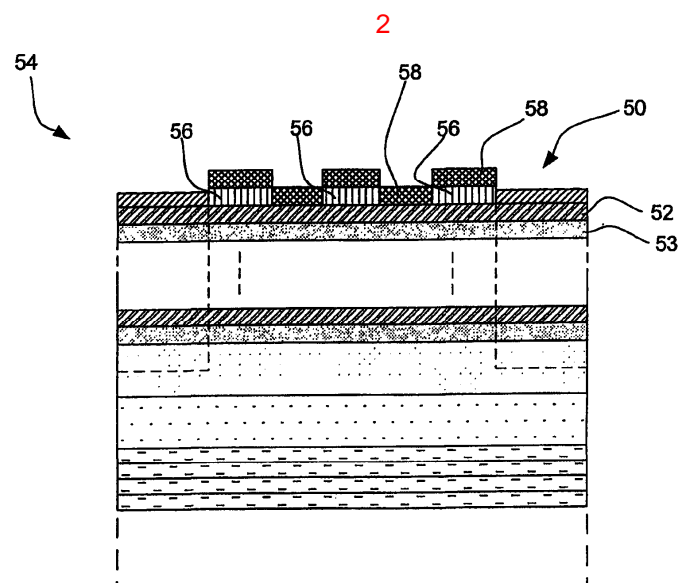
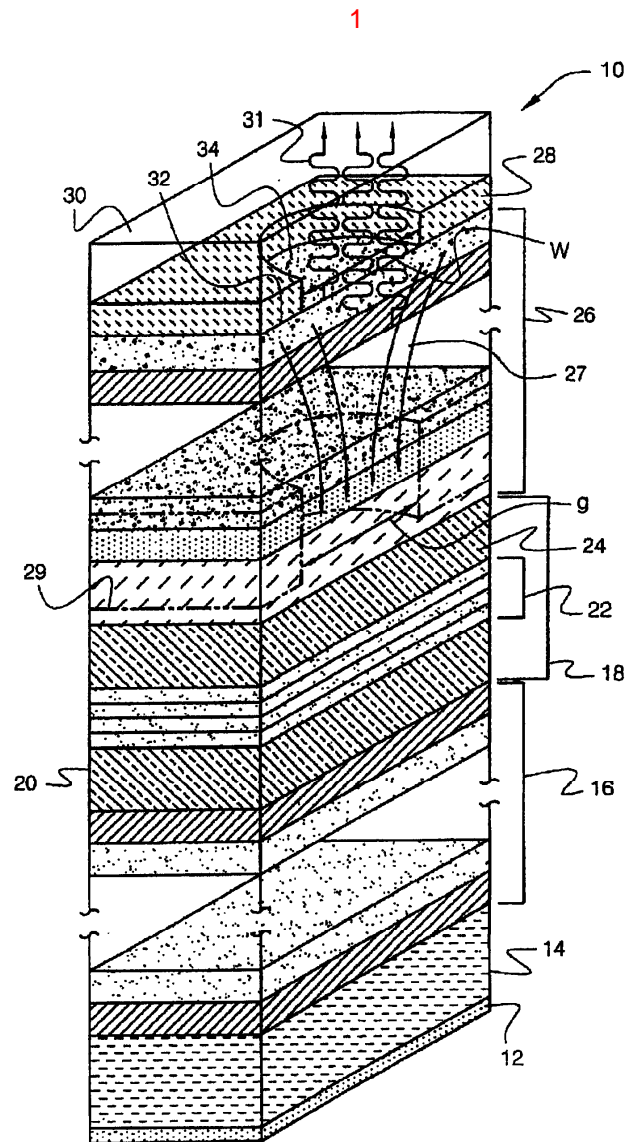
(118)가 (120) , 1 (94) ;

(118) (120) , 1 (94) (120) 가
(114) ;

(94) (120)가 (120) (120) , , 1
(114)

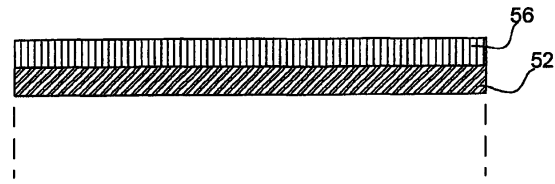
1 (94) ; ,

1 (94) 2 (96) .

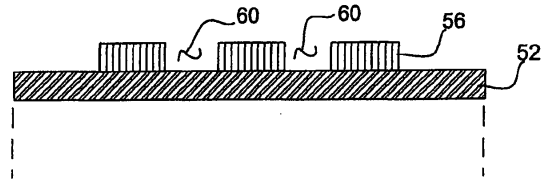


3

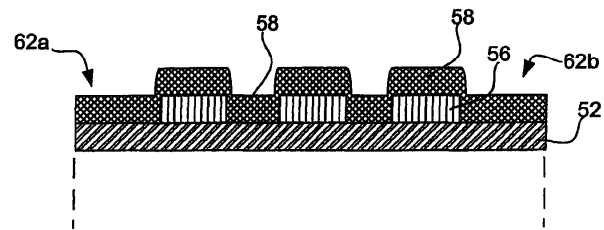
(a)



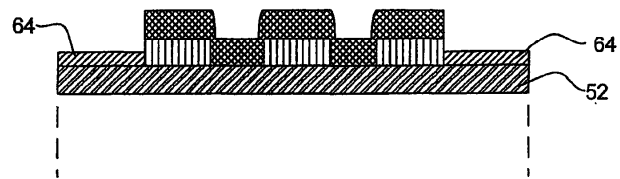
(b)



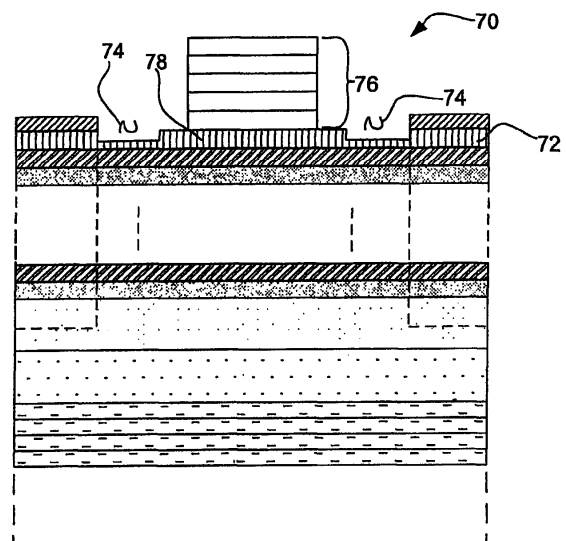
(c)



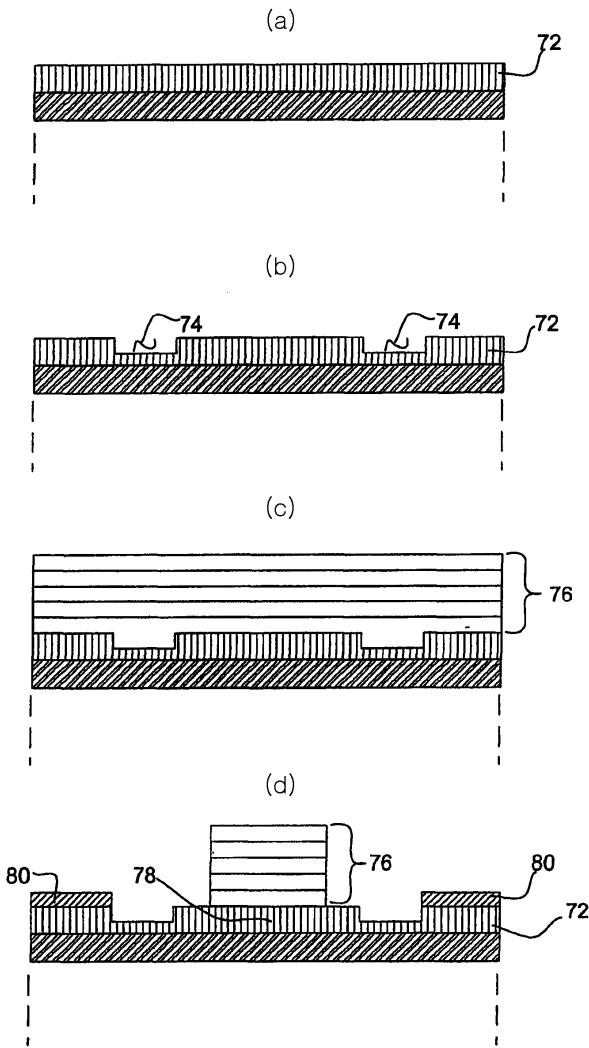
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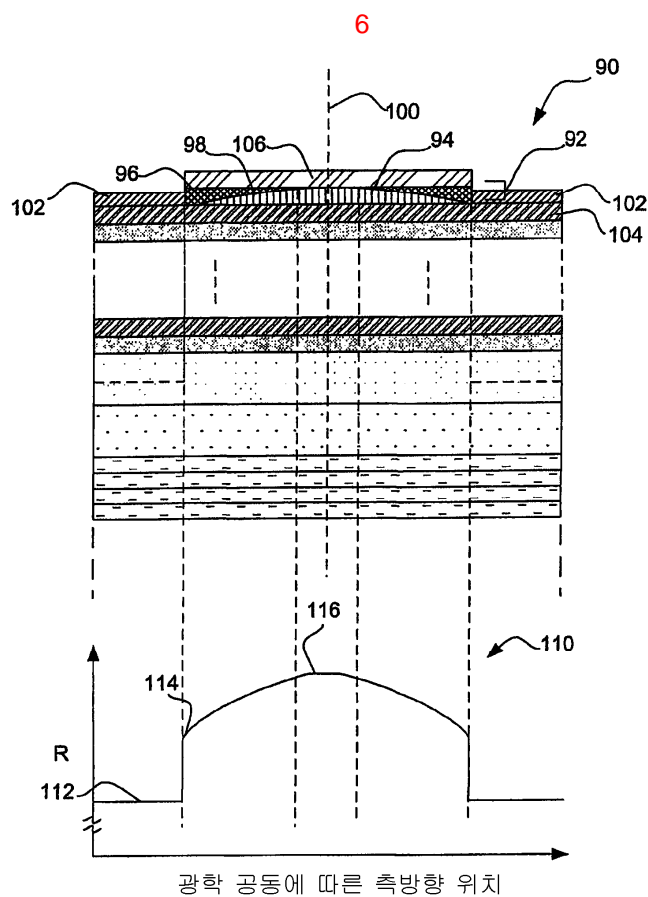


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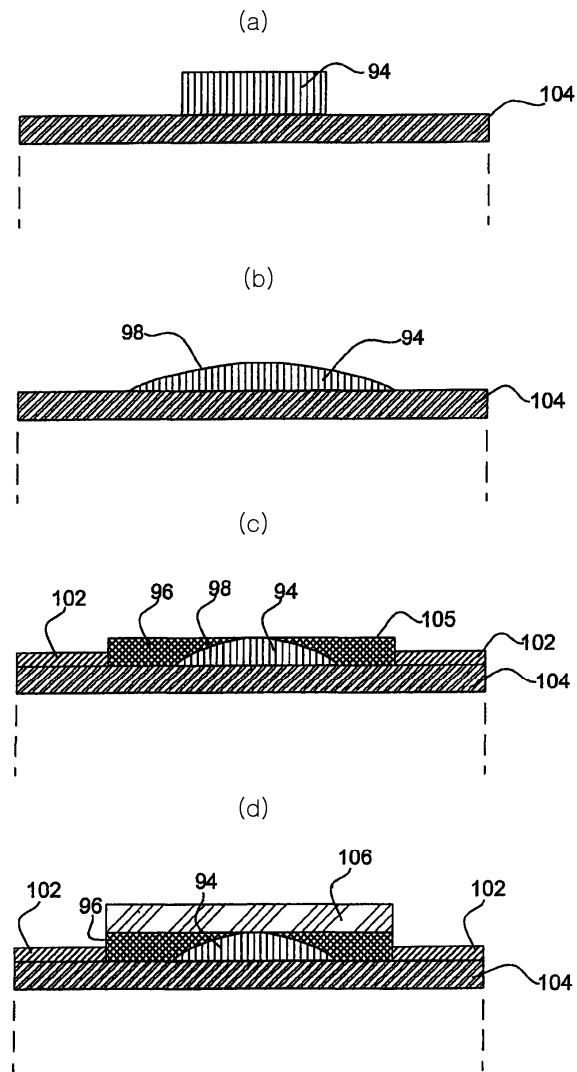


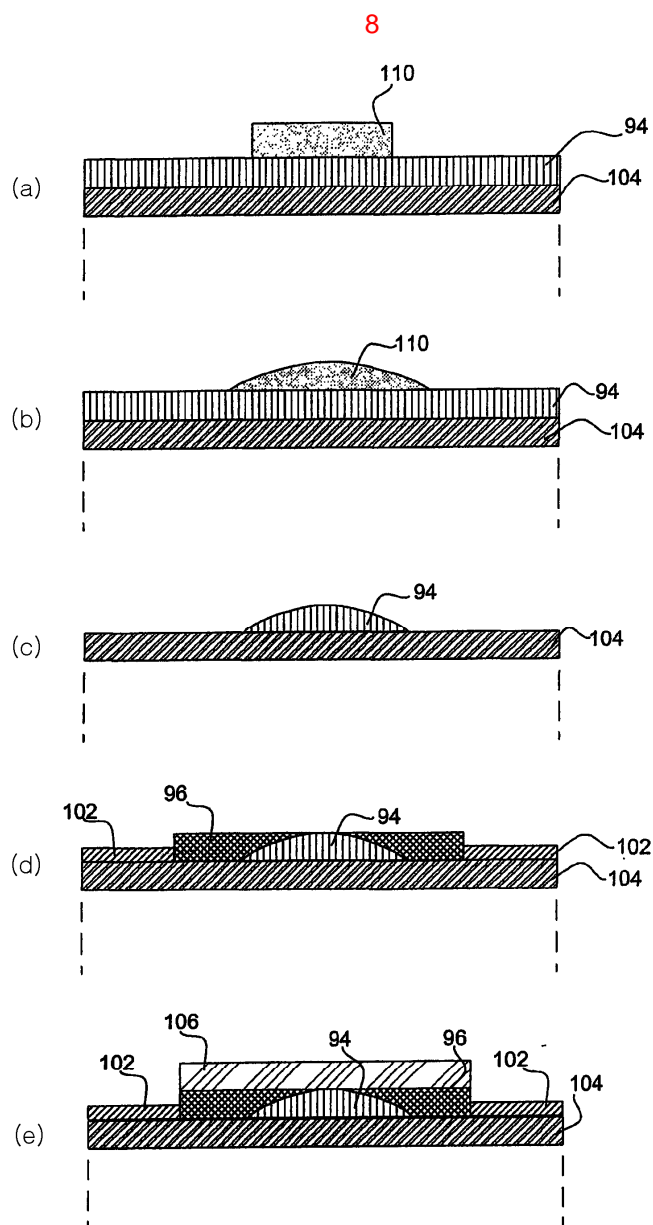
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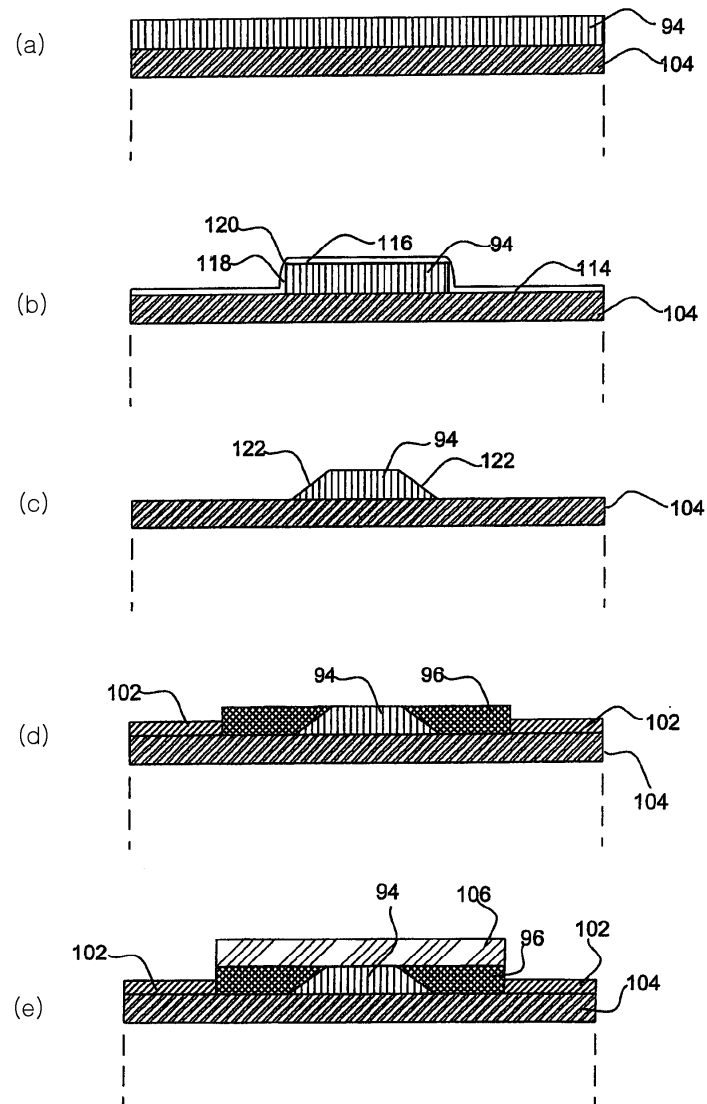


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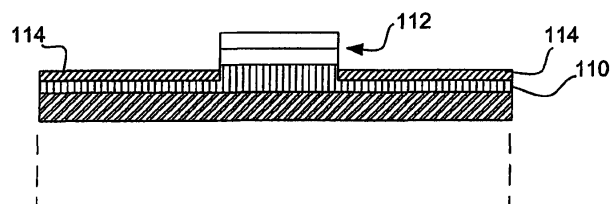




9



10



11

