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 (12) (A)

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(72) , , .
 , 97219, ,222
 , , . 97007, ,17852

(74)

:

(54) D M D T I R

(9)		(25),	TIR	(13)	
(15)	, ,	(25)	(13)		
	, ,	(25)	(53)	T	(55)

(micro-display projection systems)
(digital micromirror device; DMD) TIR

A. DMD

DMD(, ,), DMD)
 , (relay optic) (field sequential color) (color wheel)
 . . (illumination light)
 . (flipping) (reject state)

가

, TIR 가	DMD . , TIR	TIR . TIR	DMD 'Simon Magarill' Magarill
22	. DMD . TIR	DMD 6,185,047 , Poradish	6,249,387 , Fielding
, Peterson 50,763 , Okamori		6,349,006 Magarill	6,461,000

DMP

TIR

1a
2

, (13) DMD (15) . (17)
 $(19, 21)$, (23) (27), (29), (31), (35) ()
 $((25), (33))$

B

TIR

DMD

3 45 ° , 41 () DMD . 3 , 39
 , 47 ' () , 43 TIR , 45
 , 51 ') , 49 ' '

(45) 가 (46), (47) 3 (48)

가 . , 3 (47)

$$3 \quad . \quad (49) \quad , \quad (51) \quad , \quad (49) \quad (15) \quad (53) \quad 가$$

4 (13a) (59) TIR (57) (55)
 , 4 4 (53) (41) +45° 가 45° (59) (41) -45° 가 . , 4 45°
 (+) , (41) +45° 가 45° (59) (41) -45° 가 . , 4 45°

5a, 5b 5c
 $(+10^\circ)$ (67) TIR . , ,

5a (61) TIR (57) , (63) TIR (57)
 $(n=1.493)$ 10° F/3.0 (light cone) DMD
35° . ,

, 5b , TIR 가 5a
 D , 5a TIR 10 ° F/3.0 DM
 45 ° 가 . 35 ° 가 , 5b

5c (57) (65) . , 5b . , Peters
on 6,185,047 , 5c , 5a 5b , ,

, TIR (3) . , TIR (1) (2)
TIR (3) . , TIR (1) (2)
가 . , 가

, , , , , ,
가
0° , 90° , 가 9
TIR TIR

13 , 69 71 TIR . 90 °
 (73, 75) . 90 ° (75, 77) . 90 ° TIR

(75, 81) , 90 ° (75, 83)

, TIR . 가 TIR .
가 가 . 가 , , 가
,

, TIR .
,

,

,

,

,

,

,

1a 1b DMD TV

2 1 DMD TV

3 ' DMD

4

5a, 5b 5c 3

6a 6b DMD TV

7 6 DMD TV . 7 2 , 가 ,

8

9

10a 10b

11 TIR

12

13a 12

13b 13c 12 TIR

14a 14b 12

15a 15b DMD 45 °

9 : DMD 11 :

13 : 13a :

13b : 15 : DMD

17 : 19 :

21 : 23 :

25 : 27 :

29 : 31 :

33 : 35 :

37 : 39 :

41 : 43 : TIR

45 : 47 :

49 : 51 :

53 : DMD 55 :

57 : TIR 59 :

61 : 63 :

65 : TIR 67 : ' -

69 : 71 : TIR

73 : 75 : TIR

77 : 81 : TIR

83 : TIR 85 :

87 : 89 : TIR

91 : 가

93 : 가

TIR

DMD

6

6

1

DMD

DMD

10 ° DMD

F/2.4

DMD

12 °

BK7

d (587nm)

가

1.5168

, n = 1.5266

(436nm)

1.5266

(tir) :

$$\text{tir} = \sin^{-1}(1/n)$$

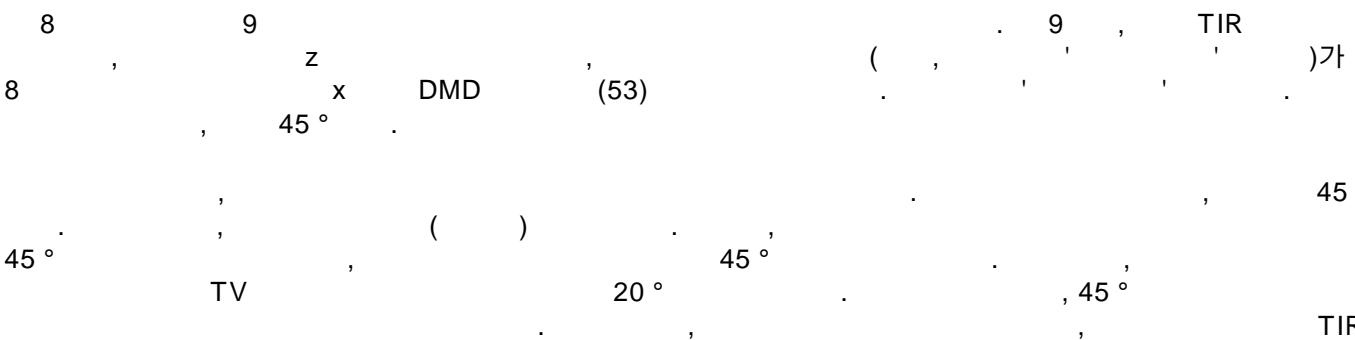
$$\text{tir} = 40.92055$$

1.5266

tir

, TIR

, BK7



DMD

m f-

U

10a

10b

1 10 ° DMD

m U

2

n_g = 1.52669 가

10 ° DMD 12 ° DMD

2

1

[1]

	10 ° DMD	12 ° DMD	(5a)
m	10 °	12 °	10 °
	22.5 °	26.5 °	20 °
FNO (FNO amp; [, U °])	3.6[9.6 °]	2.5[11.54 °]	3.0[9.6 °]

, TIR

(, TIR) ,

11 TIR (89) (91, 93) 가 (91, 93) (85) (87) . . , (89)

			(5a)
	10 ° DMD	12 ° DMD	10 ° DMD
TIR	34.65 °	33.0 °	34.5 °
	12.5 °	5.0 °	45 °
	20.16 °	16.08 °	45 °
TIR	[.555,-.123,.823]	[.543,-.047,.8.39]	[.401,-.401,.824]
	[.928,-.3408,.149]	[.995,-.271,.184]	[.700,-.700,.14]

12 12 ° DMD . , 13 12 . , 14

, DMD 2~4

가 6 1 가

, , , DMD , 2 가 가 ,
 DMD , , ,
 $= 45^\circ$, , ,
 20° , , ,

, 5,999,306 , 16 17 DMD). , TIR 45° (, Atobe / ,
 2 3 DMD . , TIR , DMD ,

,

가

가

TIR

(57)

1.

- (A) ;
- (B) ; 1 ; 가 ;
- (C) ; ;
- (D) ; (I) 2 , (III) 2 ; 1 , (II) 1 ; 3
 (a) 2 3 ,
 (b) 1 2 (i) 90° (ii) 90°

2.

- 1 , (i) , (ii) , (iii)
 20°

3.

- 1 , (i) 3 , (ii) , (iii)
 45°

4.

- (i) 1 ;
 (ii) 1 ;
 (iii) , 1

5.

- (A) ;
 (B) ; 1 2 ; 가 ;
 (C) ;

(D)

, (I)

, (II)

, (III)

;

(a)

가

, (b)

6.

5

,

7.

5

, (i)

, (ii)

, (iii)

20 °

8.

5

가 , (ii)

, (iii)

45 °

9.

(i) 5

;

(ii) 5

;

(iii) , 5

10.

(a)

;

(b)

1 2

가

;

(c)

;

(d)

;

(e)

11.

10

,

(b)

12.

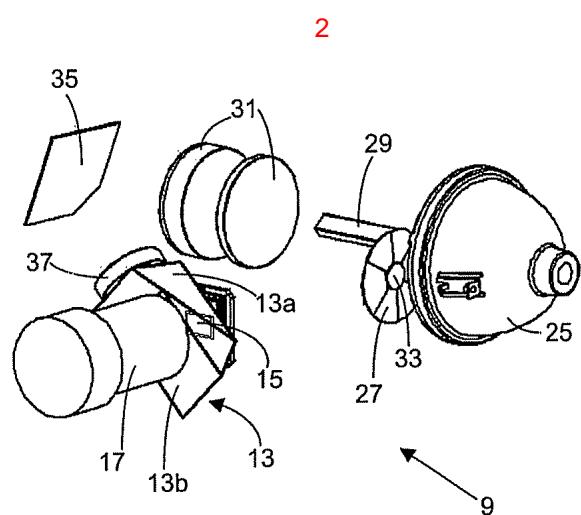
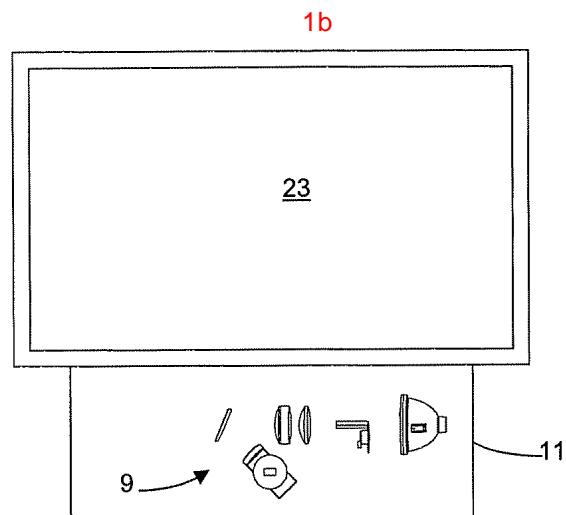
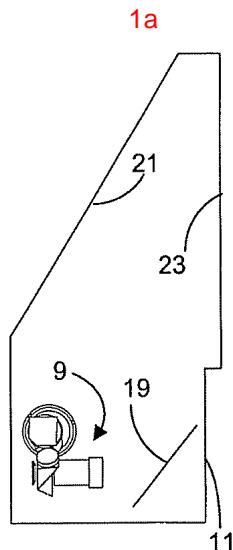
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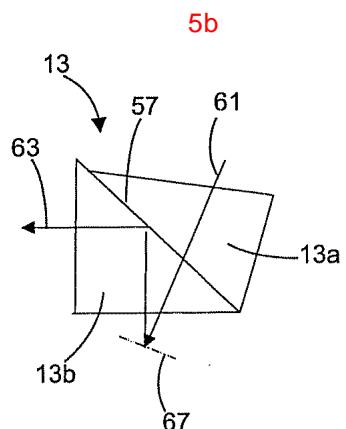
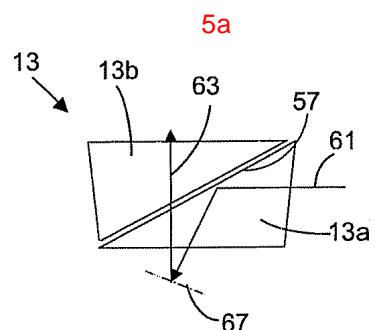
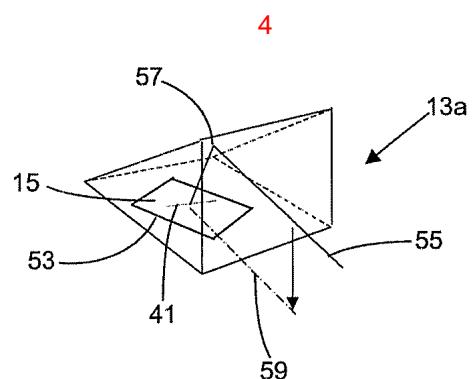
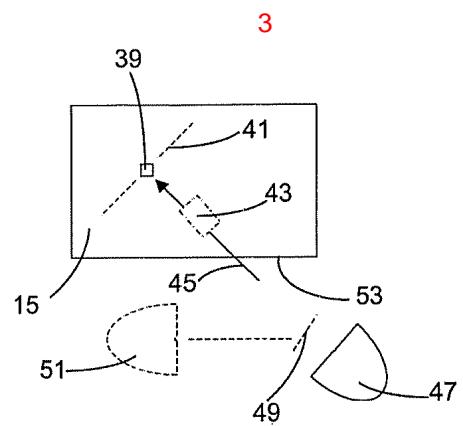
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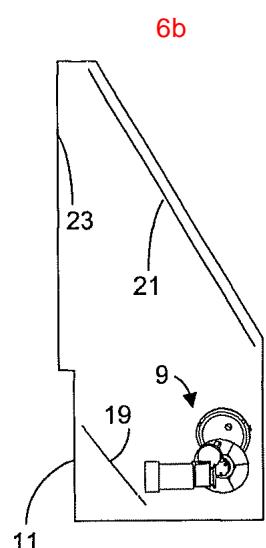
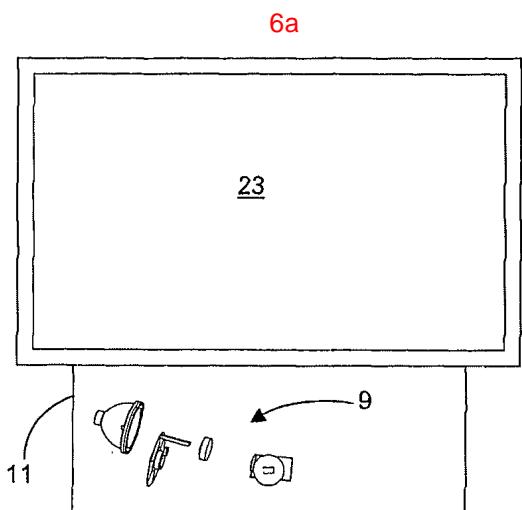
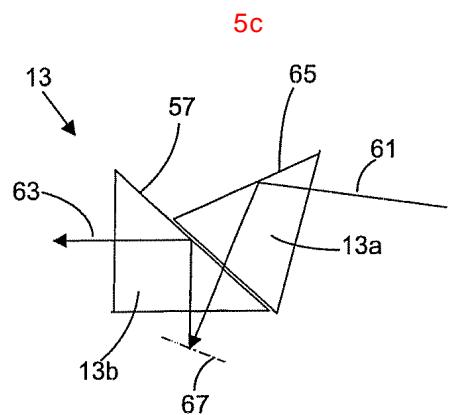
13.

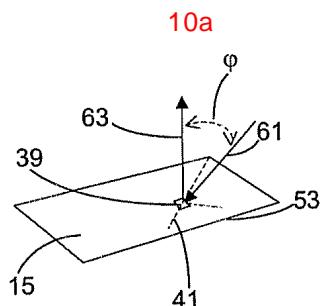
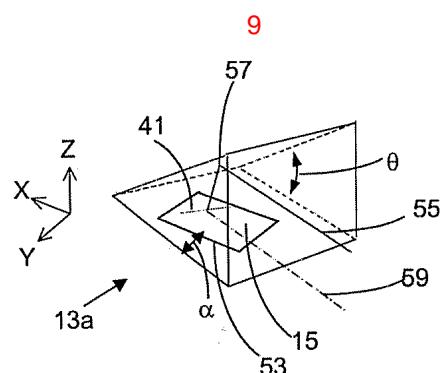
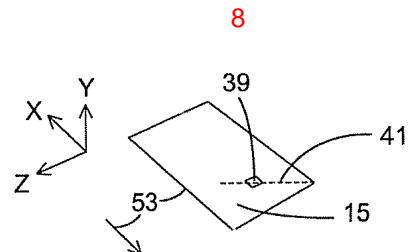
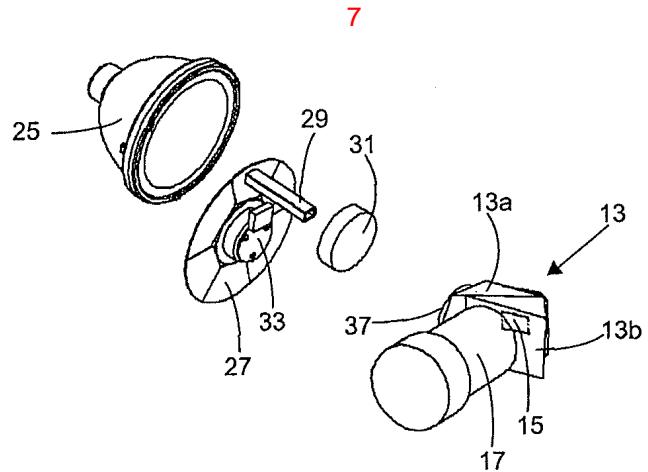
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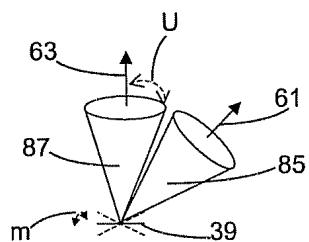




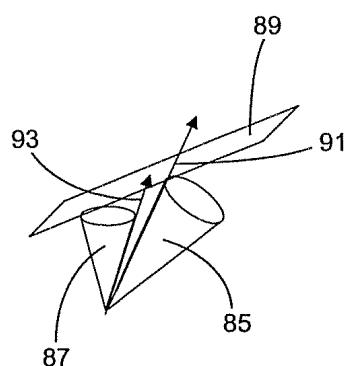




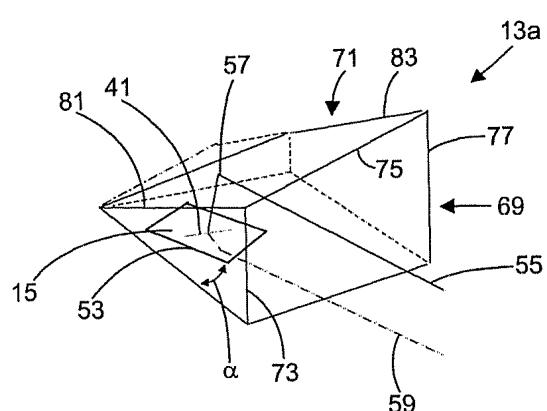
10b



11



12



13a

