

(54)

(imaging surface) , (viewing surface) , 3 (further surface) 가
 refractor) . ()가 (light
 ()
 (1) (1)

4

(sharpness) (patterned object)

(, " " .)

가

가

051576, 5177435, 5233404

가 , 3975711, 4681435, 5
 가

1 / 1 , (108) (112),
 (110), (lens assembly, 114), (image sensor, 116), / (storage and proces

sing unit, 125) (110) (imaging surface, 118), (light receiving surface, 12
 0), (viewing surface, 122) (118) 가
 (112) , LED (120) (incident light, 124)
 , (124) (110) (110) , (118)
 가 90 가 , (base angle, ,) 45 가 .

 , (124) (115) (126) (118) . (126)
 (128) . , . (1
 28) (118) (130) (122) , (118) (norm
 al line) 가 .

 (130) (122) (114) . (114)
 CMOS 가 가 , (116) CCD
 , / (125) .

 / (125) , , AD () . AD (116)
 . (captured)
 가

 PC , 4135147 4
 688995 .

 s, 109) (118) , (ridges, 111) (118) , (valley
 (124) (118) , (112) (110) 가
 (internally totally reflected). , (109) (118)
 . (111) (124) (scattering)
 , " " (strike) ,
 가 .

 109) (110) (111) (124) . , ((1
 30) 가 (111) (130) (111) (110) (1
 (118) 가 , (130) , (124)
 (111) 가 . (109)
 (111) (108) (111)
 (absorption) .

(111), (124) (130) 가 .
 (111) (109) (130) .
 (111) (109) 가 .

(108) (114) (1
 22) (108)

(118) (108) (114)가 (122) (114)
 (114)가 (108) (122) 가 가 가
 (114) 가 (118) 가 (가
) (114) 가
 (out of focus)가

(130, 130') (108) (114)가 114'
 (108) (114') (118) A, B (114)가 114'

(114) (114)가 (122) 가 .
 (122) (114) 가 (108) 가 .

(108) (114) 가 (122)

(124) (110) (108) 가 (118) AB (112)
 (122) (114) A' B' A'B' (122) AB ab "
 (apparent image)" , A (122) 가 aa'
 a , B (122) 가 bb' b (12
 2) (122) (110) n
 index of refraction) 가 , aa' = Aa'/n , n (110) (
 (114) (107) 가 , (114)
 가 (122) (108)
 aA'가 bB' (114) (122) a'b'

aA'가 bB' , () 가 가 .

4) (107) (116) 가 bB' aA' (11) (apex angle) 90° 가 (base angle) 45° 가 (130) (122) (110) (130) (122) 가 (114) (114) (116) 가 (114) (116)

114) (112) (114) (112) (stray light, 113) (가 " " 가)

scattering) (absorption) (1993.8.3. 5233404(Lough 3 Loughheed 3) (208) (210), (212), (214), (216) (210) (218), (220), (222)

8) (218) (212) (218) (220) (228) (224) (218) (210) (212) (21) (218) (218) (209) 가 (224) () (230) (222) (211) (strike) (210) (propagate) (222) (214) 가 , CCD, CMOS (216) (214)

(209) (224) (218) (211) (218) (224) (214) (216) (211) (211) (209) (230) (216) (scattering)

1 , 가 (216)

(214) 가 (214) 가 (214) 가 (222) 가 (222) 가 (210) (110)

1 가 가

(210) (208) (108) (214) 가 (214) 가 (222) (214) (216)

(210) (208) (210) (208) (214) 가 (214) (216)

가 가

(imaging surface) , (viewing surface) , 3 (further surface) 가 (light refractor) ()가 () () () ()

$$0.7 \leq (n^2 - \sin^2 \delta)^{1/2} (\cot \gamma) (\sin \delta) + \sin^2 \delta \leq 1.30$$

가 , 90°

3 () ()

가

) (,) (1 1) ,

$$0.7 \leq (n^2 - \sin^2 \delta)^{1/2} (\cot \gamma) (\sin \delta) + \sin^2 \delta \leq 1.30$$

, , 가 90° 1 .

- 1 .
- 2 1 .
- 3 .
- 4 , , , , .
- 5 4 .
- 6 4 .
- 7 4 .
- 8 4 .
- 9 , .
- 10 9 .

4 5 (308) (308) (310), (light source, 312), (lens assembly, 314), (316) (310) 4가 (310) (335) ()가 (imaging surface, 318) (310) (310) (318) (335) (310) (viewing surface, 320) 4 5 (320) (310) 가 (light receiving surface) (322) (310) 3 (322) (diffusive) .

(312) LED 가 (310) (4가)
 LED 가 , 가 (318)
 LED (320) , (312)
 (310) (312) (31

8) (338)
 1998 11 12 09/191428 (:
 ; High Contrast, Low Distortion Optical Acquisition System for
 Image Capturing). (320) 338 , (320) 365
 (320) 360 (320) (3

(314) (335) (330) , (316) (330)
 (314) (314) , 가
 (314) 13.48mm (320) 13.5mm
 , (314) 7 (904, 906, 908)
 가 , (902) (904) 17.8mm
 가 , (906, 908) 6mm 가 (314)

(316) (314) , (316)
 (316) CMOS . CCD CMOS
 (316) 4135147 4688995

(316) (335) , (335) (318) (312)
 (324) (320) (310) (312) (338)
 , (324) (322) , (322) (diffusiv
 e) (334) (322) (310)
 (322) , (324) (322) (3
 23) (322) , (322) (318) (3
 22) , (322) (381)

(324) (322) , (324) (3
 18) (328) (327) (318) , (309) (318)
 (324) , 가 (318) 가
 (309) (318) , (311)

(320) (318) (324) (330) 가 (314)
가 , (310) (316)

(324) (322) , (324) (318)
가 (318) 가 , 5
(312) (320) 가 (370) (370)
(338) (310) (370) , (312)
(320) 가

king shield, 350) (308) (312) (light bloc
) (350) (310) (4가
(interfere), (350) , (312) (314) 가
0) (350) (mirrored surface) , (31
(318) (350) () , 2
(352) (312) (314) 2 (352) (314) 가 (3
12) (320)

(312) (318) (338) (318)
(324) (324) (314) , (316)
(311) (318) (309)
(314) (316) , 5 (312)
(360) (360) (320) (318)
(365) (310) (312)
(338) , (312) (311)
(316) (324)

(312) (324) (309)
(318) (324) 가
(320) (314) 가 (318) (314)
가 (318) (311)
(311) (309) ()

Lougheed

(308)

가 , , (focus) , 6
 , (318) , (314) 가 (322) (335) , (314) , ((308) 가 (320) 가 (308)
 , (314)

6 , (314) (318) (335)
 , (out of focus)
 (apparent image) (314) (316)
 가, (308) , (335) (335') , 6 (314) (316)
 (330) 가 , AA' BB' CC' 가 , AA', BB',
 CC' (320) (314)

1 (108) , (314) (316)
 (130) (114) , (108) (114) 가
 (116)

가 (310) 1 , (320) (330) (310)
 (330) 90° (314) , (314) (307)
 , (314) 가
 가 (316)

8 , (314) 가 8 , 410, 412
 (414) (416) (307) (314) "0" 가
 Aa 412 (310) (307)
 B'b 416 (310) (307)
 B (apparent depth) Aa가 B'b B'b가 (310)

$$B'b = Bb/n$$

, Bb 416 B b
 1

1

$$Aa = Bb / n$$

(320) 8 1 412 , , (320) () (310) 412
 , , 2가 . 412가 (310) 2 .

2

$$n = \sin \theta_2 / \sin \theta_1$$

AB , Ab 2 3 . 3 , AB (310)
 (320) , (320) Ab , ' (90° - 1) 412
 , (318) (320) (8 342) .

3

$$AB \cos \gamma + Bb \cos \alpha' = Ab$$

4 .

4

$$AB / Bb = \cos \theta_1 / \sin \gamma$$

1,2,3,4
 5 (307) (320)

5

$$(n^2 - \sin^2 \delta)^{1/2} (\cot \gamma) (\sin \delta) + \sin^2 \delta = 1$$

5 , (314) (307) (320) . ,
 (308) 5

가 . (308) , 6 30%

6

$$0.7 \leq (n^2 - \sin^2 \delta)^{1/2} (\cot \gamma) (\sin \delta) + \sin^2 \delta \leq 1.3$$

7 15%

7

$$0.85 \leq (n^2 - \sin^2 \delta)^{1/2} (\cot \gamma) (\sin \delta) + \sin^2 \delta \leq 1.15$$

8 7.5%

8

$$0.925 \leq (n^2 - \sin^2 \delta)^{1/2} (\cot \gamma) (\sin \delta) + \sin^2 \delta \leq 1.075$$

5~8 (308) 가

(310) 1 (Shinkwang Ltd.) , LaK - 7 LaK - 8

(314) 6 (314) 가 , BK7 가

(312) LED 4 가 LED CMOS 가 (316)

VLSI 4 (312) (320) (320) (holding slot)

5~8 (318) AB가 가 , 90° 가 5~8 9

(541) 20), 3 (522) (510) 9 (510) (518), (512) (510) (507) (510) (312) (314) (5)

9 (612) (518) D (610) A (510) (507) 5 a'd' (507) D'd' (510) (518) D (apparent depth) Aa' D'd' (510) (510) 1 (612)가 d' (510) (5)

20) (620) 9 545 90° 545
 (612) (520) (612)
 (510) (620) (510) (610)
 a'a d'd A B (510) (507)
 ()
 가

10 10 (510) (518) E
 가, (510) A
 (612) (518) E (510)
 1 (612)가 e' (520) (620)
 545가 90° (510) (612)
 e'e (510) (610) 610 612가
 a'a (510) (507)
 가 (318) E A

90° 90° 5~8 (518)
 90° (518) 9 10 (518)
 (520) 가
) (5~8)

(510) (512) (310) (312)

가

가

(57)

1.

(imaging surface); () 가 (viewing surface);
 3 (further surface)

, (1 1) ,

2.

1 ,

$$0.7 \leq (n^2 - \sin^2 \delta)^{1/2} (\cot \gamma) (\sin \delta) + \sin^2 \delta \leq 1.3$$

3.

1 ,

$$0.85 \leq (n^2 - \sin^2 \delta)^{1/2} (\cot \gamma) (\sin \delta) + \sin^2 \delta \leq 1.15$$

4.

1 ,

$$0.925 \leq (n^2 - \sin^2 \delta)^{1/2} (\cot \gamma) (\sin \delta) + \sin^2 \delta \leq 1.075$$

5.

1~4 ,

1 , 가 90°

6.

1 ,

가

7.

6 ,

1 ,

1

LED

8.

1 ,

9.

, , 3

가 ,

가 ,

가 ,

가 ,

$$\left(\frac{1}{n^2 - \sin^2 \delta} \right) \text{가}$$

10.

9 ,

$$0.7 \leq (n^2 - \sin^2 \delta)^{1/2} (\cot \gamma) (\sin \delta) + \sin^2 \delta \leq 1.3$$

11.

9 ,

$$0.85 \leq (n^2 - \sin^2 \delta)^{1/2} (\cot \gamma) (\sin \delta) + \sin^2 \delta \leq 1.15$$

12.

9 ,

$$0.925 \leq (n^2 - \sin^2 \delta)^{1/2} (\cot \gamma) (\sin \delta) + \sin^2 \delta \leq 1.075$$

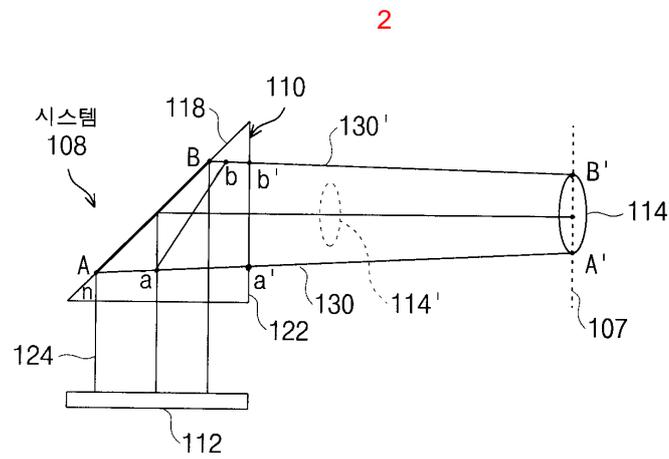
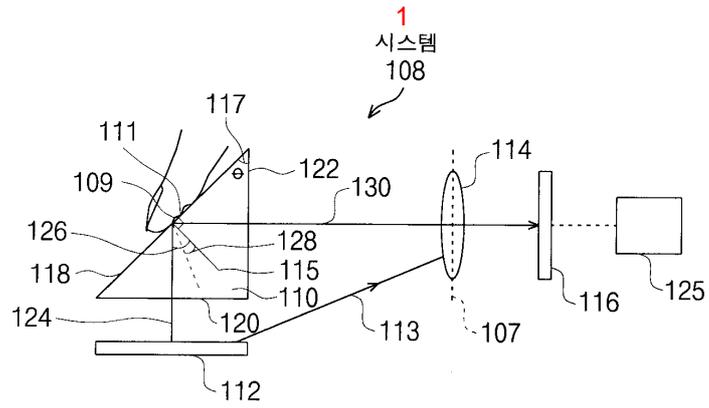
13.

9~12

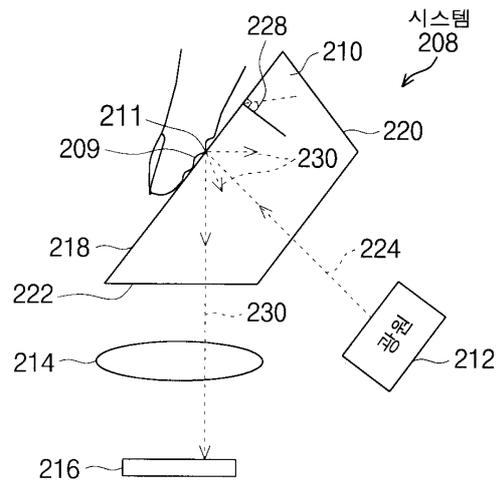
가

가 90°

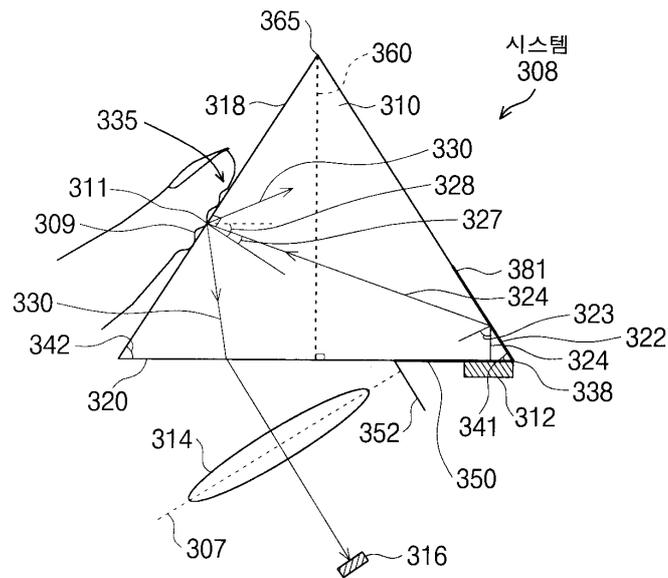
1



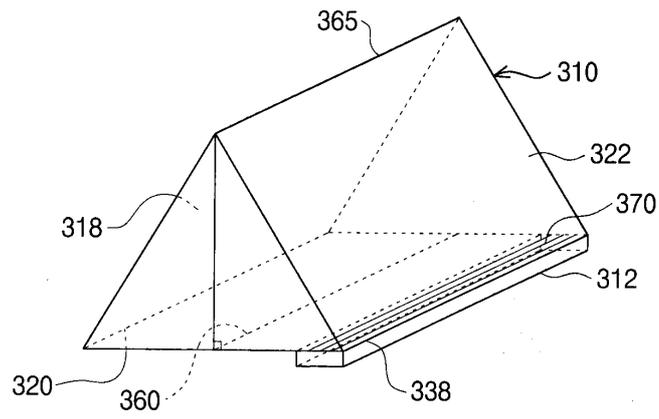
3



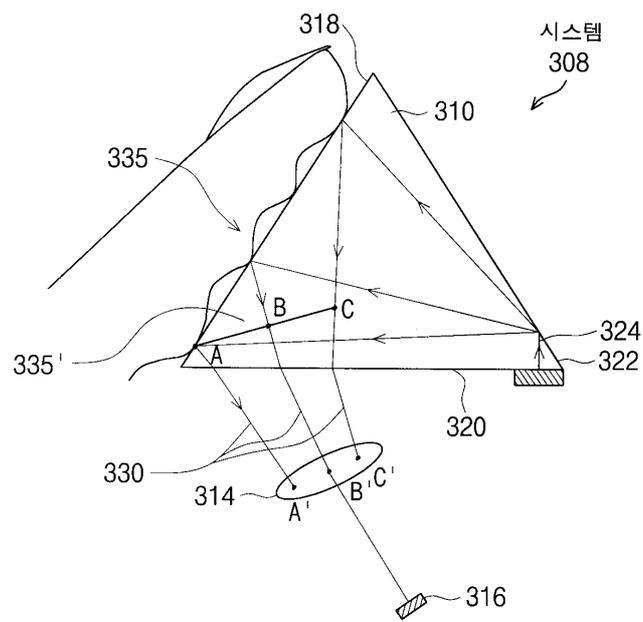
4



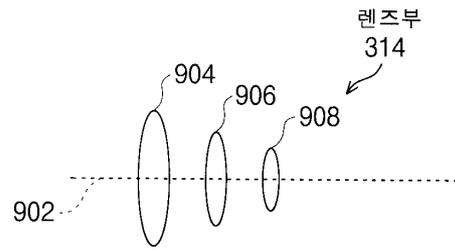
5



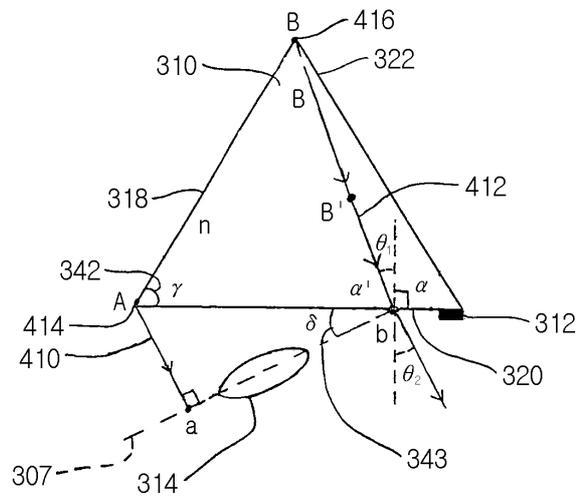
6



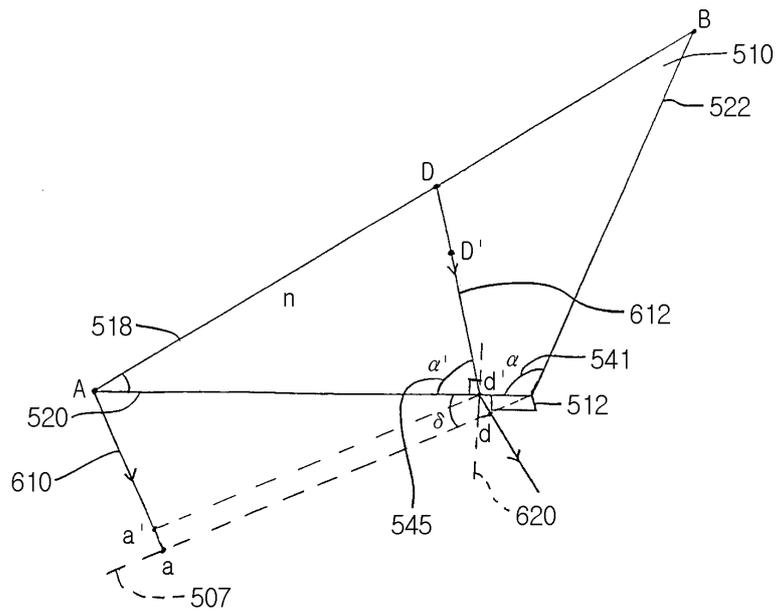
7



8



9



10

