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(11)
(24)

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2002 03 27

(21) 10 - 1999 - 0044521
(22) 1999 10 14

(65) 2001 - 0037162
(43) 2001 05 07

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(72) 2 1538 202 703
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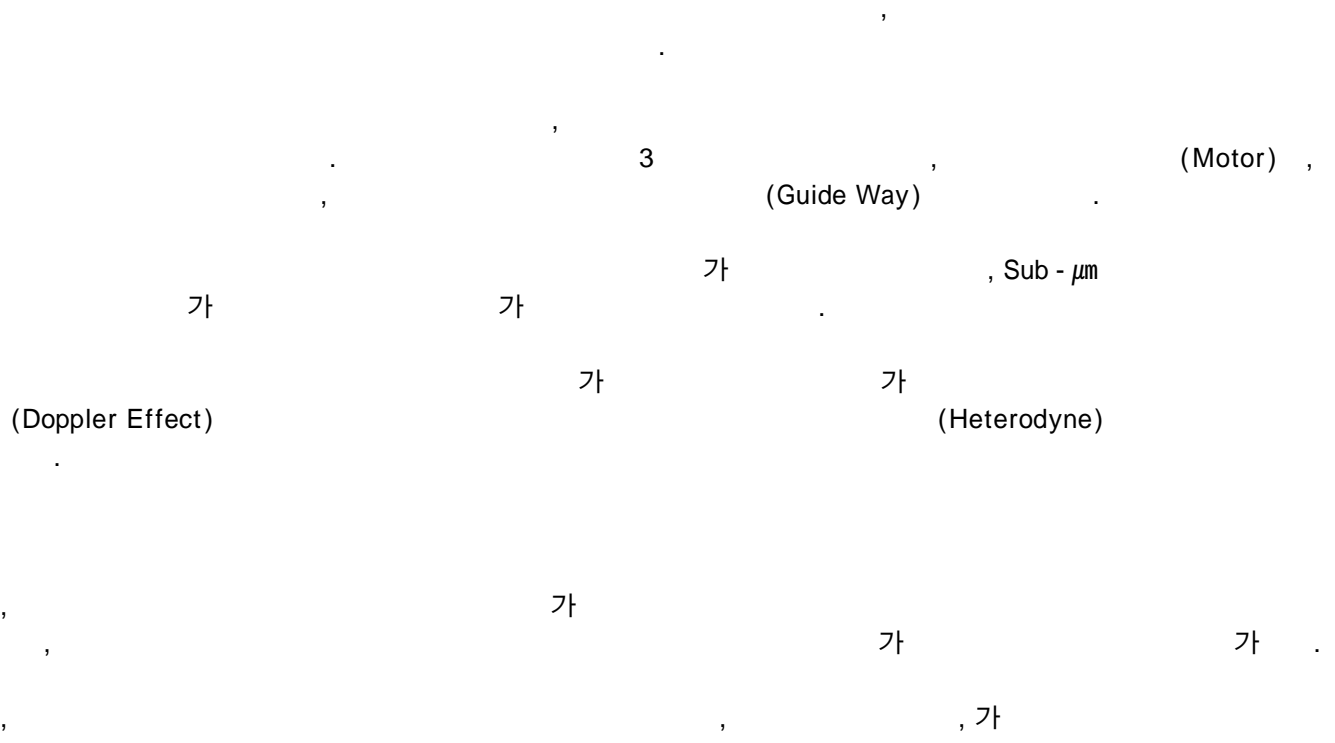
(54)

(1) (3) 1 (, S) 2
(, P) , 1 , 2
,
, 2 , 2 가
, 가 .

1

1

- 2a 1 4 ,
- 2b 1 ,
- 3 , 1 () 2 () 4
- 4 4 ,
- 5a ,
- 5b 5a 가 ,
- 6 3 ,
- 7a , 150
- 7b 7a 가 5a 4 ,
- 7c 7a ,
- 7d 7b 4 7c ,
- 8 .
- <
- 1 :
- 2 : (beam expander)
- 3 : (beam splitter)
- 4 : 1/4 (1/4 wave plate)
- 5 :
- 6 : 1 (corner cube prism)
- 7, 9 : (wedge prism)
- 8 : 2 (corner cube prism)
- 10 : (phase gratings)
- 11 : 4 (quadratic photodiode)



1/4

1

2

2

1/4

1/4

가

2

1 ((1) (2) (3) (5) (2)가 (1) (3)가 (2)가 (02) (02) (1) (3) (5) (5) 1/4 (4)가 (3) (5) (3) (02) (01) (01) (8) (01) (3) (3) (6) (7)(9) (3) 2 (11)가 (11) (10)(phase grating)가 4 (02) 4 (01) (3) 4 (11) 2a 4 (10) 2b (01) (11) (02) (11) 4 (01) 4 (02) 90 가 (1) - (He - Ne Laser) (5) (02) 4 (11) 4 4 가 , 4

(01) (wedge angle) (7,9) 가

(3) (01) , P (3) (3) (1) , S (02) (3)

P (02) 1/4 (4) (5) 1/4 (4)
P S (3) (02) 1/4 (4)
3) 1/4 (3) (4) (5) S (6)
S P (3) (02) 1/4 (4)
(11) (10) 4

2) (02) (5) 2 (5) (0)
, S (01) (7) 2 (8) (9)
(3) (01) (3) (7,9) (10) 4
(11)

(01) 가 1 (02) a b a c d e f e g ,
a h i e g

0) (10) (02) (01) (1)
(7,9) 가 가
360° (11) 90° 가 (10) 4 1
가

3 3 (5)
(02) (10) (wave front)
(01) (01) (wave front) (10)
(01) (02) 가
180

Wave Length = ' ') (7,9) (01) (Pitch = ' P ') (Tilting Angle = ' ') (

$$P = \frac{\lambda}{\sin \theta} \quad (1)$$

(5) (02) L (5) 2 (02)
 4L (02) L

$$l = \frac{L}{\lambda/4} \cdot P \quad (2)$$

(5) /4

3 360° 90° 4
 , 2b 4 90° (10) 2a 4
 (11) 4 (5) 4 (11) (A, A', B, B') , 4
 90° 가

(UP/DOWN) (optical linear encoder) (counter) (5) 4 (four - fold) /16

0.6328 μm He - Ne 0.03955 μm

5a 4 UP/DOWN (counter) (Direction Discriminator) (25) / (21) (23), (27) 가

5b 4 UP/DOWN 4

4 /16

4 (11) 90° 가 A B, A' B' 6
 (Lissajous) 가

$$\phi = \tan^{-1} \left(\frac{B - B'}{A - A'} \right) \quad (3)$$

(5)

(27) (N) 1/16 1 (5)
 (02) 4 가 , 8 가
 /2 (27) (N)
 (5) L

$$L = N \cdot \frac{\lambda}{16} + \lceil \text{mod}(\frac{\phi}{\pi/2}) - \frac{\pi}{4} \rceil \cdot \frac{\lambda}{8\pi} \quad (4)$$

가 , 가 가

633nm He - Ne (5mW) 15mm
 4 HAMAMATSU S5106
 1.16mm가 2°
 가 1.16mm가

TOKIN (piezoelectric actuator - AE0505D16)가
 1.0nm ADE (ADE - 2102+2036)

(microsensor - 3401)가

7a (PZT) 0.0625V 가 100 , 0.0625V
 50 4
 1 4.1nm 4 A, B, A', B' 90 가
 cosine , 100 가

7a A A', B B' 5a UP/DOWN (c
 ounter, LSI LS7166) 632.8nm 4
 1/16 39.55nm 가

7b 150 ('gap sensor'
) (39.55nm x , 'Count*39.55')

39.55nm 1
 , 39.55nm

7c 7a 4 (3)

7d 7b 7c (4)

$$= 2.3\text{nm}$$

가
 ,
 .
 8 (2)
 , (21) (O1) (O2)
 (23)가 , (O2)
 (25) (25) (25) (O2)
 (25) (25) (27)
 (O1) (23)
 (29) , (O1) (O2)
 (3) 4 4 (33)가
 , (31)(phase grating)가 4 (33)

, (21) (39) (39)
 (37)가 , (35)가 (23)
 , (39) (39)
 2

, (23) (25) (O2)
 1/4 (41)가 , (23) (29)
 (O1) 1/4 (43)가
 (29) (O1) ()

23) (01) 2 (43) (29) 2 ()
 (23) (23) (O2) 1/4 (41)
 /4 (25) (27) (25) 1
 (41) (23)

, (23) (O1) (O2) (31)
 4 (33) 1

(57)

1.

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2.

1 ,

1/4 ;

1 ;

2 ,

2 .

3.

1 ,

1/4 ;

;

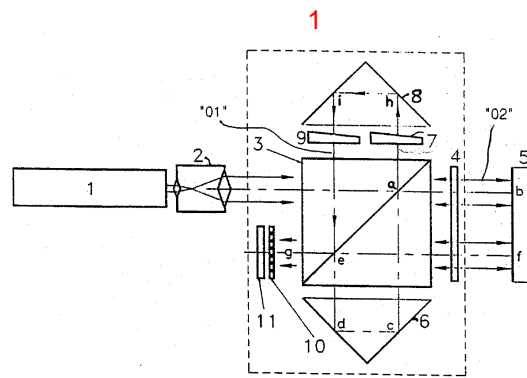
4.

1/4 ,

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1 3 ,

5.

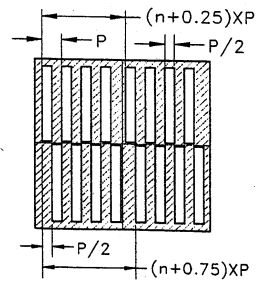


2a

A (0°)	B (90°)
A' (180°)	B' (270°)

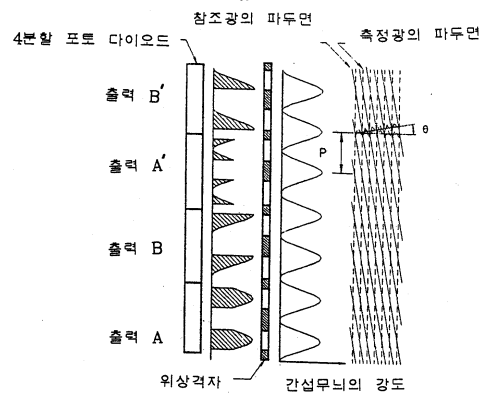
4분할 포토 다이오드

2b

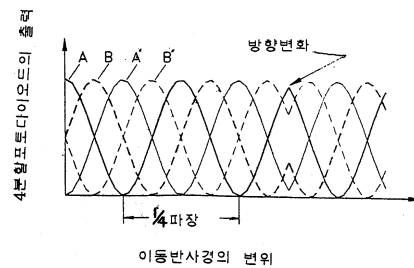


위상격자

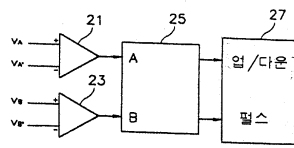
3



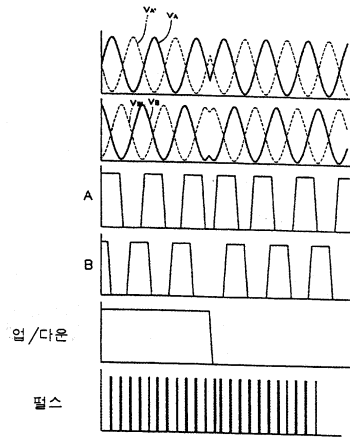
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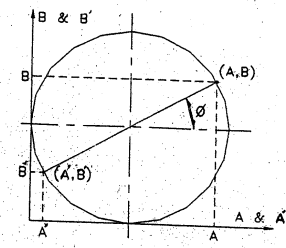
5a



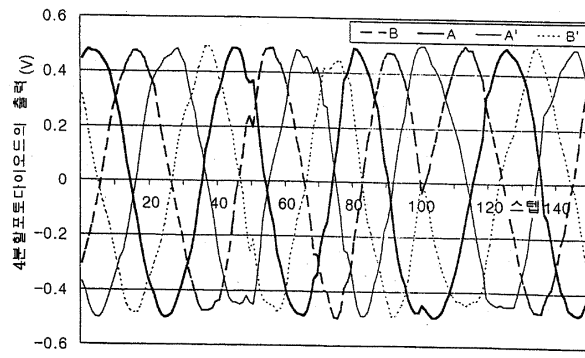
5b



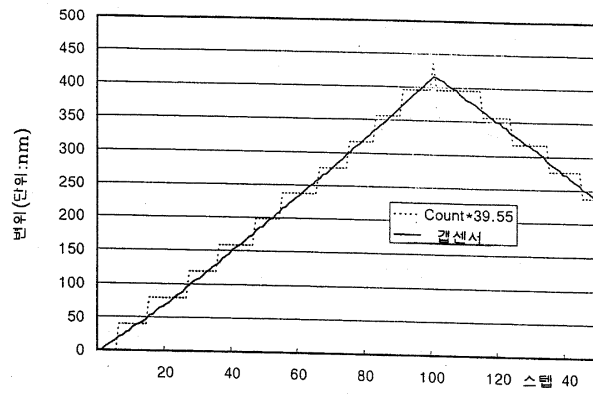
6



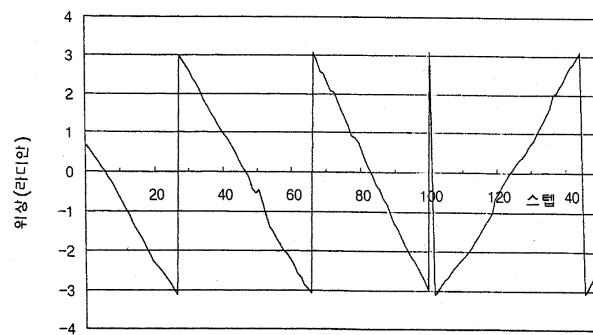
7a



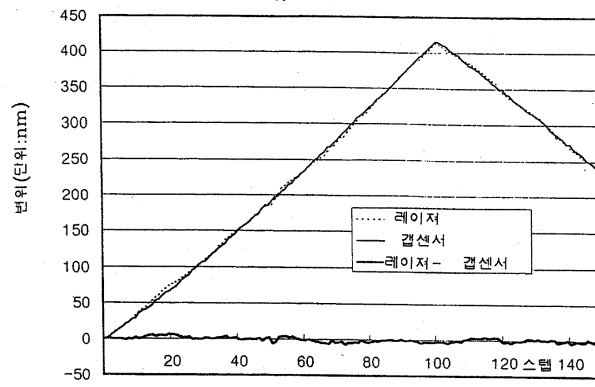
7b



7c



7d



8

