

(19)
(12)

(KR)
(B1)

(51) 。 Int. Cl.⁶
G02B 15/16

(45)
(11)
(24)

2004 07 19
10-0424961
2004 03 17

(21) 10-1996-0053575
(22) 1996 11 08

(65)
(43)

10-1997-0028634
1997 06 24

(30) 95-315799 1995 11 10 (JP)
95-318570 1995 11 13 (JP)

(73) 가 가 가 가 6 7 35

(72) 가 가 6-7-35 가 가

가 가 6-7-35 가 가

(74)

:

(54)

(wide angle field of view)

가

(negative lens),

(positive lens)

가

1

1A 1B 가

/ 2A 2B, 2C, 2D, 3A, 3B 3C

1

2B	1								
2C	1		A4, A6	A8	4, 6	8			;
2D	1				(certain key distance)				;
3A, 3B, 3C		1					(normal),		(telephoto)
			(spherical aberration),		(astigmatism),		(distortion aberration)		
4A			4B, 4C, 4D, 5A, 5B	5C					2
4B	2								
4C	2		A4, A6	A8	4, 6	8			;
4D	2								;
5A, 5B, 5C		2							,
6A			6B, 6C, 6D, 7A, 7B	7C					3
6B	3								
6C	3		A4, A6	A8	4, 6	8			;
6D	3								;
7A, 7B, 7C		3							,
8A		1, 2	3		f, FNO	2			
8B		1, 2	3		1	5			
9A			9B, 9C, 9D, 10A, 10B	10C					4
9B	4								
9C	4		A4, A6	A8	4, 6	8			;
9D	4								;
10A, 10B, 10C		4							,
11A			11B, 11C, 11D, 12A, 12B	12C					5
11B	5								;
11C	5		A4, A6	A8	4, 6	8			;
11D	5								;
12A, 12B, 12C		5							,
13A			13B, 13C, 13D, 14A, 14B	14C					6
13B	6								;
13C	6		A4, A6	A8	4, 6	8			;
13D	6								;
14A, 14B, 14C		6							,

*
 12 : 13 :
 15 : 17 :

가 가 : -
 (charged-coupled device; CCD)
 가 62-24213 (1987)
 3-33710 (1991) (asphe

rical lens)

가
가,
가

5) (fold) 가 7-13073(199
ror)가 () (mir
가

(視界; field of view) 가
4 (6-324265 (1994)
(field angle) (counting)) 60

가
7-13073
가
가
가
6-324265
가
가
가

가

가
(viewfinder) / (integrated video camera) /

D1/D1A가 1.2 1.7
가 가 가 가
D1
, D1A
가

가 가 1 D1 1.7 가 가 1
, D1A
(wide angle end) 2 1 3 (telephoto end)
4 3

가 1A 1B (15), (13) 3 (17), (12) (10) (14),
 1A (18; grip) 가 1B P
 1, 2 3 (14, 14A 14B) 2A, 4A 6A
 2A, 4A 6A (GR1) (GR3) (positive refracting power) (14, 14A 14B) 4 (GR2) (negative) : 1
 3 (GR4) (GR4) (GR4) (GR2) (GR2) (22)
 2A, 4A 6A 4 (GR4) (IR) 2 (GR2) 3 (GR3)
 (FL) 1 (GR1) (NL) (PL)
 (PL) 2A, 4A 6A (23), (24) (25)
 가 가 가 'D1A' 1 'D1' (GR1)
 (GR1)
 [1]
 $1.2 < D1/D1A < 1.7$
 (NL) 1 (GR1) 1
 (PR) 1 (MR) (NL) (PL)
 가 1 (X) (GR1)
 1, D1/D1A 1.2 (NL) (PL)
 1.7 (X) 가 (PR) (MR) D1/D1A
 (26) 1 (GR1) (NL) , 3
 1 (GR1) (PL) 3 6A 4 1 3
 (47), (23), (24, 25) 2
 (afocal unit) 1
 2 (GR1) 1 (26) (26) (47) (NL) (PL) (PR)
 (PL) 가
 , 4- (piece) (PL) (PL) 가 가 (23) (24, 25)
 3- (26) 가 (47) (47)가 가 (NL;
 (X) 가 가
 2A, 4A, 6A (X) (14, 14A, 14B) (X)
 (PR) (MR) 가
 가 2 (GR2) , 3 (GR3)
 (22) , 2 (GR2) 2 (GR2) 가

tion power) 가 . 2 (GR2) (magnifica
 , 6A 가 3 (GR3) (22)
 (68) (69) 2- 3 (GR3)

6A (68) , 3 (GR3) (68) 'R31'
 'R32'

[²]
 $|R31/R32| < 0.4$
 ((69) 2 'R33' (69) 'R34'

[³]
 $-0.5 < R34/R33 < 0.2$
 (가 (68) 3 (69) 'D3'
 'fW'

[⁴]
 $\sum D3/fW > 1.2$
 ((68) 4 (Abbe number) 'ν_{3P}' (69) 'ν_{3N}'

[⁵]
 $\nu_{3P} - \nu_{3N} > 10$
 ((68) 5 5 가 ,
 2 , |R31/R32| 0.4 (68) 가 ,
 (68) 3 , R34/R33 -0.5 (69) ,
 (coma) 가 (68) (69) (68) ,
 , R34/R33 0.2 (69) 가 , 가 ,
 (69) 가 , 가 ,

point) 4 D3/fW 1.2 3 (GR3) (principle

5 3 (GR3) (chromatic aberration)
 3 (GR3) 5가 (68) (69) (Abbe Number)

4B, 4C, 4D, 6B, 6C, 6D 가 2B, 2C, 2D,
 'N' d- (spectral d-line; =587.6 nm) 'd' 2
 'FNO' F- (F-number) 'f' (half-angl

e) 'r_i' (i+1) 'N_i' 'ν_i' (i = 1, 2, 3, iii, 28) 'd'
 d- (aspherical surface)

[⁶]
 $Xa = c \cdot y^2 / [1 + \sqrt{1 - c^2 \cdot y^2}] + \sum (A_{2i} \cdot y^{2i})$
 'Xa' X- 'C' (近軸) (paraxial curvature; 1/r) 'A'
 2i 'y'

2A, 2B, 2C, 2D, 3A, 3B 3C 1 1 (14) 2A
 , 1 4 (GR1, GR2, GR3, GR4) 4 , 10
 , 2B (14) 18 21 4 , 6 8
 , 2C , , 18 21 4 , 6 8
 A4, A6, A8 , 'e' 10
 2D f()가 (14) 1.000 2.4903 9.5727 , d
 10 [1 (GR1) 2], d 15 [2 (GR2) (IR)
], d 18 [3 (GR3) 4 (GR4)] d 21 [4 (GR4)
 (FL)]
 3A, 3B 3C (14)가 , ,
 , d- , g- (= 435.8nm)
 (sagittal image surface) , (meridion
 al image surface)
 4A, 4B, 4C, 4D, 5A, 5B 5C 2 2 (14A) 4
 , 1 4 (GR1, GR2, GR3, GR4) 4 , 1
 1 4B 20 23 (14A)
 , 4C , 20 23 4, 6 8 A4, A6, A8
 4D f()가 (14A) 1.000 2.4615 9.5692 ,
 d 2 [1 (GR1) 2 (GR2)] , d 17 [2 (GR2) IR
], d 20 [3 (GR3) 4 (GR4)] d 23 [4 (GR4)
 FL]
 5A, 5B 5C (14A) , ,
 6A, 6B, 6C, 6D, 7A, 7B 7C 3 3 (14B) 6A
 , 1 4 (GR1, GR2, GR3, GR4) 4 ,
 12- 6B 3 , 21 26 (14B)
 , 6C , 3 , 21 26 4, 6 8
 A4, A6, A8
 6D f()가 (14B) 1.000, 2.4499 9.5815 , d
 13 [1 (GR1) 2 (GR2)] , d 18 [2 (GR2) (IR)
], d 23 [3 (GR3) 4 (GR4)] d 26 [4 (GR4)
 FL]
 7A, 7B 7C (14B) , ,
 (14B) , 1 (GR1) (26)
 (glass spherical surface)
 , 1 3 f. FNO 2W 8A , 1 5
 8B , 2 5 가 3
 가 ,
 , 4, 5 6 가 ,
 , 4, 5, 6 9A, 11A, 13A
 (14C, 14D, 14E) , (AU) (NL) ,
 (NL) (PL) (PR MR) 9A, 11A 13A
 (PL) (X) (PR MR) 90
 (14C, 14D, 14E) (MR) , 9A 13A
 4 6 11A 5 (MR)
 (PR) , 1 3
 (AU)
 1 3 , (AU) (FU;)
 4 (GR1, GR2, GR3, GR4) . 1 (

(22) (GR2) 가 (GR4) 2 (GR2)

(22) 1 3 (FL) 4 (GR4) (22) (IR) 2 (GR2) 3 (GR3)

4, 5, 6 (1-c²i²y²)]+ (A_{2i}i²y²ⁱ) 가 'Xa' 6: Xa=c_iy²/[1+ X-

'c' (1/) 'A' 2i 'y' (X) 9A, 9B, 9C, 9D, 10A, 10B, 10C 9A

(AU) (14C) (AU) (FU) 4 (AU) (NL) (NL) (PL) (PL) 2-

(FU) (PR) (AU) (NL) 1 4 (PL) (GR1, GR2, GR3, GR4) (AU) 9-

9B 4 (14C) 2

0 23 9C 4, 6, 8 A4, A6, A8 1.000, 2,4

9D f가 (14C)

615, 9.5692 , d₁₂, d₁₇, d₂₀, d₂₃

10A, 10B, 10C (14C)

11A, 11B, 11C, 11D, 12A, 12B, 12C 5 11A

(14D) (AU) (FU) (AU)

(NL) (PL) (NL) (PL)

(MR) 2 2- (AU) (FU) 1 4 (FU) 4, 9-

(AU) (FU) (GR1, GR2, GR3, GR4)

) 11B 5 (14D) 1

8, 21 11C 4, 6, 8 A4, A6, A8 1.000, 2.486

11D f가 (14D)

3, 9.5741 , d₁₀, d₁₅, d₁₈, d₂₁

12A, 12B, 12C (14C)

13A, 13B, 13C, 13D, 14A, 14B, 14C 6 13A

(14E) (AU) (FU) (AU)

(NL) (NL) (PL) (PL) 2- (FU) (PR)

(NL) 1 4 (GR1, GR2, GR3, GR4) 10- (FU) (AU)

13B 6 (14E) 13C 4, 6, 8 A4, A6,

3, 21, 26 14D f가 (14E)

A8 1.000, 2.4499, 9.5812 d₁₃, d₁₈, d₂₃, d₂₆

14A, 14B, 14C (14E)

(14E) 가 (NL)

(total reflection) (optical path) 가

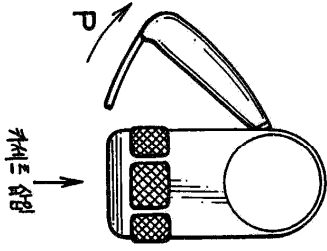
가 (constructor) 가

(NL) (AU) 가

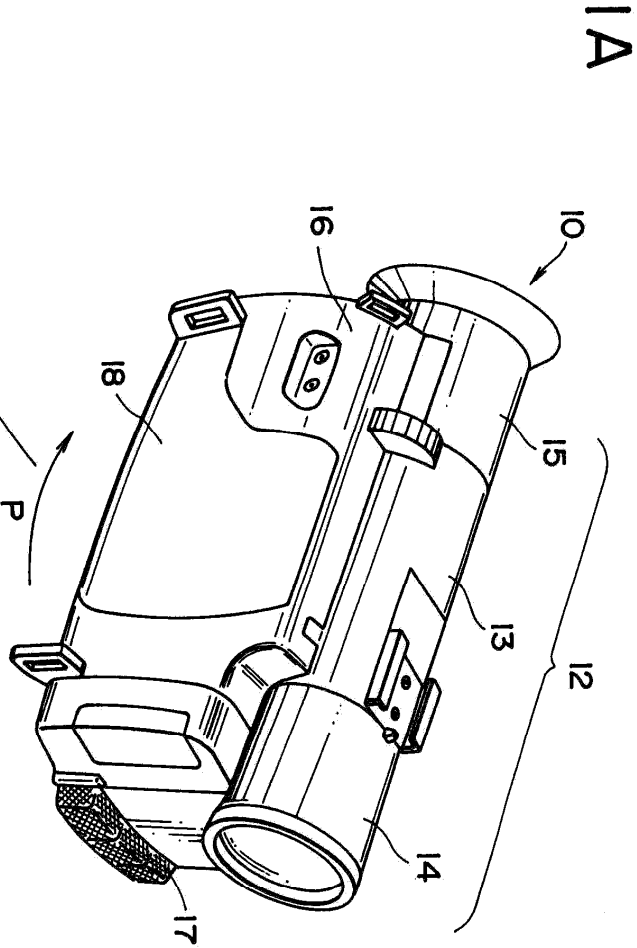
(NL, PL) (AU) (NL) (PL)

- 8 , 4 (focusing) 3
- 11.
- 8 , 1, 2, 3 4
- 12.
- 8 , 3
- 3 , | R231/R32 | 가 0.4 , | R34/R33 | -0.5 0.2 , D3/fW 1.2 , R3
- 2 , $\nu_{3P} - \nu_{3N} > 10$, R31 , R33 , R34 , ν
- 3P , fW , D3 , ν_{3N} , ν
- 13.
- 6 , 1 1 2 , 1
- 14.
- 6 , 가 ,
- 15.
- 14 , 가
- 16.
- 15 , 90
- 17.
- 14 ,
- 18.
- 6 1 , 1 , 1 , 1 2 , 1 3
- 19.
- 18 , 1 가 (afocal unit)
- 20.
- 19 , 가 가

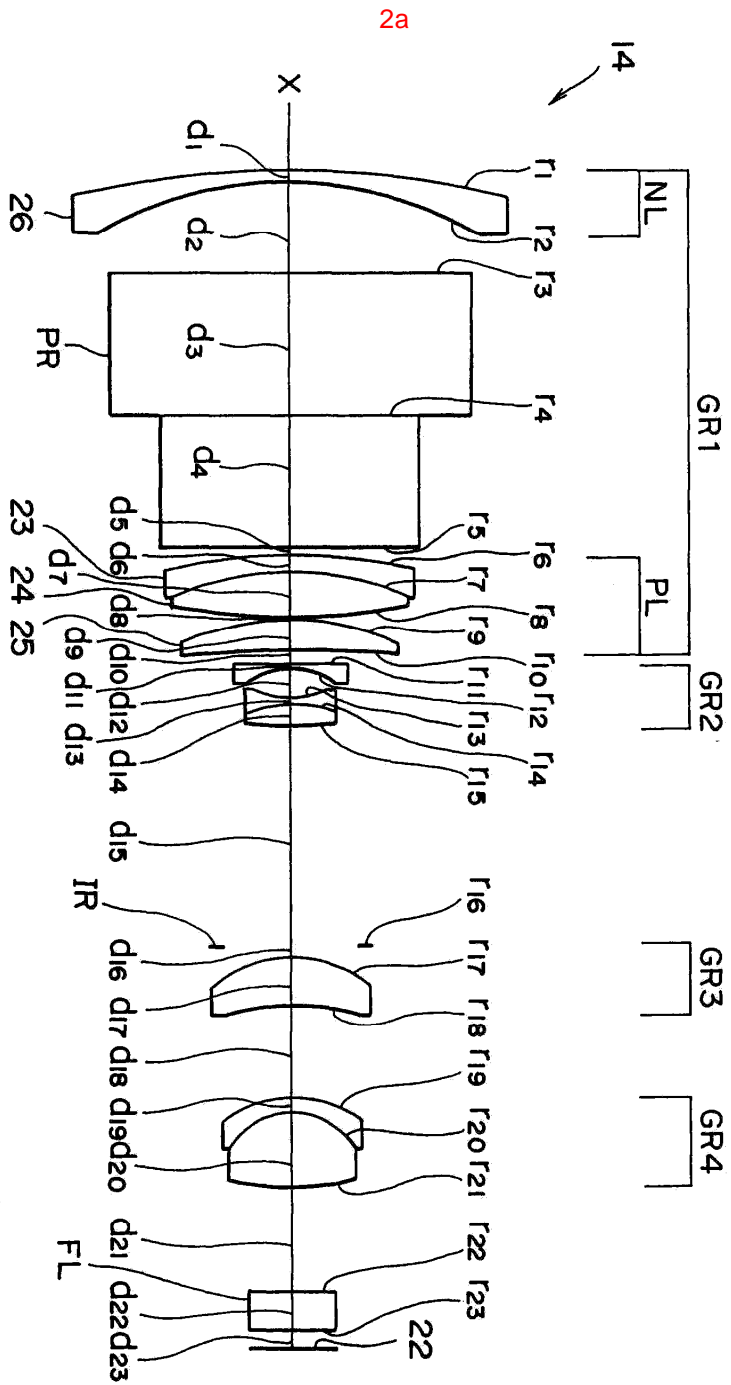
1



IB



IA



2b

표면	r_i	d_i	N_i	v_i
1	17.3764	0.2683	1.69680	55.46
2	7.4558	1.7153		
3	무한	2.6827	1.72342	37.99
4	무한	2.5486	1.72342	37.99
5	무한	0.1341		
6	10.4139	0.2951	1.84666	23.78
7	5.1200	0.9215	1.62041	60.34
8	-13.5482	0.0537		
9	4.7603	0.5610	1.69680	55.46
10	20.8971	가변		
11	21.8168	0.1341	1.83400	37.34
12	1.4974	0.5325		
13	-1.8539	0.1341	1.64850	53.03
14	2.1550	0.4302	1.84666	23.78
15	-10.8157	가변		
16	정지	0.1878		
17	2.1230	0.9268	1.58913	61.25
18	5.4746	가변		
19	2.5614	0.2447	1.84666	23.78
20	1.4247	1.3885	1.58913	61.25
21	-5.4608	가변		
22	무한	0.7276	1.51680	64.19
23	무한	0.3000		

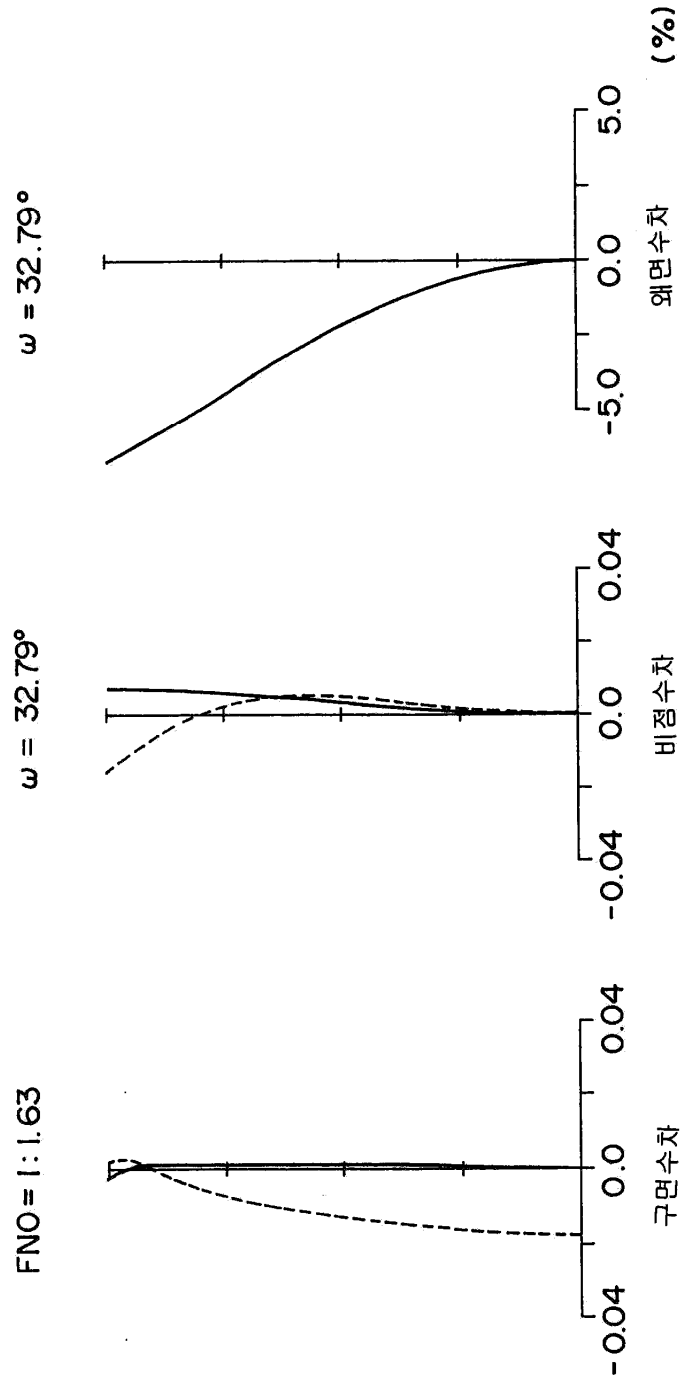
2c

표면	A_4	A_6	A_8
18	2.06777e-02	1.54480e-03	5.68096e-04
21	1.21351e-02	-3.11493e-03	5.18183e-04

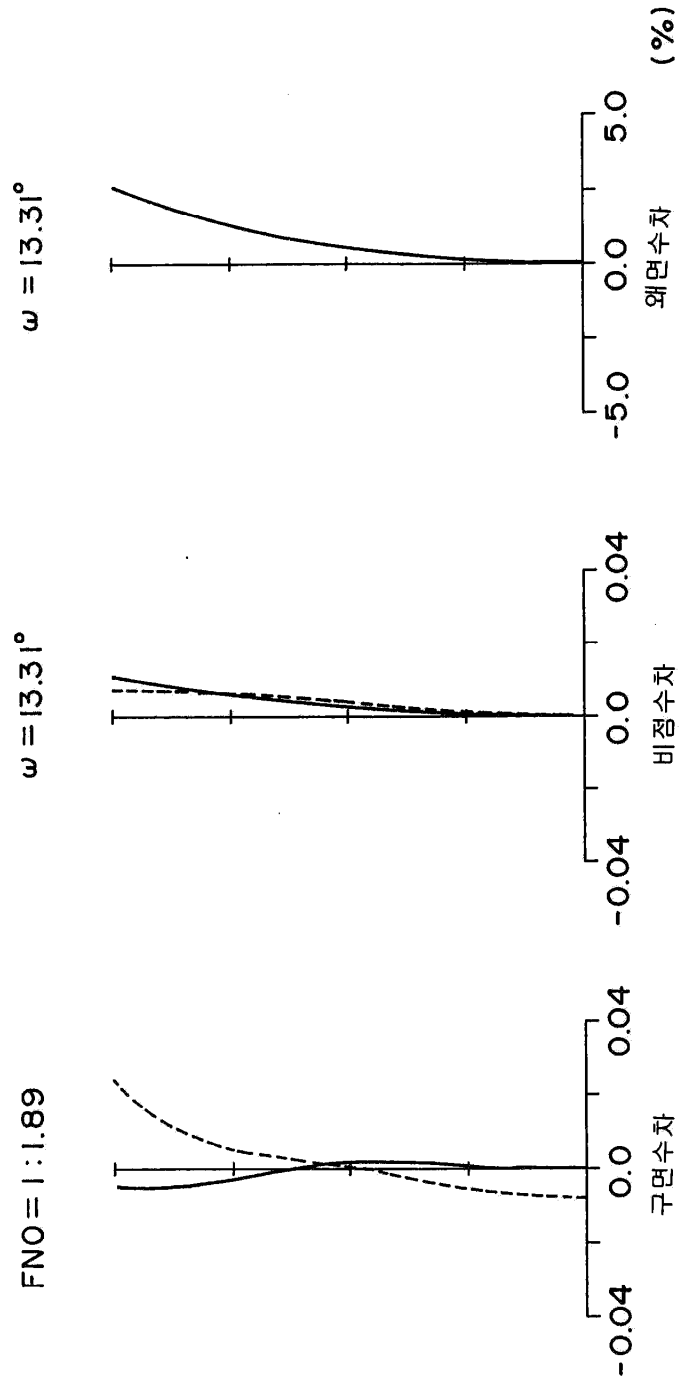
2d

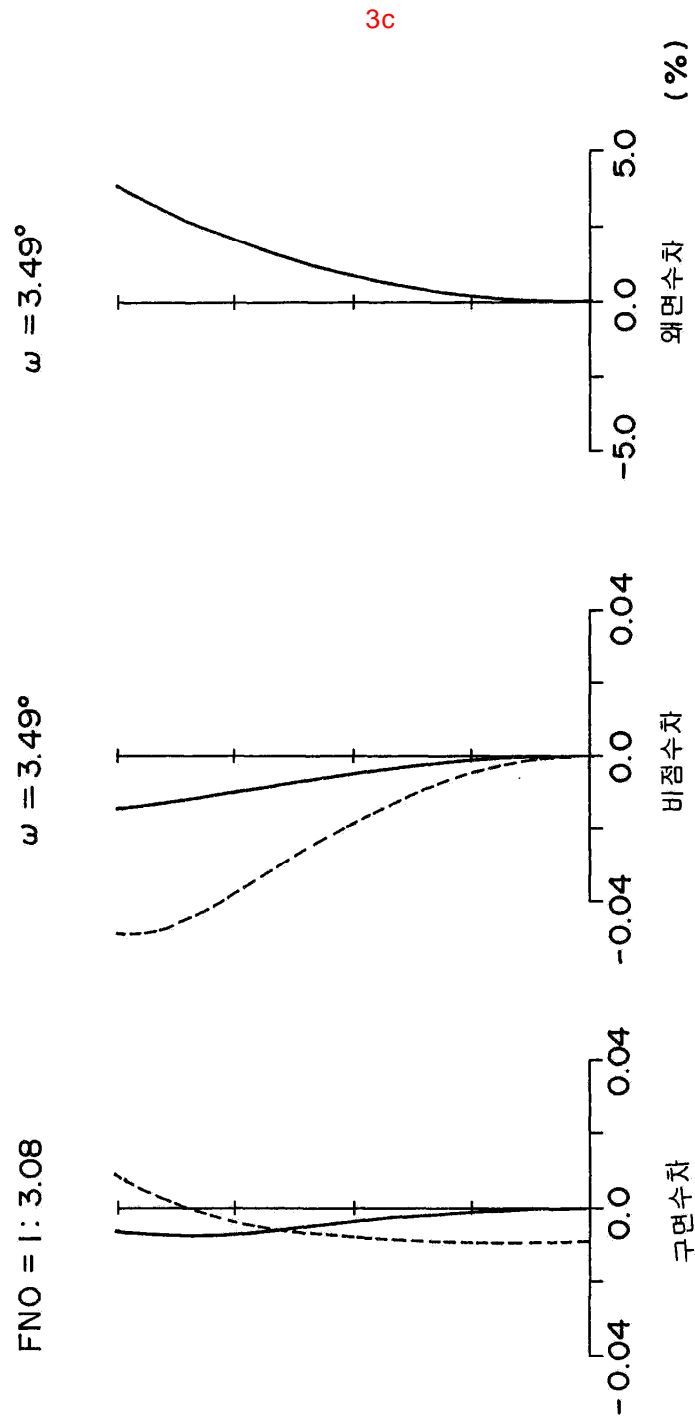
f	1.0000	2.4903	9.5727
d_{10}	0.2426	2.1437	4.0448
d_{15}	4.1913	2.2901	0.3890
d_{18}	1.7651	1.0528	1.9438
d_{21}	1.9563	2.6677	1.7877

3a



3b





4b

표면	r_i	d_i	N_i	V_i
1	-337.7356	0.2683	1.69680	55.46
2	12.0750	1.7153		
3	무한	2.6827	1.72342	37.99
4	무한	2.5486	1.72342	37.99
5	무한	0.1341		
6	13.3791	0.5365	1.69680	55.46
7	118.9429	0.1341		
8	8.8873	0.2951	1.84666	23.78
9	4.5912	1.0244	1.62299	58.12
10	-21.5674	0.0537		
11	4.2153	0.4746	1.69680	55.46
12	8.1645	가변		
13	5.5521	0.1341	1.83400	37.34
14	1.2945	0.7385		
15	-1.8513	0.1341	1.65844	50.85
16	1.8546	0.4476	1.84666	23.78
17	-21.0387	가변		
18	경지	0.1878		
19	2.1193	0.8649	1.58913	61.25
20	6.5346	가변		
21	2.6755	0.2146	1.84666	23.78
22	1.4186	1.1656	1.58913	61.25
23	-4.6855	가변		
24	무한	0.7276	1.51680	64.19
25	무한	0.3000		

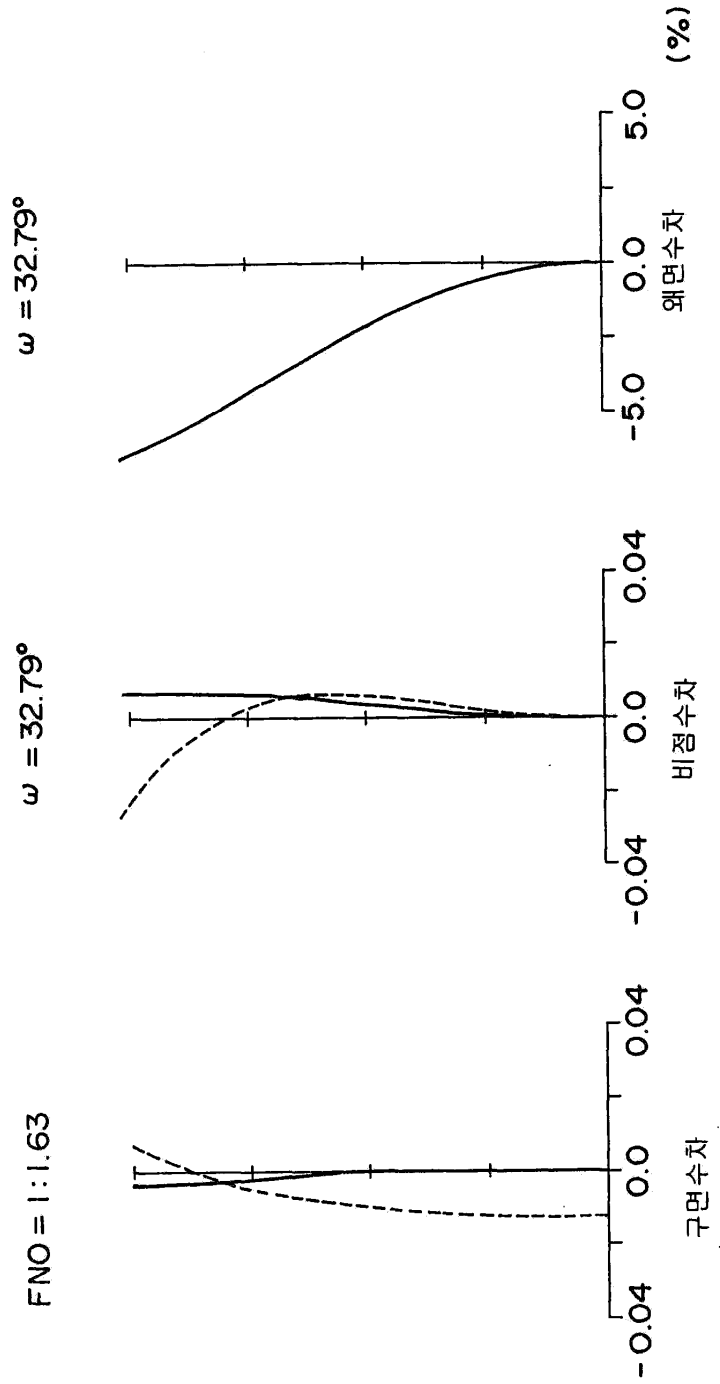
4c

표면	A_4	A_6	A_8
20	2.13594e-02	1.30794e-03	4.60137e-04
23	1.11186e-02	-2.11602e-03	1.30411e-05

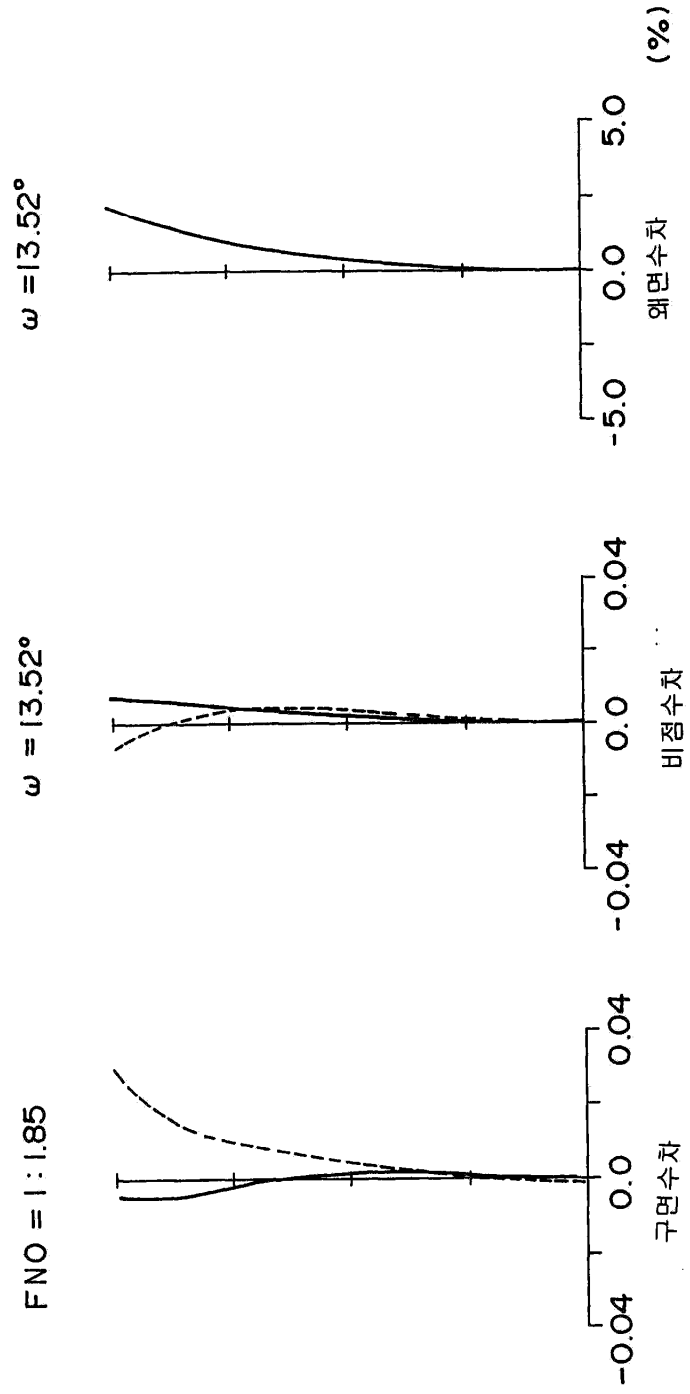
4d

f	1.0000	2.4615	9.5692
d_{12}	0.2414	1.9941	3.7468
d_{17}	3.8943	2.1416	0.3890
d_{20}	1.5673	0.9349	1.9703
d_{23}	1.9633	2.5925	1.5684

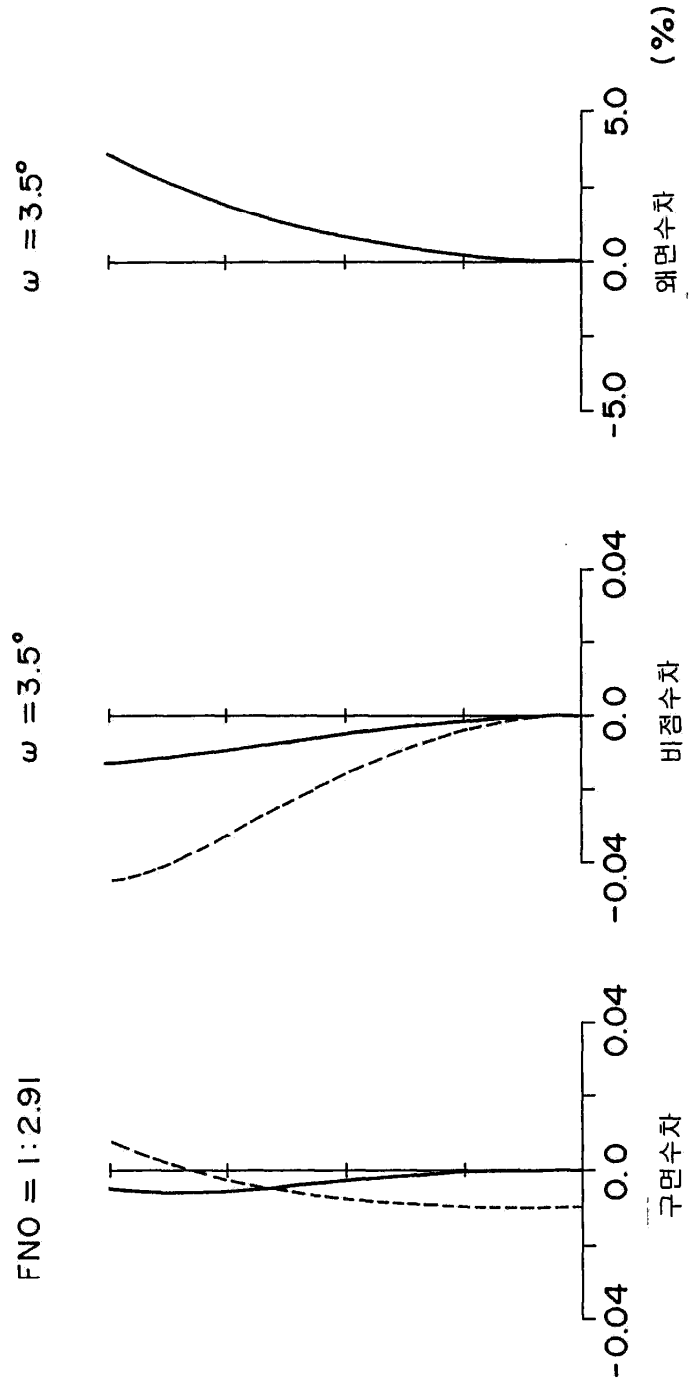
5a

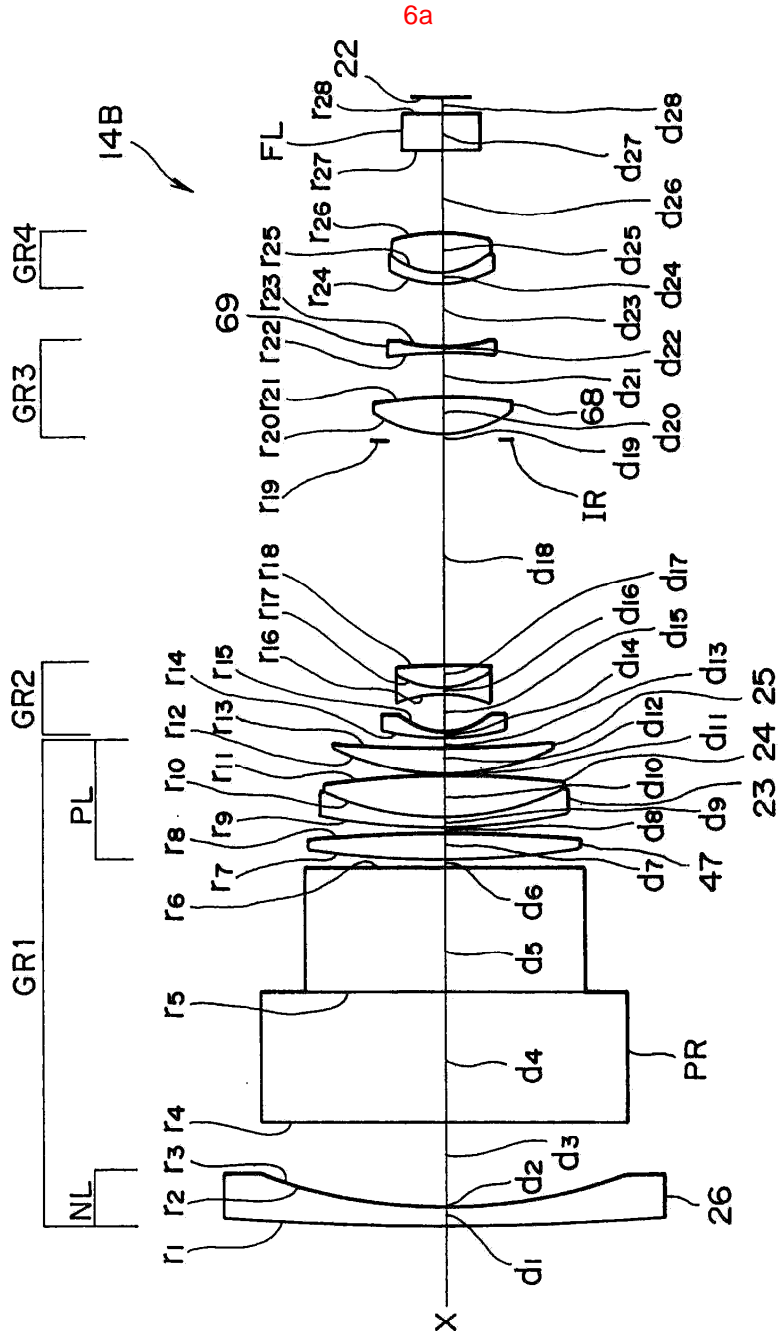


5b



5c





6b

표면	r_i	d_i	N_i	V_i
1	134.3890	0.3091	1.69680	55.46
2	10.6382	0.0403	1.49200	58.00
3	10.6382	1.6664		
4	무한	2.6878	1.72342	37.99
5	무한	2.5534	1.72342	37.99
6	무한	0.1344		
7	19.2848	0.5107	1.58913	61.25
8	-36.7446	0.1344		
9	14.1646	0.2150	1.84666	23.78
10	6.0677	0.7714	1.62299	58.12
11	-29.3156	0.0538		
12	4.9866	0.5295	1.69680	55.46
13	15.6966	가변		
14	5.6621	0.1075	1.83400	37.34
15	1.5221	0.7795		
16	-2.0782	0.1344	1.65844	50.85
17	2.2532	0.3978	1.84666	23.78
18	-22.2924	가변		
19	정지	0.1881		
20	2.6171	0.6988	1.69350	53.34
21	-7.8752	0.8708		
22	-17.3007	0.1344	1.84666	23.78
23	4.0599	가변		
24	2.4260	0.1881	1.84666	23.78
25	1.6449	0.7714	1.58913	61.25
26	-4.1929	가변		
27	무한	0.7290	1.51680	64.19
28	무한	0.3000		

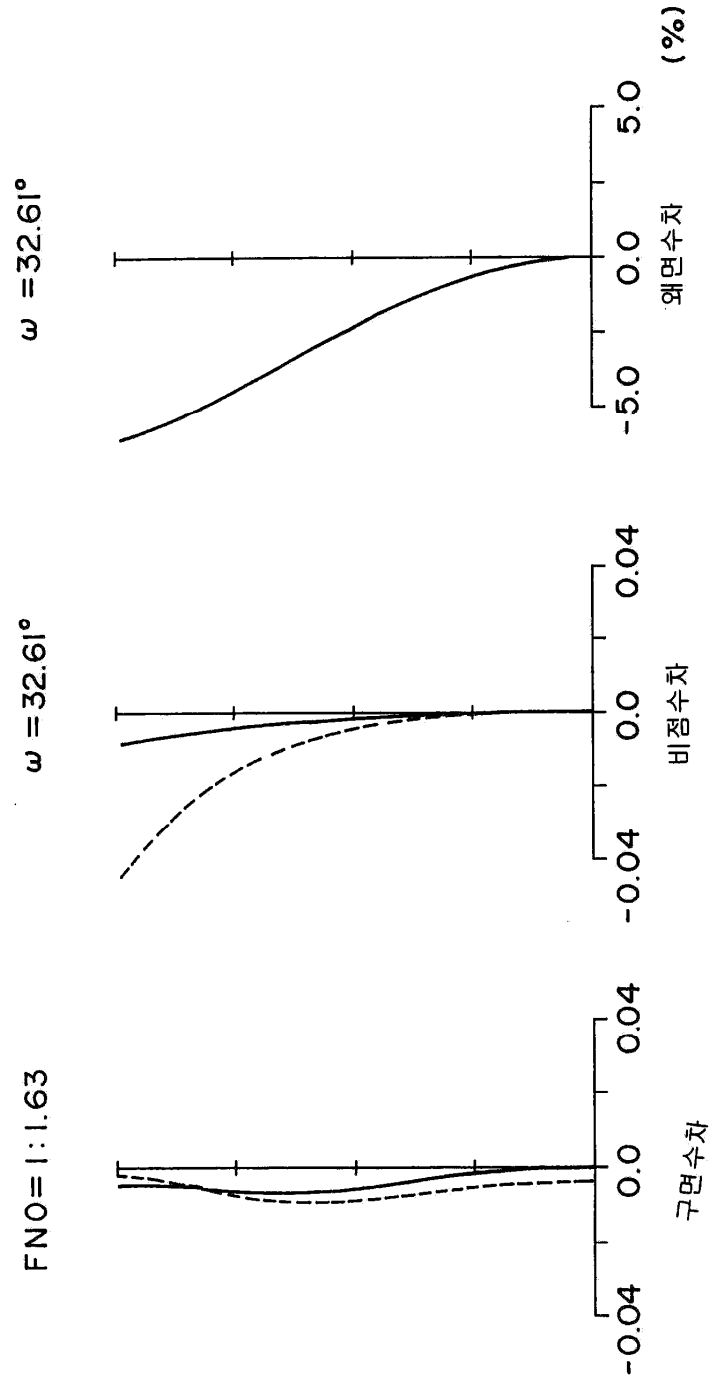
6c

표면	A_4	A_6	A_8
3	5.87907e-06	-1.84931e-07	-1.20228e-07
21	1.31194e-02	-4.48930e-04	-8.72152e-05
26	1.86015e-02	2.69246e-03	-7.06982e-04

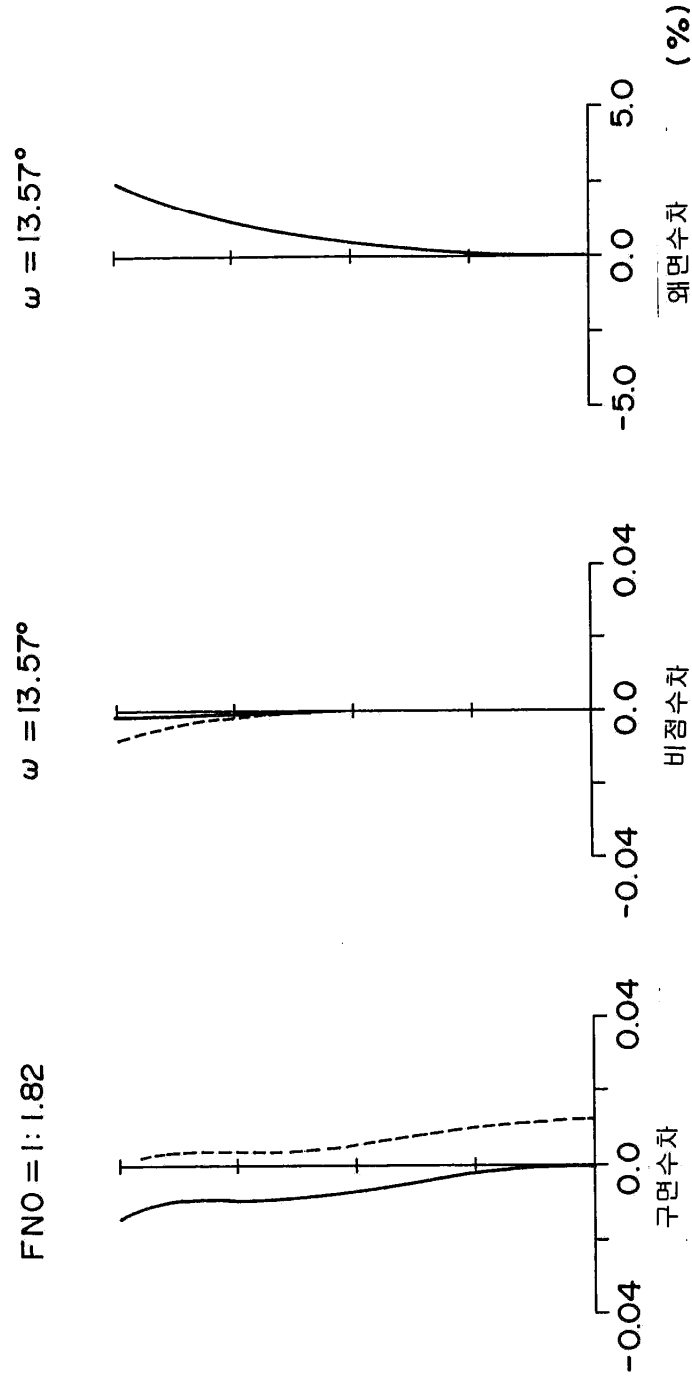
6d

f	1.0000	2.4499	9.5812
d ₁₃	0.2419	2.3026	4.3633
d ₁₈	4.5380	2.4773	0.4166
d ₂₃	1.2768	0.7075	1.6739
d ₂₆	1.6108	2.1814	1.2074

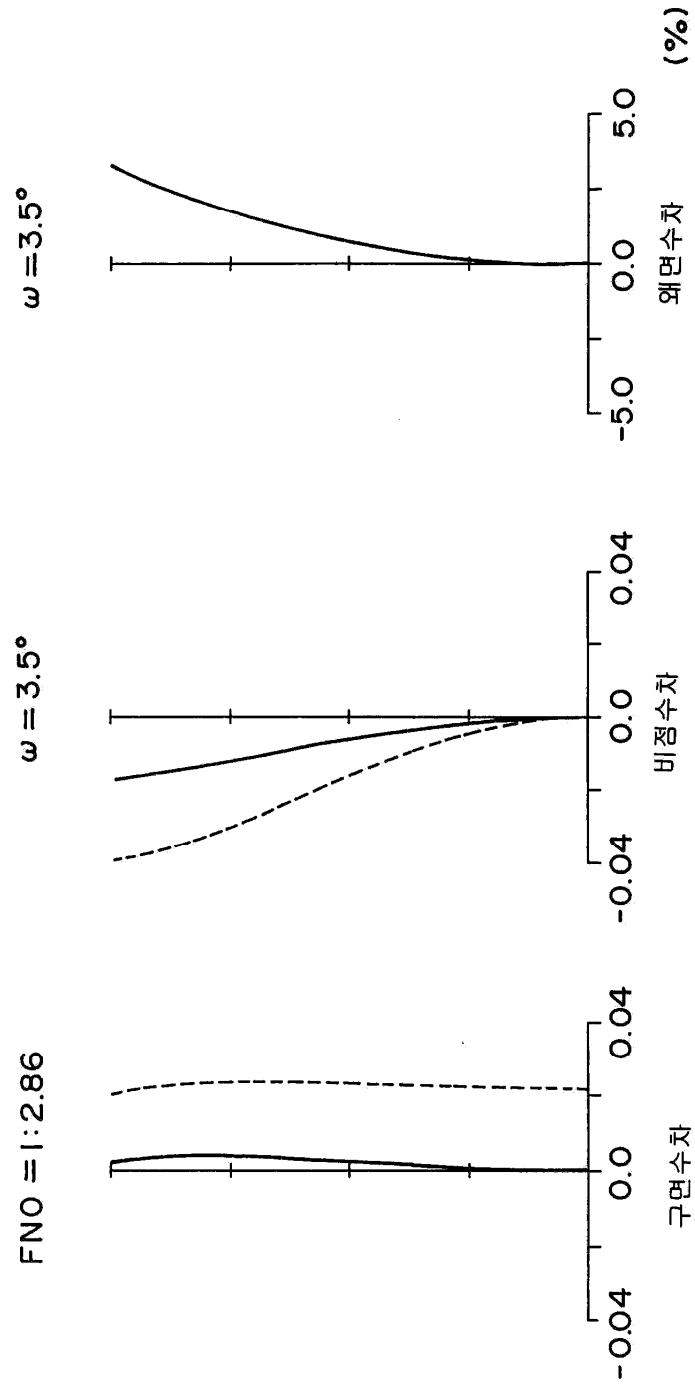
7a



7b



7c



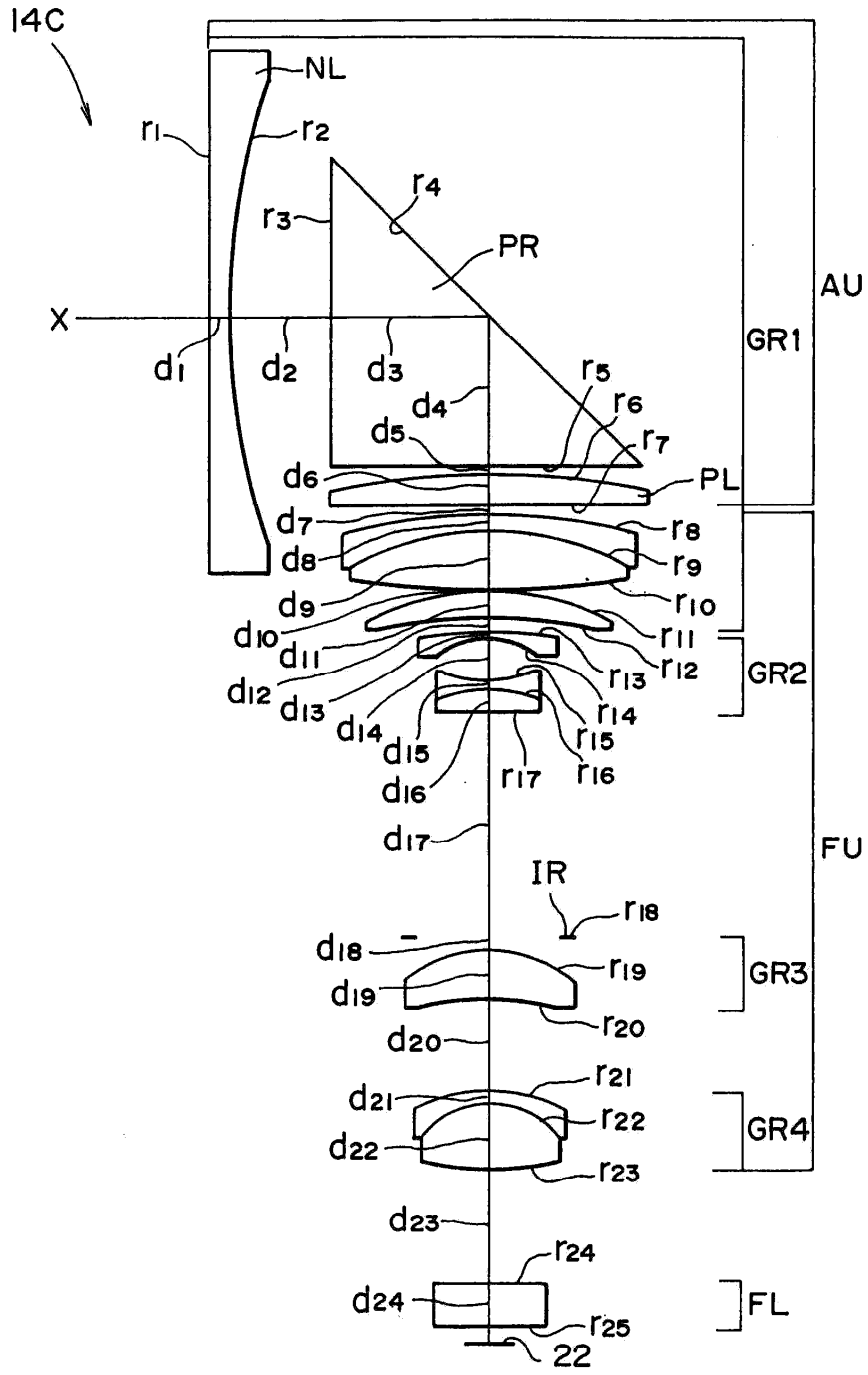
8a

실시예	f	FNO	2ω
1	1.0-9.6	1 : 1.63-3.08	65.6-7.0
2	1.0-9.6	1 : 1.63-2.91	65.6-7.0
3	1.0-9.6	1 : 1.63-2.86	65.2-7.0

8b

순시예	D1/D1A	/R31/R32/	R34/R33	Σ D3/fW	v3P - v3N
1	1.297	--	--	--	--
2	1.394	--	--	--	--
3	1.364	0.332	-0.235	1.704	29.56

9a



9b

표면	r_i	d_i	N_i	V_i
1	-337.7356	0.2683	1.69680	55.46
2	12.0750	1.7153		
3	무한	2.6827	1.72342	37.99
4	무한	2.5486	1.72342	37.99
5	무한	0.1341		
6	13.3791	0.5365	1.69680	55.46
7	118.9429	0.1341		
8	8.8873	0.2951	1.84666	23.78
9	4.5912	1.0244	1.62299	58.12
10	-21.5674	0.0537		
11	4.2153	0.4746	1.69680	55.46
12	8.1645	가변		
13	5.5521	0.1341	1.83400	37.34
14	1.2945	0.7385		
15	-1.8513	0.1341	1.65844	50.85
16	1.8546	0.4476	1.84666	23.78
17	-21.0387	가변		
18	정지	0.1878		
19	2.1193	0.8649	1.58913	61.25
20	6.5346	가변		
21	2.6755	0.2146	1.84666	23.78
22	1.4186	1.1656	1.58913	61.25
23	-4.6855	가변		
24	무한	0.7276	1.51680	64.19
25	무한	0.3000		

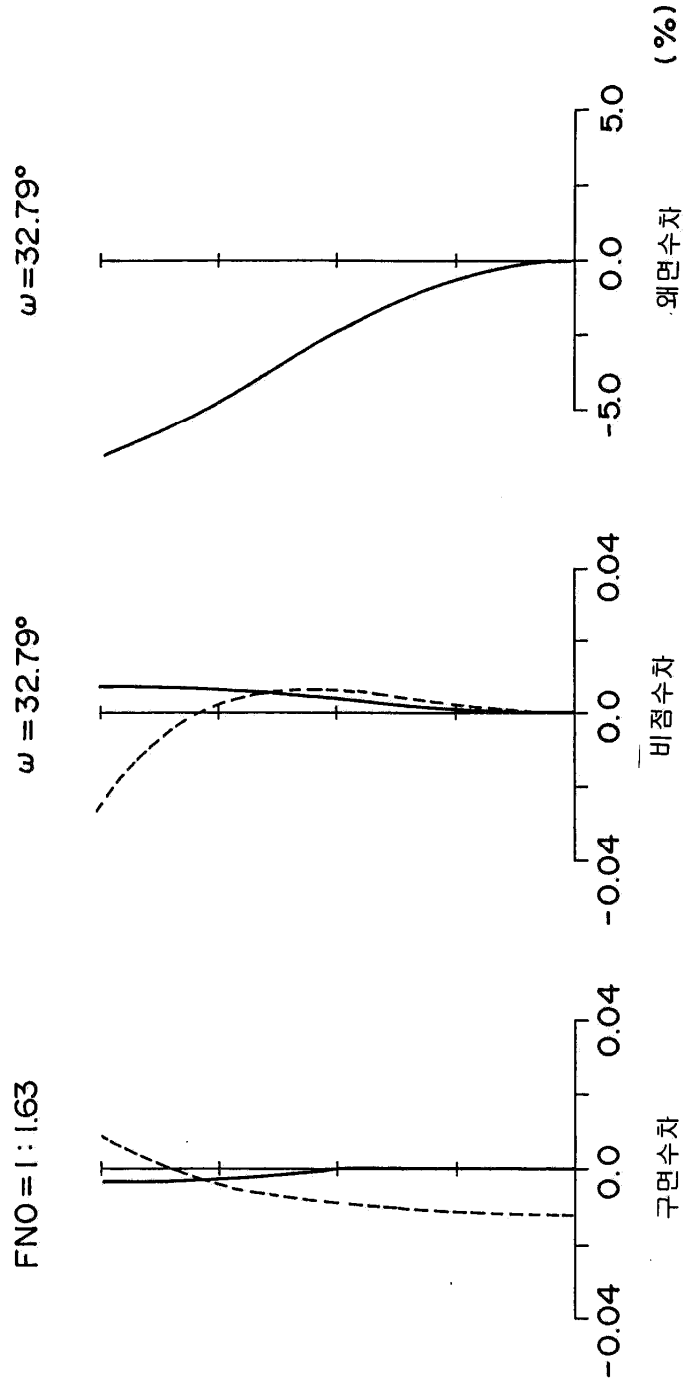
9c

표면	A_4	A_6	A_8
20	2.13594e-02	1.30794e-03	4.60137e-04
23	1.11186e-02	-2.11602e-03	1.30411e-05

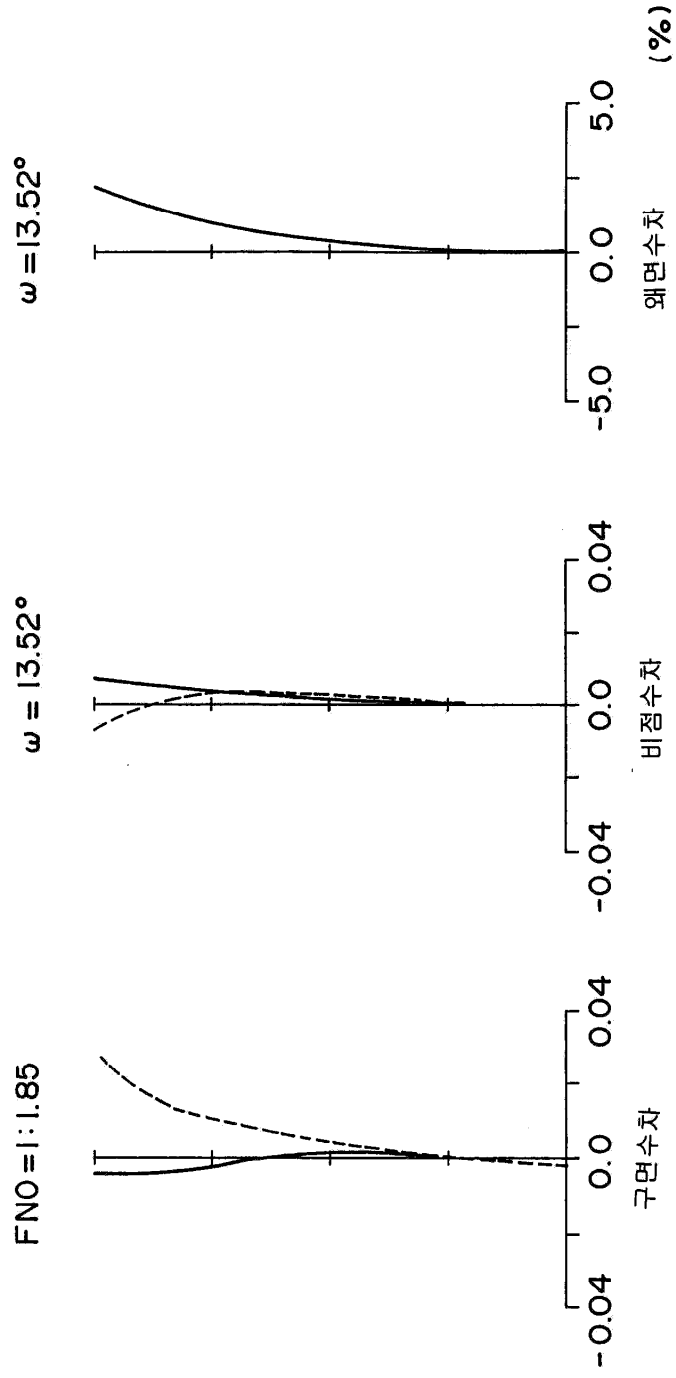
9d

f	1.0000	2.4615	9.5692
d_{12}	0.2414	1.9941	3.7468
d_{17}	3.8943	2.1416	0.3890
d_{20}	1.5673	0.9349	1.9703
d_{23}	1.9633	2.5925	1.5684

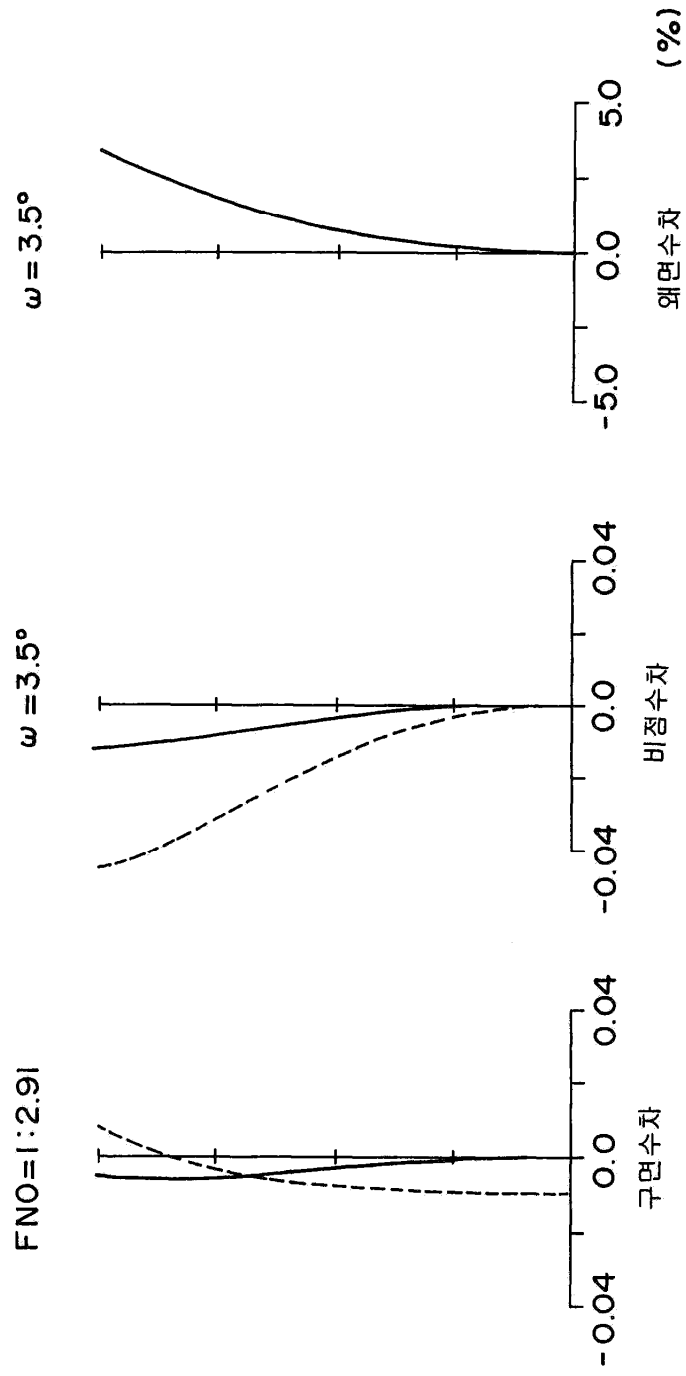
10a

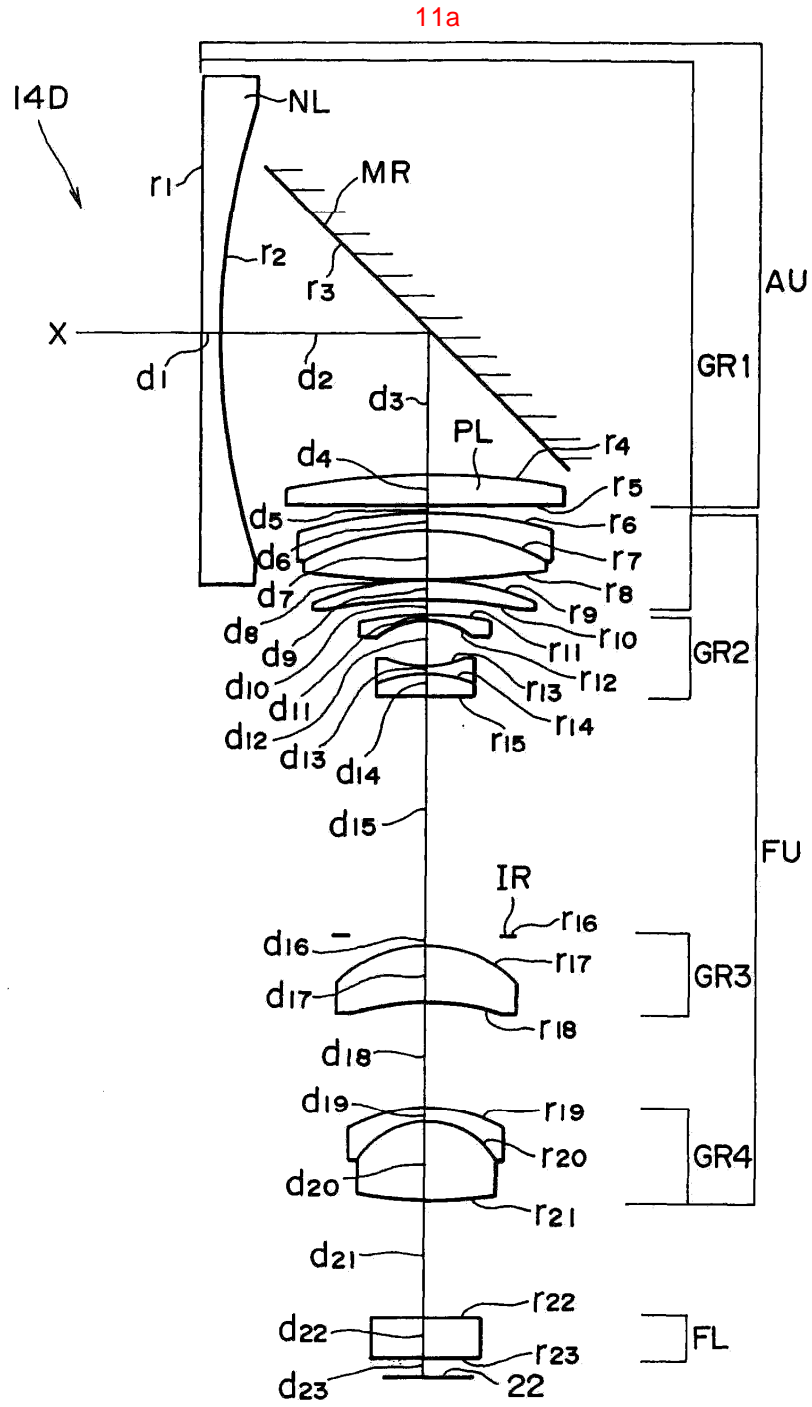


10b



10c





11b

표면	r_i	d_i	N_i	v_i
1	-651.0159	0.2495	1.69680	55.46
2	11.4980	3.4181		
3	무한	2.2954		
4	13.5915	0.4990	1.69680	55.46
5	121.7142	0.1247		
6	7.4458	0.2744	1.84666	23.78
7	4.1385	0.8038	1.62041	60.34
8	-26.1799	0.0499		
9	4.4938	0.3521	1.69680	55.46
10	8.2991	가 변		
11	4.0308	0.1247	1.83400	37.34
12	1.2597	0.7634		
13	-1.8617	0.1247	1.64850	53.03
14	1.7345	0.3994	1.84666	23.78
15	-151.4396	가 변		
16	정지	0.1746		
17	2.1006	0.9439	1.58913	61.25
18	6.0317	가 변		
19	2.4930	0.2609	1.84666	23.78
20	1.3395	1.3525	1.58913	61.25
21	-5.6299	가 변		
22	무한	0.6767	1.51680	64.19
23	무한	0.3000		

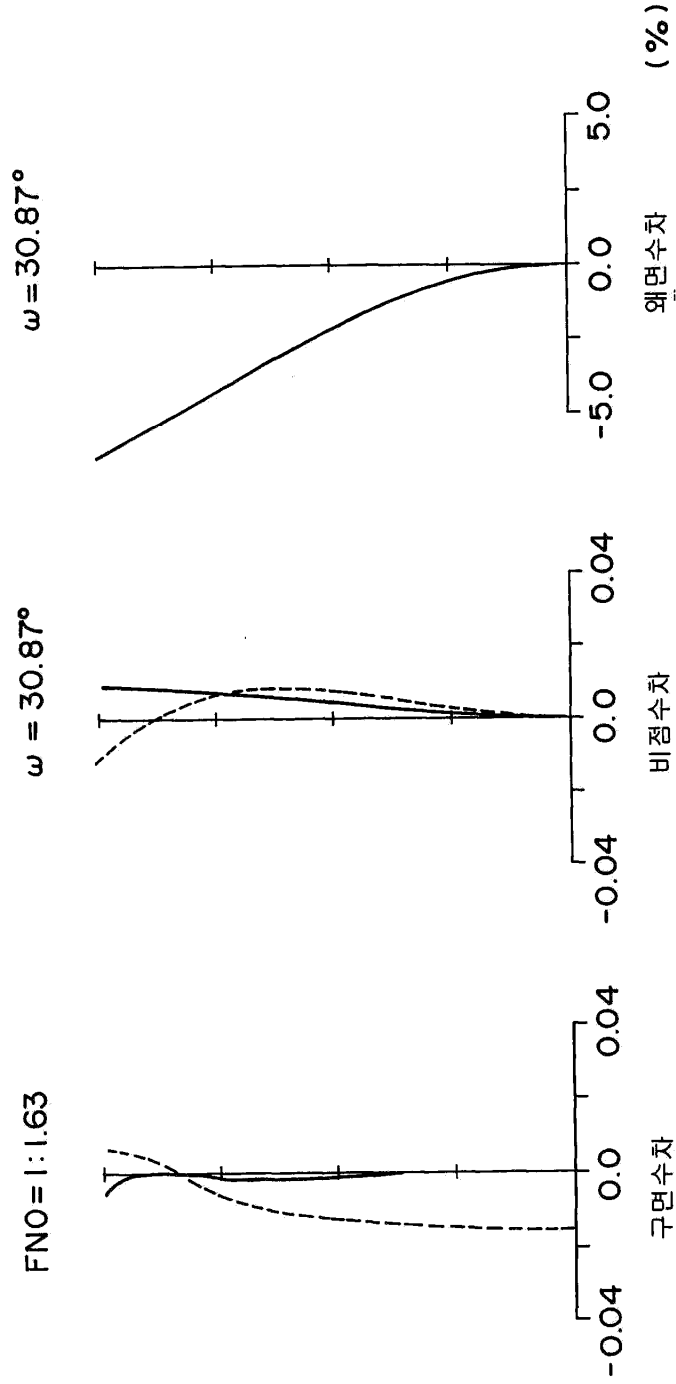
11c

표면	A_4	A_6	A_8
18	2.13796e-02	1.97676e-03	5.20549e-04
21	1.08692e-02	-3.38563e-03	-1.35395e-04

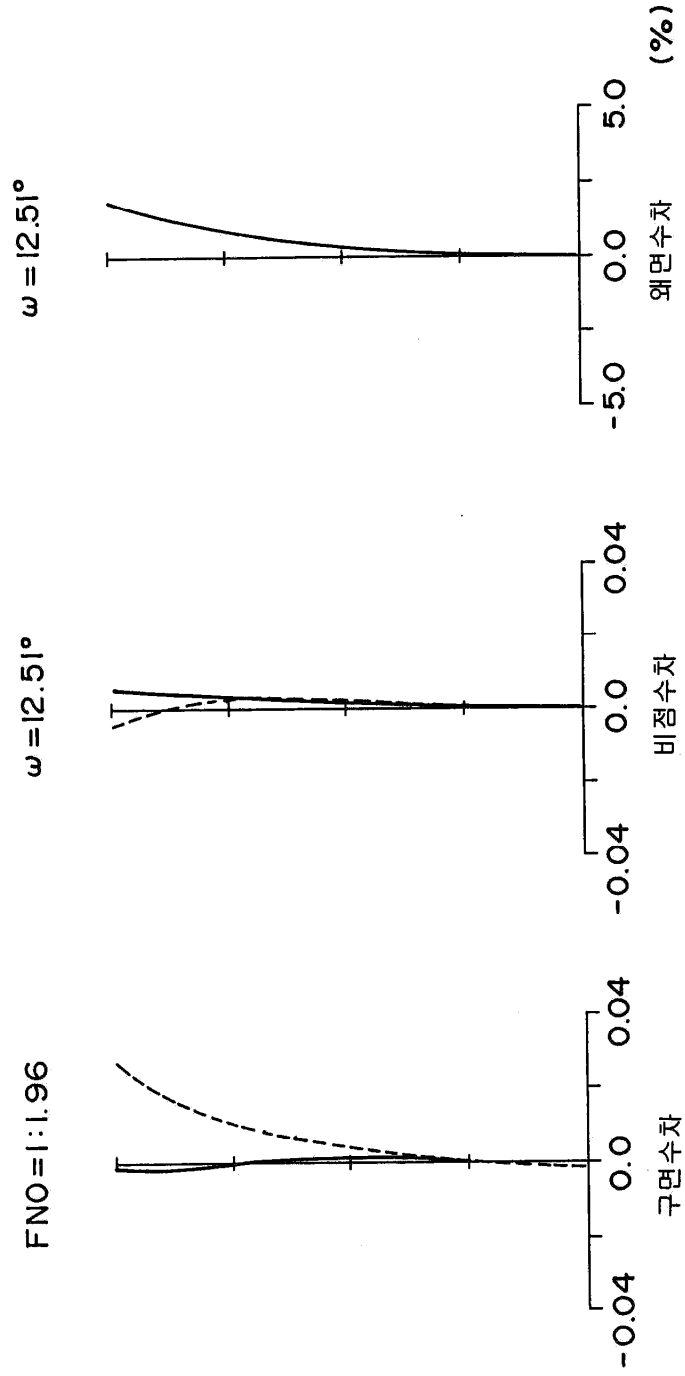
11d

f	1.0000	2.4863	9.5741
d_{10}	0.2245	2.0323	3.8401
d_{15}	3.9773	2.1696	0.3618
d_{18}	1.7588	1.0377	2.1336
d_{21}	1.9305	2.6477	1.5642

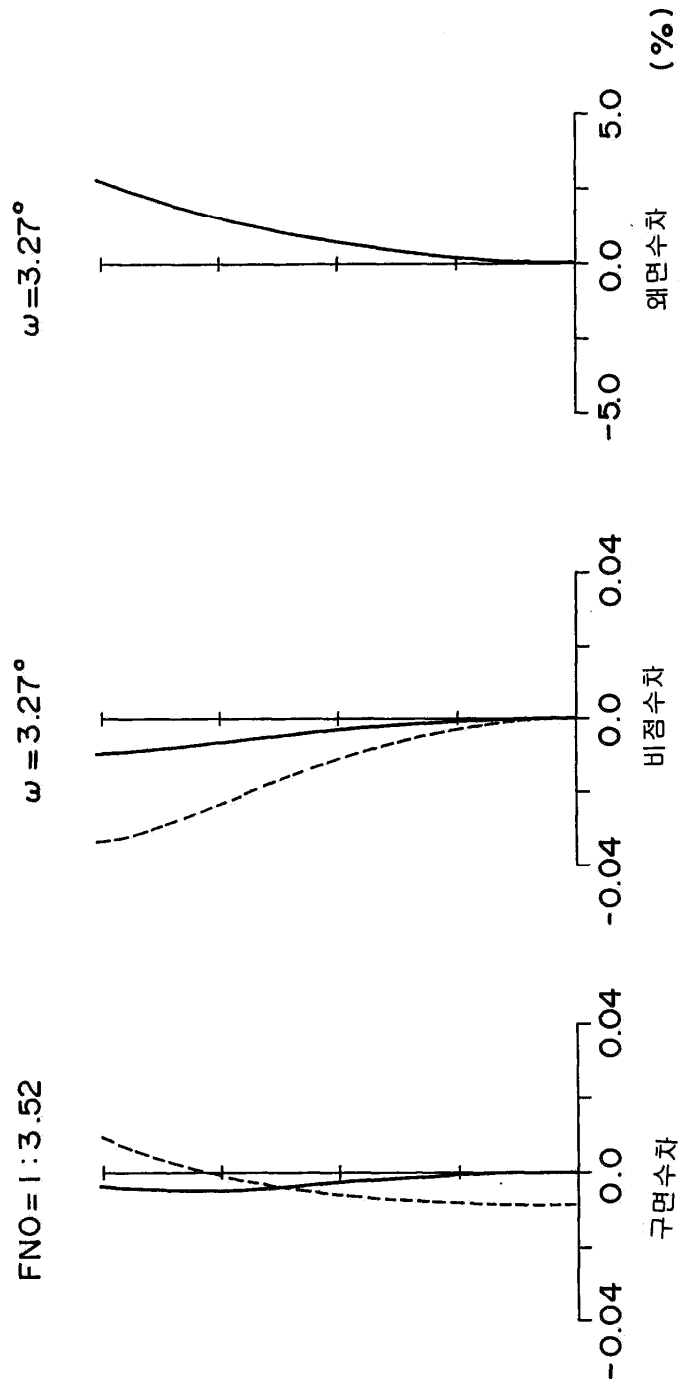
12a



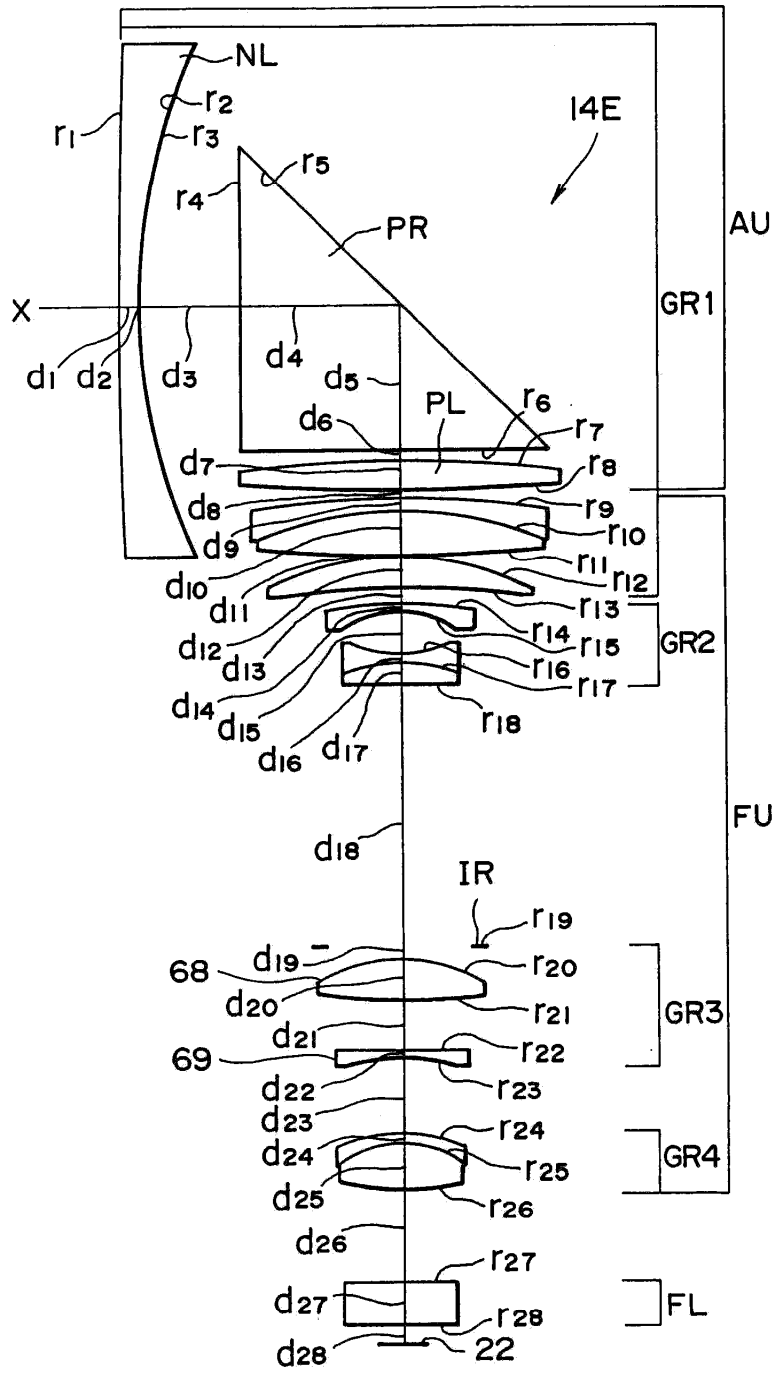
12b



12c



13a



13b

표면	r_i	d_i	N_i	V_i
1	134.3890	0.3091	1.69680	55.46
2	10.6382	0.0403	1.49200	58.00
3	10.6382	1.6664		
4	무한	2.6878	1.72342	37.99
5	무한	2.5534	1.72342	37.99
6	무한	0.1344		
7	19.2848	0.5107	1.58913	61.25
8	-36.7446	0.1344		
9	14.1646	0.2150	1.84666	23.78
10	6.0677	0.7714	1.62299	58.12
11	-29.3156	0.0538		
12	4.9866	0.5295	1.69680	55.46
13	15.6966	가변		
14	5.6621	0.1075	1.83400	37.34
15	1.5221	0.7795		
16	-2.0782	0.1344	1.65844	50.85
17	2.2532	0.3978	1.84666	23.78
18	-22.2924	가변		
19	정지	0.1881		
20	2.6171	0.6988	1.69350	53.34
21	-7.8752	0.8708		
22	-17.3007	0.1344	1.84666	23.78
23	4.0599	가변		
24	2.4260	0.1881	1.84666	23.78
25	1.6449	0.7714	1.58913	61.25
26	-4.1929	가변		
27	무한	0.7290	1.51680	64.19
28	무한	0.3000		

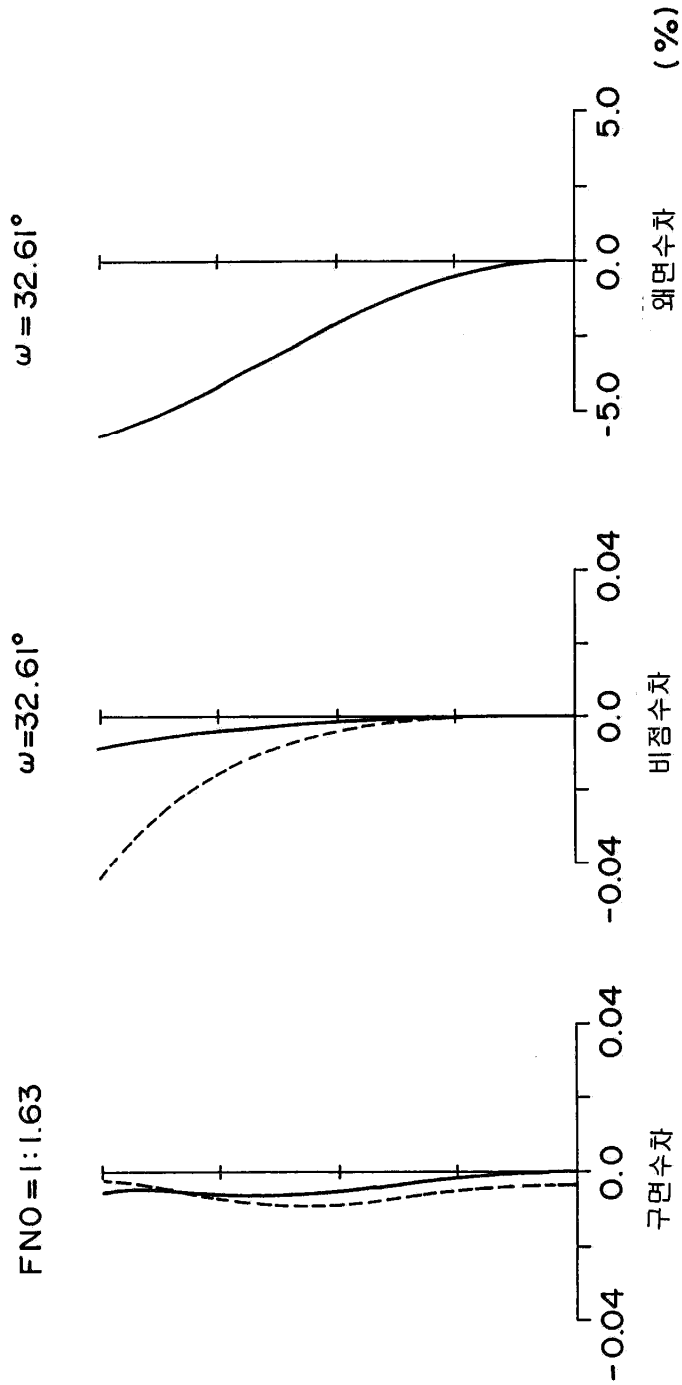
13c

표면	A_4	A_6	A_8
3	5.87907e-06	-1.84931e-07	-1.20228e-07
21	1.31194e-02	-4.48930e-04	-8.72152e-05
26	1.86015e-02	2.69246e-03	-7.06982e-04

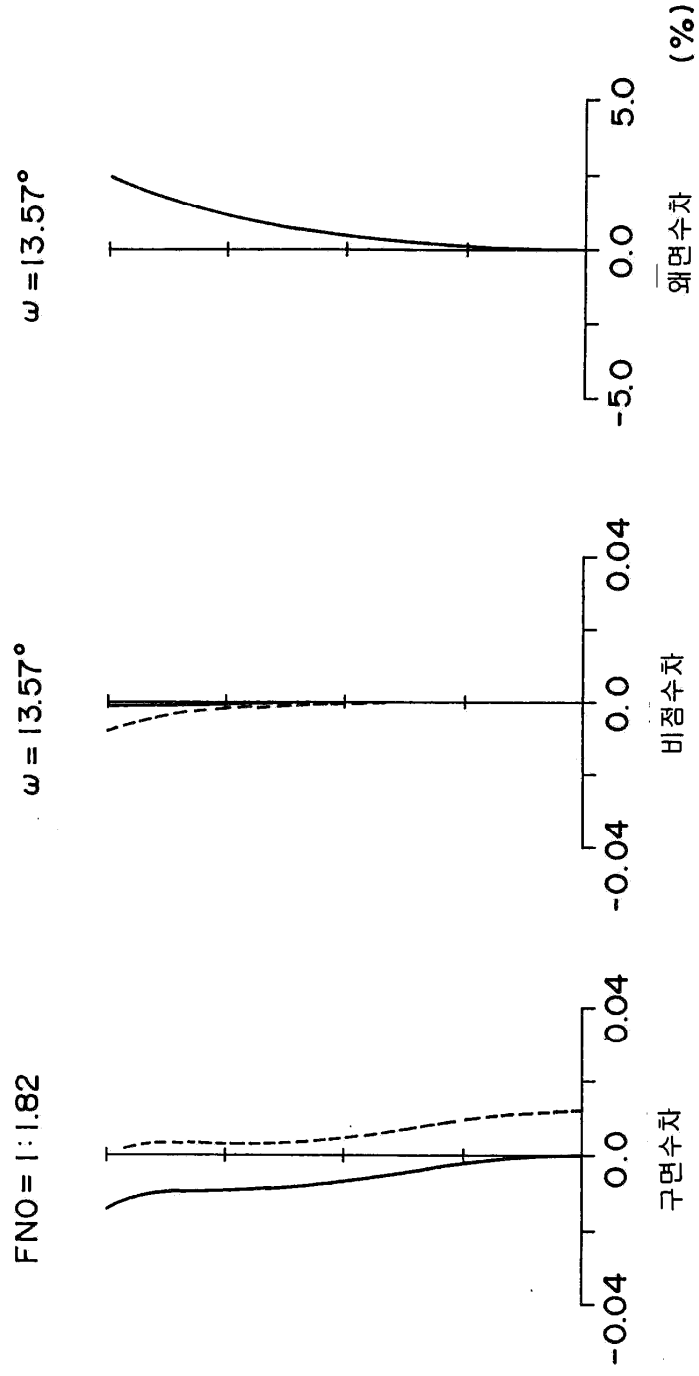
13d

f	1.0000	2.4499	9.5812
d ₁₃	0.2419	2.3026	4.3633
d ₁₈	4.5380	2.4773	0.4166
d ₂₃	1.2768	0.7075	1.6739
d ₂₆	1.6108	2.1814	1.2074

14a



14b



14c

