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(54) SINGLE LENS REFLEX VIEW FINDER

(71) We, KARL VOCKENHUBER, of 118 Pötzleinsdorferstrasse, Vienna 18, Austria, and RAIMUND HAUSER, of 2 Goldeggasse, Vienna 4, Austria, both Austrian Citizens, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a single-lens reflex viewfinder for cameras, more particularly cine cameras of the super-8 format, comprising a viewfinder lens and a viewfinder eyepiece with a fixed exit pupil.

In recent times the development of cine cameras has been accompanied by attempts to create particularly fast taking lenses which, in cooperation with highly light-sensitive film material enable photographs to be taken even under extremely unfavourable light conditions. Lenses of this kind are marketed under the description "available light lenses".

Filming under available light makes exceptional demands not only on the taking lens and film emulsion but also on the viewfinder so that relatively dark objects in a dark background can be recognized without any particular strain. The diameter of the viewfinder exit pupil may be regarded as a measure for the viewfinder brightness. This applies for as long as the diameter of the pupil of the human eye exceeds the diameter of the exit pupil, the diameter of the human eye under the given circumstances being assumed to be between 5 and 6 millimetres.

It is possible on the one hand to increase the diameter of the exit pupil by increasing the viewfinder lens and viewfinder eyepiece. However, since space is generally very limited in the design of a camera this solution is unsatisfactory. It would also be possible to increase the diameter of the exit pupil by elongating the focal length of the eyepiece but then the telescopic magnification of the viewfinder diminishes with an increasing focal length of the eyepiece and the viewfinder image thus offered becomes too small.

In order to obtain a viewfinder brightness measure which is independent of the structural length, the stop number B of the viewfinder

may be expressed by the following relationship

$$B = \frac{f_{ok}}{AP} = \frac{f_{obj}}{EP}$$

where AP or EP refer to the diameter of the exit pupil and the entry pupil respectively, f_{ok} refers to the focal length of the eyepiece and f_{obj} refers to the focal length of the viewfinder lens, counting all optical elements in the optical finder path between the object and a first real intermediate image.

The stop numbers in known reflex viewfinders are approximately $B = 6$ to 10. In one proposed viewfinder the focal length of the viewfinder lens f_{obj} is equal to the focal length of the viewfinder eyepiece f_{ok} and amounts to approximately 22.8. The diameter of the exit pupil or entry pupil is stated to be 2.5. This provides a stop number of $B = 9.1$. The focal length of the eyepiece in another proposed viewfinder is 17.8 and the diameter of the exit pupil or entry pupil is 2.0. The stop number which can be calculated therefrom has a value of 8.9. These stop numbers are inadequate for filming under conditions of unfavourable lighting when a stop number of approximately 3.4 is preferable.

In accordance with the present invention, there is provided a camera having a reflex viewfinder system receiving light from an objective of the main optical system of the camera, the viewfinder system including a viewfinder objective and a viewfinder eyepiece, wherein the viewfinder objective includes an achromatic lens pair comprising a positive biconvex lens and a negative meniscus, all the radii of curvature in the lens pair being greater than $0.3f_A$, f_A being the focal length of the viewfinder objective.

The use of a positive and negative lens pair allows for compensation of chromatic as well as other forms of aberration so that it becomes possible to construct a large diameter viewfinder objective without the quality of the viewfinder image being adversely affected.

The invention will now be described in

more detail, by way of example, with reference to the accompanying drawings, in which:—

FIGURES 1 and 1A show a fast taking lens system in the position for minimum focal length in conjunction with a single reflex viewfinder provided with a wide-angle eyepiece;

FIGURES 2 and 2A in conjunction with a fast taking lens shows an arrangement of the viewfinder lens system with a known viewfinder eyepiece; and

FIGURE 3 is a sectional view of a viewfinder lens system comprising three elements with a novel viewfinder eyepiece.

The taking lens system of Figure 1 comprises a supplementary lens combination for variable magnification and a base lens group of fixed focal length. The supplementary lens combination comprises a positive front group I followed by a negative lens group II, the negative group II being slidable along the optical axis for the purpose of changing the magnification, and the supplementary lens combination performing the compensating motion which is required to maintain a constant image position. The base lens group IV is preceded by a positive element III that follows the negative group II, the element III

being adapted to converge the ray pencils which diverge behind the diaphragm space so that they strike the base lens group IV in the axially parallel or converging direction. The base lens group IV incorporates a cemented doublet which is adjacent to the positive element III and is followed by a biconcave lens and two biconvex lenses. Among the radii of the base lens group none is shorter than 0.6 times the overall focal length of the combination III + IV, the refractive index of all biconvex lenses being less than 1.72. The following conditions could also be satisfied in order to eliminate aberrations:

$$\begin{aligned} 0.7r_{1s} < r_{1s} < 2.1r_{1s} \\ 0.03f_{III} < d_{III} < 0.55f_{III} \end{aligned}$$

where r_{1s} and r_{1s} are the radii of curvature of the surfaces bearing these designations in Fig. 1A.

Three numerical examples for a zoom lens or for the associated base lens group are stated below, the radii being designated with r , the lens thickness with d , the air spaces with l , the refractive indices with n , and the Abbe numbers with v .

EXAMPLE I.

				n_d	v_d
L_1	r_1	+8.706	$d_1=0.15$	/ 1.805	/ 25.4
	r_2	+2.628	$l_1=0.21$		
L_2	r_3	+3.408	$d_2=0.43$	/ 1.603	/ 60.6
	r_4	-18.304	$l_2=0.01$		
L_3	r_5	+2.278	$d_3=0.52$	/ 1.658	/ 50.9
	r_6	-130.310	l_3 { 0.05 . . . $f_{\min}$ 0.78 . . . f_M 1.21 . . . $f_{\max}$		
L_4	r_7	+40.501	$d_4=0.08$	/ 1.713	/ 53.8
	r_8	+0.999	$l_4=0.24$		
L_5	r_9	-3.780	$d_5=0.08$	/ 1.641	/ 60.1
L_6	r_{10}	+1.170	$d_6=0.21$	/ 1.847	/ 23.8
	r_{11}	+4.173	l_6 { 2.06 . . . $f_{\min}$ 1.63 . . . f_M 0.90 . . . $f_{\max}$		
L_7	r_{12}	+2.794	$d_7=0.21$	/ 1.717	/ 48.0
	r_{13}	-3.655	$l_6=0.01$		
L_8	r_{14}	+0.955	$d_8=0.42$	/ 1.657	/ 36.7
	r_{15}	-1.513	$d_9=0.17$	/ 1.805	/ 25.4
L_9	r_{16}	+2.066	$l_7=0.08$		
	r_{17}	-2.166	$d_{10}=0.19$	/ 1.847	/ 23.8
L_{10}	r_{18}	+1.030	$l_8=0.15$		
	r_{19}	+5.136	$d_{11}=0.23$	/ 1.713	/ 53.8
L_{11}	r_{20}	-1.036	$l_9=0.01$		
	r_{21}	+0.946	$d_{12}=0.23$	/ 1.641	/ 60.1
L_{12}	r_{22}	-380.504	$f_{\min}=0.594$ $f_M=1$ $f_{\max}=1.683$		

Group III+IV
 $f_{III+IV}=1.23$

relative aperture=1:1.2

diagonal of the cine format =2y=0.54

5 This as well as the following examples shows that all the initially mentioned conditions for the base lens group are satisfied. This results not only in a fast lens system but also in a short structural length without excessively

short curvature radii, without the need for using special kinds of glass and having relatively low reflection losses. The following examples refer merely to the base lens group.

EXAMPLE II

			n_d	v_d	
L_7	r_{12}	+2.794	$d_7 = 0.21$	/ 1.717	/ 48.0
	r_{13}	-3.655			
L_8	r_{14}	+0.955	$d_8 = 0.42$	/ 1.657	/ 36.7
	r_{15}	-1.513			
L_9	r_{16}	+3.800	$d_9 = 0.04$	/ 1.805	/ 25.4
	r_{17}	-2.166			
L_{10}	r_{18}	+1.030	$d_{10} = 0.19$	/ 1.847	/ 23.8
	r_{19}	+5.136			
L_{11}	r_{20}	-1.036	$d_{11} = 0.23$	/ 1.713	/ 53.8
	r_{21}	+1.153			
L_{12}	r_{22}	+42.916	$d_{12} = 0.23$	/ 1.641	/ 60.1

Group III+IV
 $f_{III+IV} = 1.17$

EXAMPLE III

			n_d	v_d	
L_7	r_{12}	+4.180	$d_7 = 0.21$	/ 1.717	/ 48.0
	r_{13}	-3.655			
L_8	r_{14}	+0.955	$d_8 = 0.42$	/ 1.657	/ 36.7
	r_{15}	-1.513			
L_9	r_{16}	+2.066	$d_9 = 0.17$	/ 1.805	/ 25.4
	r_{17}	-2.166			
L_{10}	r_{18}	+1.064	$d_{10} = 0.76$	/ 1.847	/ 23.8
	r_{19}	+5.136			
L_{11}	r_{20}	-1.036	$d_{11} = 0.23$	/ 1.713	/ 53.8
	r_{21}	+0.922			
L_{12}	r_{22}	-12.883	$d_{12} = 0.23$	/ 1.658	/ 57.3

Group III+IV
 $f_{III+IV} = 1.48$

15 The beam splitter T, constructed as a prism or reflector, which separates the optical taking path from the optical viewfinder path is provided behind the group II to reflect the incident light into the viewfinder. In Figure 1 the object which is assumed to be at infinity is projected by the supplementary lens combination so as to produce a virtual image at

a position approximately 56.6 mm in front of a viewfinder lens group A. A real, inverted intermediate image is thus produced in a first focal plane SE_1 and this image is then projected by a reversing system B into a second focal plane SE_2 , but upright and unreverted. The reversal system B which also includes the field lens F that is disposed close to the

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first focal plane, is characterised by the design data. The second focal plane SE_2 is observed through a wide-angle lens group C_1 .

Design data for the general construction of the viewfinder lens group A are disclosed in the table below, the letter s additionally referring to the back foci.

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			n_d	v_d
L_{A1}	$r_{A1} + 27.487$	$s_{A1} = -56.6$	/ 1.744 /	44.8
	$r_{A2} - 7.167$	$d_{A1} = 2.3$		
L_{A2}		$l_{A1} = 0.13$	/ 1.805 /	25.4
	$r_{A3} - 6.100$	$d_{A2} = 2.4$		
	$r_{A4} - 9.360$	$s'_{A4} = 14.4$		
1. First focal plane (SE_1)				
L_{B1}	$r_{B1} - 25.728$	$s_{B1} = -5.0$	/ 1.569 /	63.1
	$r_{B2} - 12.103$	$d_{B1} = 2.0$		
L_{B2}		$l_{B1} = 33.5$	/ 1.615 /	51.2
	$r_{B3} + 65.750$	$d_{B2} = 3.6$		
L_{B3}	$r_{B4} - 11.691$	$d_{B3} = 1.0$	/ 1.728 /	28.4
	$r_{B5} - 29.638$	$l_{B2} = 28.2$		
L_{B4}	$r_{B6} + 29.638$	$d_{B4} = 1.0$	/ 1.728 /	28.4
	$r_{B7} + 11.691$	$d_{B5} = 3.6$		
L_{B5}		$s'_{B8} = 38.29$	/ 1.615 /	51.2
	$r_{B8} - 65.750$			
2. Second focal plane (SE_2)				
L_{C1}	$r_{C1} - 19.780$	$s_{C1} = -5.33$	/ 1.755 /	27.6
	$r_{C2} + 19.780$	$d_{C1} = 1.2$		
L_{C2}		$l_{C1} = 0.5$	/ 1.658 /	50.9
	$r_{C3} + 24.170$	$d_{C2} = 4.5$		
L_{C3}	$r_{C4} - 13.501$	$l_{C2} = 0.1$	/ 1.623 /	58.1
	$r_{C5} + 38.521$	$d_{C3} = 4.5$		
L_{C4}	$r_{C6} - 38.521$	$l_{C3} = 0.1$	/ 1.623 /	58.1
	$r_{C7} + 19.174$	$d_{C4} = 3.6$		
	r_{C8} plane			

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The following table discloses in Tables A₁, A₂ and A₃ design data for three embodiments of the viewfinder lens A, that according to example A₁ having already been listed in the table which relates to the general construction of the viewfinder of Figure 1.

EXAMPLE A_I

			n_d	v_d
L_{A1}	$r_{A1} + 27.487$	$d_{A1} = 2.3$	/ 1.744	/ 44.8
	$r_{A2} - 7.167$	$l_{A1} = 0.13$		
L_{A2}	$r_{A3} - 6.100$	$d_{A2} = 2.4$	/ 1.805	/ 25.4
	$r_{A4} - 9.360$	$f_{AI} = 12.075$		

EXAMPLE A_{II}

L_{A1}	$r_{A1} + 23.798$	$d_{A1} = 2.3$	/ 1.641	/ 60.1
	$r_{A2} - 6.151$	$l_{A1} = 0.15$		
L_{A2}	$r_{A3} - 5.284$	$d_{A2} = 2.0$	/ 1.805	/ 25.4
	$r_{A4} - 7.803$	$f_{AII} = 12.103$		

EXAMPLE A_{III}

L_{A1}	$r_{A1} + 20.0$	$d_{A1} = 2.0$	/ 1.620	/ 60.3
	$r_{A2} - 6.524$	$l_{A1} = 0.4$		
L_{A2}	$r_{A3} - 5.5$	$d_{A2} = 1.0$	/ 1.785	/ 25.8
	$r_{A4} - 8.177$	$f_{AIII} = 12.460$		

SECOND EMBODIMENT.

5 The diameter of the exit pupil amounts to approximately 5 mm by dispensing with the use of the wide-angle eyepiece in favour of extreme viewfinder brightness and by using an eyepiece of only conventional construction and a focal length of approximately $f_{ok} = 17.0$. Since this practically reaches the physio-

logical limit any further increase of the diameter of the exit pupil hardly has any further practical significance. Figure 2 shows such a viewfinder eyepiece C in conjunction with the viewfinder lens group 'A', the position of the two lenses L_{A1} and L_{A2} being interchanged. The design data for such a viewfinder system is as follows:—

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			n_d	v_d
L_{A1}	$r_{A1} = 27.487$	$s_{A1} = -56.6$		
	$r_{A2} = 7.167$	$d_{A1} = 2.3$	/ 1.744 /	44.8
L_{A2}	$r_{A3} = 6.100$	$l_{A1} = 0.13$		
	$r_{A4} = 9.360$	$d_{A2} = 2.4$	/ 1.805 /	25.4
		$s_{A4} = 14.4$		
1. First focal plane SE_1				
$L_{B1}=F$	$r_{B1} = 25.728$	$s_{B1} = -5.0$		
	$r_{B2} = 12.103$	$d_{B1} = 2.0$	/ 1.569 /	63.1
L_{B2}	$r_{B3} = 65.750$	$l_{B1} = 33.5$		
	$r_{B4} = 11.691$	$d_{B2} = 3.6$	/ 1.615 /	51.2
L_{B3}	$r_{B5} = 29.638$	$d_{B3} = 1.0$	/ 1.728 /	28.4
	$r_{B6} = 29.638$	$l_{B2} = 28.2$		
L_{B4}	$r_{B7} = 11.691$	$d_{B4} = 1.0$	/ 1.728 /	28.4
	$r_{B8} = 65.750$	$d_{B5} = 3.6$	/ 1.615 /	51.2
L_{B5}		$s_{B8} = 38.29$		
2. Second focal plane SE_2				
L_{C1}	$r_{C1} = 13.9$	$s_{C1} = -5.06$		
	$r_{C2} = 7.94$	$d_{C1} = 1.08$	/ 1.487 /	70.4
L_{C2}	$r_{C3} = 22.0$	$l_{C1} = 13.0$		
	$r_{C4} = 34.0$	$d_{C2} = 1.9$	/ 1.620 /	60.3

A three-lens embodiment of a viewfinder lens is shown in Figure 3. Its design dimensions are given below. It corrected for an inter-

mediate image at a finite distance from L_{A1} in the same way as the above mentioned two-element viewfinder lens. 5

			n_d	v_d	
L_{A1}	$r_{A1} + 43.586$	$d_{A1} = 1.7$	/ 1.658 /	50.9	$f_A=18.70$
	$r_{A2} - 43.586$	$l_{A1} = 2.8$			
L_{A2}	$r_{A3} + 49.735$	$d_{A2} = 3.4$	/ 1.658 /	50.9	
	$r_{A4} - 10.020$	$d_{A3} = 1.2$			
L_{A3}	$r_{A5} - 27.179$	$l_{A2} = 18.76$	/ 1.805 /	25.4	
	$r_{F1} + 12.481$	$d_{F1} = 2.0$			
F_1	$r_{F2} + 22.628$	$l_{F1} = 2.71$	/ 1.658 /	50.9	
	r_{F3} plane	$d_1 = 1.0$			
I	r_{F4} plane	$l_{F2} = 3.25$	/ Plastics		
	$r_{F5} - 22.628$	$d_{F2} = 2.0$			
F_2	$r_{F6} - 12.481$	$l_{F3} = 38.29$	/ 1.658 /	50.9	
	$r_{B1} + 25.250$	$d_{B1} = 3.2$			
L_{B1}	$r_{B2} - 8.083$	$d_{B2} = 1.0$	/ 1.683 /	44.5	
	$r_{B3} - 21.469$	$l_{B1} = 37.62$			
L_{B2}	$r_{C1} + 86.171$	$l_{C1} = 9.29$	/ 1.805 /	25.4	
	$r_{C2} + 12.004$	$d_{C1} = 1.3$			
L_{C1}	$r_{C3} - 17.000$	$d_{C2} = 6.2$	/ 1.847 /	23.8	
	$r_{C4} + 15.658$	$l_{C2} = 4.0$			
L_{C2}	$r_{C5} + 185.300$	$d_{C3} = 4.5$	/ 1.620 /	60.3	
L_{C3}			/ 1.603 /	60.6	

The following two embodiments of three-element finder lenses form an intermediate image at an infinite distance projected by an

afocal supplementary lens in the first focal plane. 5

EXAMPLE 1

			n_d	v_d
L_{A1}	$r_{A1} + 27.986$	$d_{A1} = 2.0$	/ 1.724 /	38.1
	$r_{A2} + 150.000$	$l_{A1} = 2.0$		
L_{A2}	$r_{A3} + 17.000$	$d_{A2} = 3.7$	/ 1.487 /	70.4
	$r_{A4} - 10.620$	$d_{A3} = 1.3$		
L_{A3}	$r_{A5} - 72.382$	$l_{A2} = 19.09$	/ 1.805 /	25.4

 $f_A = 30.91$

EXAMPLE 2

L_{A1}	$r_{A1} + 25.250$	$d_{A1} = 2.0$	/ 1.623 /	58.1
	r_{A2} plane	$l_{A1} = 3.0$		
L_{A2}	$r_{A3} + 19.039$	$d_{A2} = 4.0$	/ 1.532 /	48.8
	$r_{A4} - 10.512$	$d_{A3} = 1.0$		
L_{A3}	$r_{A5} - 614.079$	$l_{A2} = 19.01$	/ 1.805 /	25.4

 $f_A = 32.41$

In all of the above examples the following tolerances are assumed to occur: a deviation of curvature of individual surfaces of up to $\pm 10\%$ of the refractive index of the appropriate element, a deviation of the thicknesses amounting to $\pm 10\%$ of the appropriate element, a deviation of the refractive indices amounting to ± 0.3 and a deviation of the Abbe numbers amounting to ± 5 .

WHAT WE CLAIM IS:—

1. A camera having a reflex viewfinder system receiving light from an objective of the main optical system of the camera, the viewfinder system including a viewfinder objective and a viewfinder eyepiece, wherein the viewfinder objective includes an achromatic lens pair comprising a positive biconvex lens and a negative meniscus, all the radii of curvature in the lens pair being greater than $0.3f_A$, f_A being the focal length of the viewfinder objective.

2. A camera as claimed in claim 1, wherein the concave surface of the meniscus in the achromatic lens pair is arranged nearer the incident light than the convex surface of the meniscus.

3. A camera as claimed in claim 1 or 2, in which the difference between the Abbe numbers of the biconvex lens and the negative meniscus in the achromatic lens pair amounts to at least 19.4.

4. A camera as claimed in claim 1, 2 or 3, in which the radius of curvature of the biconvex lens element surface nearer the incident light amounts to between 1.6 and 2.3 times the focal length of the viewfinder objective, the thickness of the negative meniscus at its centre amounting to between 0.08 and 0.2 times the focal length of the viewfinder objective and the refractive index of the biconvex lens in the achromatic lens pair being between 1.62 and 1.75.

5. A camera according to any one of claims 1 to 4, having the following data relating to the viewfinder and which are understood to include a deviation of curvature of individual surfaces of up to $\pm 10\%$ of the refractive index of the appropriate element, the deviation of the thicknesses amounting to $\pm 10\%$ of the appropriate element, the deviation of the refractive indices amounting to ± 0.03 and the deviation of the Abbe numbers amounting to ± 5 :

			n_d	v_d
L_{A1}	$r_{A1} + 27.487$	$d_{A1} = 2.3$	/ 1.744 /	44.8
	$r_{A2} - 7.167$	$l_{A1} = 0.13$		
L_{A2}	$r_{A3} - 6.100$	$d_{A2} = 2.4$	/ 1.805 /	25.4
	$r_{A4} - 9.360$			

 $f_{A1} = 12.075$



EXAMPLE 1

			n_d	v_d
L _{A1}	$r_{A1} + 27.986$	$d_{A1} = 2.0$	/ 1.724 /	38.1
	$r_{A2} + 150.000$			
L _{A2}	$r_{A3} + 17.000$	$l_{A1} = 2.0$	/ 1.487 /	70.4
	$r_{A4} - 10.620$	$d_{A2} = 3.7$		
L _{A3}	$r_{A5} - 72.382$	$d_{A3} = 1.3$	/ 1.805 /	25.4
		$l_{A2} = 19.09$		

 $f_A = 30.91$

EXAMPLE 2

L _{A1}	$r_{A1} + 25.250$	$d_{A1} = 2.0$	/ 1.623 /	58.1
	r_{A2} plane			
L _{A2}	$r_{A3} + 19.039$	$l_{A1} = 3.0$	/ 1.532 /	48.8
	$r_{A4} - 10.512$	$d_{A2} = 4.0$		
L _{A3}	$r_{A5} - 614.079$	$d_{A3} = 1.0$	/ 1.805 /	25.4
		$l_{A2} = 19.01$		

 $f_A = 32.41$

In all of the above examples the following tolerances are assumed to occur: a deviation of curvature of individual surfaces of up to $\pm 10\%$ of the refractive index of the appropriate element, a deviation of the thicknesses amounting to $\pm 10\%$ of the appropriate element, a deviation of the refractive indices amounting to ± 0.3 and a deviation of the Abbe numbers amounting to ± 5 .

WHAT WE CLAIM IS:—

1. A camera having a reflex viewfinder system receiving light from an objective of the main optical system of the camera, the viewfinder system including a viewfinder objective and a viewfinder eyepiece, wherein the viewfinder objective includes an achromatic lens pair comprising a positive biconvex lens and a negative meniscus, all the radii of curvature in the lens pair being greater than $0.3f_A$, f_A being the focal length of the viewfinder objective.

2. A camera as claimed in claim 1, wherein the concave surface of the meniscus in the achromatic lens pair is arranged nearer the incident light than the convex surface of the meniscus.

3. A camera as claimed in claim 1 or 2, in which the difference between the Abbe numbers of the biconvex lens and the negative meniscus in the achromatic lens pair amounts to at least 19.4.

4. A camera as claimed in claim 1, 2 or 3, in which the radius of curvature of the biconvex lens element surface nearer the incident light amounts to between 1.6 and 2.3 times the focal length of the viewfinder objective, the thickness of the negative meniscus at its centre amounting to between 0.08 and 0.2 times the focal length of the viewfinder objective and the refractive index of the biconvex lens in the achromatic lens pair being between 1.62 and 1.75.

5. A camera according to any one of claims 1 to 4, having the following data relating to the viewfinder and which are understood to include a deviation of curvature of individual surfaces of up to $\pm 10\%$ of the refractive index of the appropriate element, the deviation of the thicknesses amounting to $\pm 10\%$ of the appropriate element, the deviation of the refractive indices amounting to ± 0.03 and the deviation of the Abbe numbers amounting to ± 5 :

			n_d	v_d
L _{A1}	$r_{A1} + 27.487$	$d_{A1} = 2.3$	/ 1.744 /	44.8
	$r_{A2} - 7.167$			
L _{A2}	$r_{A3} - 6.100$	$l_{A1} = 0.13$	/ 1.805 /	25.4
	$r_{A4} - 9.360$	$d_{A2} = 2.4$		

 $f_{A1} = 12.075$

the terms being as hereinabove explained.

- 5 6. A camera according to any one of claims 1 to 4, having the following data relating to the viewfinder and which are understood to include a deviation of curvature of individual surfaces of up to $\pm 10\%$ of the

refractive index of the appropriate element, the deviation of the thicknesses amounting to $\pm 10\%$ of the appropriate element, the deviation of the refractive indices amounting to ± 0.03 and the deviation of the Abbe numbers amounting to ± 5 :

			n_d	v_d	
L_{A1}	$r_{A1} + 23.798$	$d_{A1} = 2.3$	/ 1.641	/ 60.1	$f_{AII}=12.103$
	$r_{A2} + 6.151$				
L_{A2}	$r_{A3} - 5.284$	$d_{A2} = 2.0$	/ 1.805	/ 25.4	
	$r_{A4} - 7.803$				

- 15 7. A camera according to any one of claims 1 to 4, having the following data relating to the viewfinder and which are understood to include a deviation of curvature of individual surfaces of up to $\pm 10\%$ of the refractive

index of the appropriate element, the deviation of the thicknesses amounting to $\pm 10\%$ of the appropriate element, the deviation of the refractive indices amounting to ± 0.03 and the deviation of the Abbe numbers amounting to ± 5 :

			n_d	v_d	
L_{A1}	$r_{A1} + 20.0$	$d_{A1} = 2.0$	/ 1.620	/ 60.3	$f_{AIII} = 12.460$
	$r_{A2} - 6.524$				
L_{A2}	$r_{A3} - 5.5$	$l_{A1} = 0.4$	/ 1.785	/ 25.8	
	$r_{A4} - 8.177$				

- 30 8. A camera according to any of claims 1 to 3, having the following data relating to the viewfinder and which are understood to include a deviation of curvature of individual surfaces of up to $\pm 10\%$ of the refractive

index of the appropriate element, the deviation of the thicknesses amounting to $\pm 10\%$ of the appropriate element, the deviation of the refractive indices amounting to ± 0.03 and the deviation of the Abbe numbers amounting to ± 5 :

			n_d	v_d	
L_{A1}	$r_{A1} + 43.586$	$d_{A1} = 1.7$	/ 1.658	/ 50.9	$f_A=18.70$
	$r_{A2} - 43.586$				
L_{A2}	$r_{A3} + 49.735$	$l_{A1} = 2.8$	/ 1.658	/ 50.9	
	$r_{A4} - 10.020$				
L_{A3}	$r_{A5} - 27.179$	$d_{A2} = 3.4$	/ 1.805	/ 25.4	
		$d_{A3} = 1.2$			
		$l_{A2} = 18.76$			

- 40 the terms being as hereinabove explained.
45 9. A camera according to claim 1, 2 or 3, having the following data relating to the viewfinder and which are understood to include a deviation of curvature of individual surfaces of up to $\pm 10\%$ of the refractive index of

the appropriate element, the deviation of the thicknesses amounting to $\pm 10\%$ of the appropriate element, the deviation of the refractive indices amounting to ± 0.03 and the deviation of the Abbe numbers amounting to ± 5 :



* C L H S *

			n_d	v_d
L_{A1}	$r_{A1} + 27.986$	$d_{A1} = 2.0$	/ 1.724 /	38.1
	$r_{A2} + 150.000$	$l_{A1} = 2.0$		
L_{A2}	$r_{A3} + 17.000$	$d_{A2} = 3.7$	/ 1.487 /	70.4
	$r_{A4} - 10.620$	$d_{A3} = 1.3$		
L_{A3}	$r_{A5} - 72.382$	$l_{A2} = 19.09$	/ 1.805 /	25.4

 $f_A = 30.91$

the terms being as hereinabove explained.

10. A camera according to claim 1, 2 or 3, having the following data relating to the viewfinder and which are understood to include a deviation of curvature of individual surfaces of up to $\pm 10\%$ of the refractive

index of the appropriate element, the deviation of the thicknesses amounting to $\pm 10\%$ of the appropriate elements, the deviation of the refractive indices amounting to ± 0.03 and the deviation of the Abbe numbers amounting to ± 5 :

10

			n_d	v_d
L_{A1}	$r_{A1} + 25.250$	$d_{A1} = 2.0$	/ 1.623 /	58.1
	r_{A2} plane	$l_{A1} = 3.0$		
L_{A2}	$r_{A3} + 19.039$	$d_{A2} = 4.0$	/ 1.532 /	48.8
	$r_{A4} - 10.512$	$d_{A3} = 1.0$		
L_{A3}	$r_{A5} - 614.079$	$l_{A2} = 19.01$	/ 1.805 /	25.4

 $f_A = 32.41$

- 15 the terms being as hereinabove explained.

11. A camera according to any one of claims 1 to 10, having a viewfinder with a wide-angle eyepiece and a stop number, expressed by the ratio of the focal length of the viewfinder eyepiece to the diameter of the exit pupil or by the ratio of the focal length of the viewfinder objective to the diameter of the entry pupil, amounting to approximately 3.4, in which camera the lens group of the single-lens reflex viewfinder representing the eyepiece comprises four individual elements, the element nearest to the viewfinder objective being negative but the other three lens being positive, the middle thicknesses of the three positive elements designated with d_{C2} , d_{C3} and d_{C4} and the focal length

of the eyepiece designated with f_{OK} being subject to the following condition

$$d_{C2,3,4} \geq 0.3 f_{OK}$$

12. A camera with a wide-angle eyepiece according to claim 11, having the following data for the reflex finder which are understood to be subject to a deviation of the curvature of individual surfaces of up to $\pm 10\%$ of the refractive power of the appropriate element, a deviation of the thicknesses of up to $\pm 10\%$ of the appropriate element, a deviation of the refractive indices of up to ± 0.03 and a deviation of the Abbe numbers of up to ± 5 :

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* C L N S *

			n_d	v_d
L_{C1}	$r_{C1} - 19.78$	$d_{C1} = 1.2$	/ 1.755 /	27.6
	$r_{C2} + 19.78$	$l_{C1} = 0.5$		
L_{C2}	$r_{C3} + 24.17$	$d_{C2} = 4.5$	/ 1.658 /	50.9
	$r_{C4} - 13.501$	$l_{C2} = 0.1$		
L_{C3}	$r_{C5} + 38.521$	$d_{C3} = 4.5$	/ 1.623 /	58.1
	$r_{C6} - 38.521$	$l_{C3} = 0.1$		
L_{C4}	$r_{C7} + 19.174$	$d_{C4} = 3.6$	/ 1.623 /	58.1
	$r_{C8} \quad C0$			

the terms having the meaning hereinabove explained.

5 13. A camera as claimed in any preceding claim in which all the radii of curvature in the achromatic lens pair are greater than $0.4f_A$.

10 14. A cine camera for super-8 film format and having an optical system incorporating a single-lens reflex viewfinder and arranged substantially as described with reference to any

one of the embodiments illustrated in the accompanying drawings or in the tabulated data examples set forth in the description of the drawings.

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