

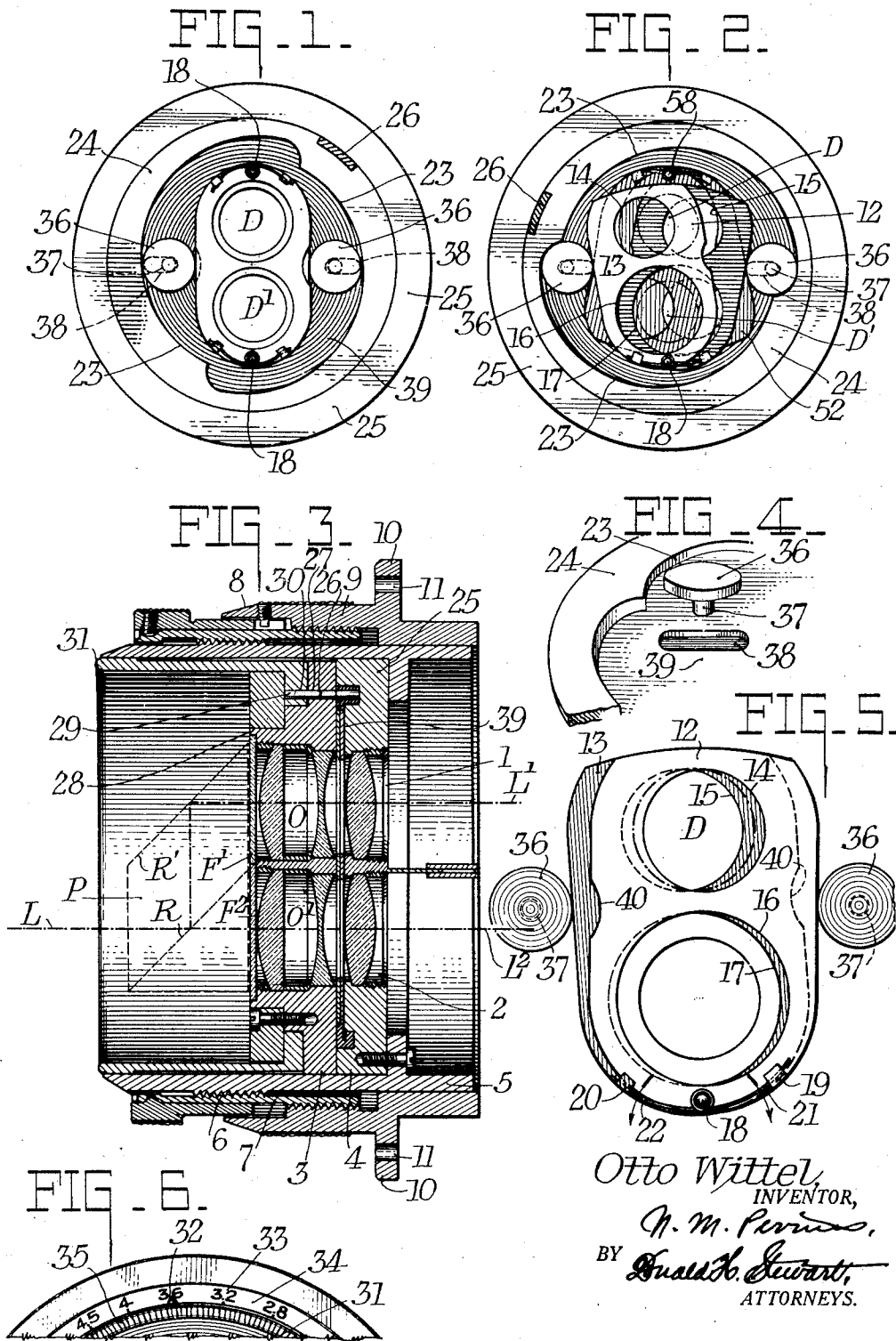
April 7, 1931.

O. WITTEL

1,799,879

MULTIPLE OPENING DIAPHRAGM FOR PHOTOGRAPHIC CAMERAS

Filed July 18, 1929



UNITED STATES PATENT OFFICE

OTTO WITTEL, OF ROCHESTER, NEW YORK, ASSIGNOR TO EASTMAN KODAK COMPANY,
OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK

MULTIPLE-OPENING DIAPHRAGM FOR PHOTOGRAPHIC CAMERAS

Application filed July 18, 1929. Serial No. 379,177.

This invention relates to photography and more particularly to diaphragms for use with photographic objectives. One object of my invention is to provide a diaphragm structure which is thin and compact and which is provided with a plurality of apertures which open and close simultaneously and to the same extent. Another object of my invention is to provide a multiple diaphragm having a plurality of very thin diaphragm leaves which are adapted to lie close together. Another object of my invention is to provide a plurality of diaphragm leaves normally spring pressed in one direction but being adapted to be moved in an opposite direction by means of a cam. Another object of my invention is to provide a smooth working diaphragm which requires a minimum effort to move and which includes friction reducing elements between the cam and diaphragm leaves. Another object of my invention is to provide a duplex diaphragm which is adapted to fit into a focusing objective mount. Still another object of my invention is to provide a diaphragm structure having a plurality of leaves which may be adjusted by a pair of friction reducing elements which, in turn, may be moved through a cam; and other objects will appear from the following specification, the novel features being particularly pointed out in the claims at the end thereof.

The focusing mechanism which carries the objectives and the diaphragm structure is substantially the same as the focusing mechanism shown in my U. S. Patent 1,690,607, for "Focusing objective mount for cameras", patented November 6, 1928. For the details of the focusing mechanism reference may be had to this patent.

Coming now to the drawing wherein like reference characters denote like parts throughout:

Fig. 1 is a top plan view of a diaphragm structure constructed in accordance with and embodying a preferred form of my invention removed for an objective focusing mount;

Fig. 2 is a similar view but with the parts in a different position;

Fig. 3 is a section through a duplex ob-

jective focusing mount equipped with the diaphragm shown in the first two figures, parts of the diaphragm being omitted for the fact of clearness;

Fig. 4 is a fragmentary perspective view of a portion of the setting cam and the anti-friction elements used in connection with my diaphragm;

Fig. 5 is an enlarged fragmentary view showing a single pair of diaphragm leaves and the actuating rollers removed from the lens barrel; and

Fig. 6 is a fragmentary front plan view of the diaphragm setting member of the focusing mount.

In certain color processes a plurality of color records are made through separate objectives on different areas of film and it is for making such color records that the present invention is particularly directed.

An optical equipment for such color work may comprise a pair of matched objectives 0 and 01, these objectives being mounted in similar lens mounts 1 and 2 which are carried by the annular members 3 and 4 mounted in the barrel 5. This barrel may be moved back and forth for focusing the objectives through the threaded connection 6 with the barrel 7, a focusing scale being arranged on the bevelled portion 8 of a ring 9 which is equipped with a flange 10 to be fastened to a support by screws passing through the apertures 11. So far the structure is quite similar to the structure of my above mentioned focusing objective mount patent.

For color work light rays may enter along the line L and may be reflected by the surfaces R and R1 of the prism P, surface R being partially reflecting so that the light rays are divided and pass through the objectives 0 and 01 along the lines L1 and L2. For color work filters F1 and F2 may be placed in front of the objective 0 and 01.

If such an objective mount is used for stereo motion pictures the prism P and the filters F1 and F2 may be omitted.

Coming now to my invention, in order to provide diaphragm openings of exactly the same size for both objectives I provide the mechanism as best shown in Figs. 5, 1 and 2.

Referring to Fig. 5 the diaphragm D which lies between the lens elements of objective 0 may comprise a pair of similar plates 12 and 13, plate 12 having an opening 14 therein and plate 13 having an opening 15, these openings both, in the present instance, being round. There is a second pair of openings in these two plates, 16 in plate 12 and 17 in plate 13. These openings are larger than the openings 14, 15 and are provided solely for clearance. The diaphragm blades 12 and 13 are both pivoted upon a stud 18 and each of the blades 12 and 13 have bent-up lugs 19 and 20 to receive the ends 21 and 22 of a spring coiled about the pivot 18 and exerting a pressure in the direction shown by the arrows in Fig. 5.

This spring pressure naturally tends to separate the blades 12 and 13 and therefore tends to reduce the opening in the diaphragm D.

To limit the outward movement of these blades there is a cam 23, as best shown in Figs. 1 and 2, this cam being in the form of an annular member which is free to turn in a recess in plate 25. The ring 24, carrying the cam surfaces 23 (of which there are two in the present instance), may be turned by means of a lug or projection 26 which extends through an arcuate slot 27 in the annular member 28 which supports a portion of the objective mount. The end 29 of member 26 engages an aperture 30 in the annular adjusting ring 31 which, as best shown in Fig. 6, is provided with a pointer 32 which may be brought opposite an indicating member 33 on the diaphragm scale 34 to indicate the quantity of light admitted by the aperture.

As best shown in Fig. 6 the annular member 31 has a knurled edge by which it may be turned and the ring 31 moves with the objective mount as it is moved to focus the objectives.

The cam surfaces 23 form stops which limit the movement of the shutter blades 12 and 13 in the following manner. As best indicated in Fig. 4 the cam surfaces 23 are adapted to contact with friction reducing elements 36 which may comprise small rollers having short shafts 37 which may extend down into guiding slots 38 which are cut into the supporting plate 39. These rollers are alike and are free to turn so that as the ring 24 is turned the cams will be moved and the rollers may move in and out with respect to the center of the objectives.

As the rollers move away from each other the springs 22 and 21 thrust the shutter leaves 12 and 13 apart and as they move towards each other the blades are moved against the pressure of the spring and the aperture D is opened permitting more light to pass.

So far only one diaphragm opening D has been described. The second diaphragm opening D' is identical with the first opening

comprising a second pair of blades 52 and 53 pivoted upon a single stud 58 which is arranged opposite to stud 18 and operable in the clearance opening formed by the large apertures 16 and 17 in the diaphragm blades 12 and 13. Since the second pair of diaphragm blades 52 and 53 operate in exactly the same manner as the blades 12 and 13 they will not be again described in detail.

Both sets of shutter blades have arcuate cut-outs 40, one on each side of each blade, the object of these cut-outs being to provide clearance when the anti-friction members 36 are as close together as they can be moved because it is necessary to have the peripheries of these rollers touch only the blades which must be moved. Each roller, of course, contacts and actuates one diaphragm blade of each pair of diaphragms so that the openings D and D' are not round but are elongated. With highly corrected lenses it is not possible to detect any difference in definition between a round diaphragm and a diaphragm opening of the type herein shown although theoretically such an opening is not as desirable as a round one. It is possible that some difference in results might be detected from extremely poorly corrected lenses although I have never tried to use such lenses in my present mount.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a diaphragm for photographic objectives, the combination with an apertured support, of means for altering the aperture in the support including a pair of blades, a pivot upon which the blades are mounted, a spring tending to move the blades in opposite directions about the pivot and a cam for limiting the movement of the blades under the influence of the spring.

2. In a diaphragm for photographic objectives, the combination with an apertured support, of means for altering the aperture in the support including a pair of pivoted blades, a cam for moving the blades, and an anti-friction element between the cam and blades.

3. In a diaphragm for photographic objectives, the combination with an apertured support, of means for altering the aperture in the support including a pair of pivoted blades, a cam for moving the blades and an anti-friction element between the cam and blades comprising a roller adapted to lie between and contact with the blades and cam.

4. In a diaphragm for photographic objectives, the combination with an apertured support, of means for altering the aperture in the support including a pair of pivoted blades, a cam for moving the blades, and an anti-friction element between the cam and blades comprising a guided roller, said roller having engagement with the cam and blades.

5. In a diaphragm for photographic ob-

jectives, the combination with an apertured support, of means for altering the aperture in the support including a pair of pivoted blades, a spring tending to move the blades in one direction, a cam adapted to limit the movement of the blades under the influence of the spring, said cam comprising an annular member movable on the apertured support.

6. In a diaphragm for photographic objectives, the combination with an apertured support, of means for altering the aperture in the support including a pair of pivoted blades, a spring tending to move the blades in one direction, a cam adapted to limit the movement of the blades under the influence of the spring, said cam comprising an annular member movable on the apertured support and having a plurality of cam faces, one face being adapted to serve as a limiting stop for a pivoted blade, whereby each blade is separately controlled through the cam.

7. In a diaphragm for photographic objectives, the combination with an apertured support, of means for altering the aperture in the support including a pair of pivoted blades, a spring tending to move the blades in one direction, a cam adapted to limit the movement of the blades under the influence of the spring, said cam comprising an annular member movable on the apertured support and having a plurality of cam faces, a plurality of anti-friction devices between the cam faces and the diaphragm blades whereby the blades may be positioned by the cam faces through the anti-friction devices.

8. In a diaphragm for photographic objectives, the combination with an apertured support, of means for altering the apertures including pairs of pivoted blades two for each aperture, means for positively moving the blades in one direction including cams and rollers and springs for moving the pairs of blades in an opposite direction.

9. In a diaphragm for photographic objectives, the combination with an apertured support, of means for altering the apertures including pairs of pivoted blades two for each aperture, means for positively moving the blades including cams, and rollers contacting with the cams, each roller being adapted to contact with one blade of each pair of pivoted blades whereby the blades may be moved together and to a like extent.

Signed at Rochester, New York, this 15th day of July, 1929.

OTTO WITTEL.