March 29, 1949. G. K. CZARNIKOW ET AL 2,465,578

IRIS DIAPHRAGM BLADE

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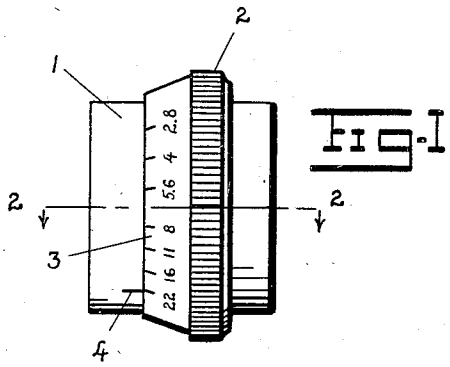



Fig-1

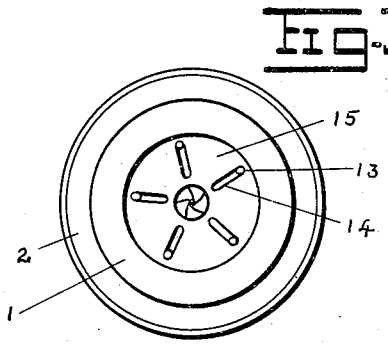



Fig-3

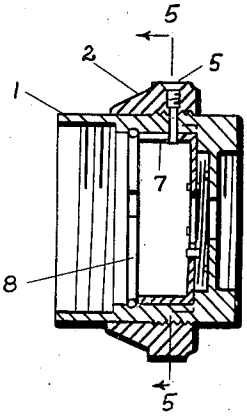



Fig-2

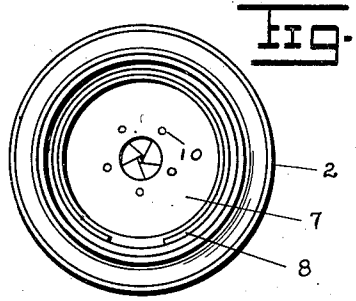



Fig-4

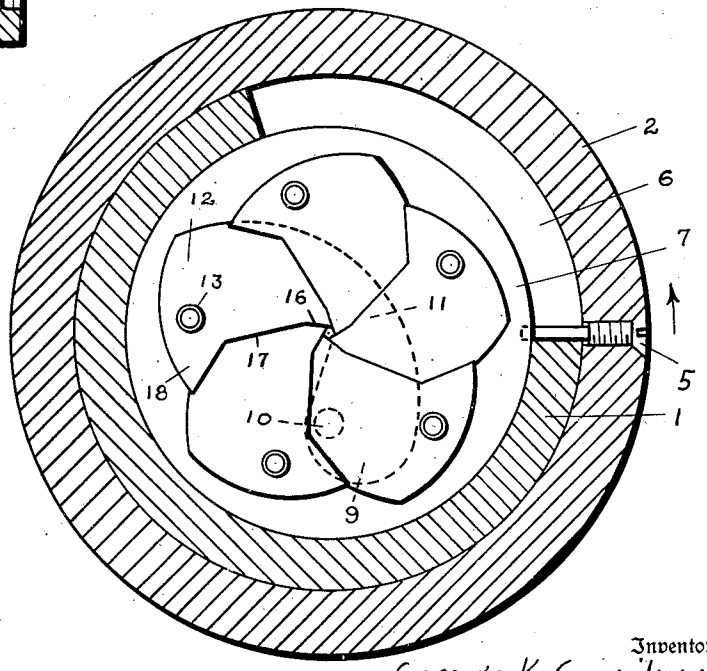



Fig-5

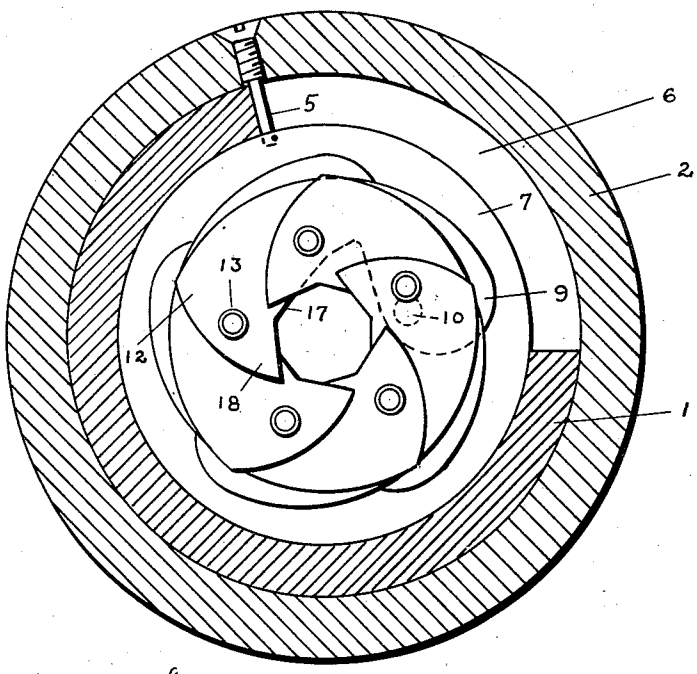
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IRIS DIAPHRAGM BLADE

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Fig-6



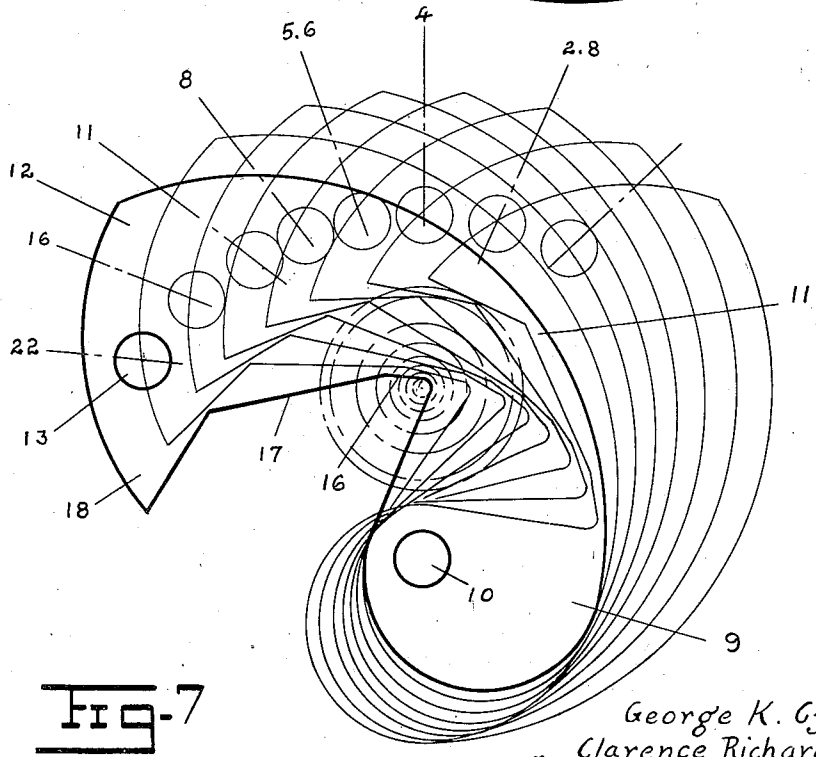




Fig-7

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## IRIS DIAPHRAGM BLADE

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1 Claim. (Cl. 95—64)

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This invention relates to an iris diaphragm for use on cameras and similar structures, with particular reference to the type of diaphragm employing a multiplicity of blades, each of which is pivotally connected at one point to an operating ring and at another point to a radial slot in a fixed guide plate, as a result of which the blades are moved to open or close the aperture when the operating ring is turned, and it has for its particular purpose to afford a structure in which the operating ring turns through a relatively large arc to effect travel of the blades from closed to open position.

In diaphragms as heretofore constructed, the operating ring turns through approximately one-sixth of its circumference to effect movement of the blades from one extreme position to the other, such relatively short movement of the operating ring necessitating a correspondingly small indicating scale on the adjusting ring, and it is a purpose of the invention to cause the operating ring to travel through a much larger arc, preferably about one-third of its circumference, whereby the indicating scale on the adjusting ring is much larger and more legible than in conventional diaphragms.

Another purpose of the invention is to afford a structure whereby the spacing between the several indications of the scale on the adjusting ring can be readily controlled and made more nearly uniform by varying the contour of the aperture-defining edge of the blade so as to provide any desired spacing between the intermediate indications of the scale representing different positions of the blades and different sized apertures.

More specifically, the invention has for its purpose to afford a structure of diaphragm blade that gives a different ratio of change between the size of the aperture and the circumferential movement of the adjusting ring, thus reducing the amount of error and increasing the tolerance permitted, as compared with prior devices where the change in the size of the aperture is directly proportionate to the extent of movement of the adjusting ring.

Another object of the invention is to afford a construction of diaphragm blade designed to operate as set forth above, which is simple and economical to produce and assemble, and is practical,

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efficient, and durable under actual operating conditions.

Still a further purpose is to afford a diaphragm having a minimum number of blades capable of the required adjustments, and in which the blades are constructed so as to cooperate in a practical and efficient manner in all positions.

To these and other ends, the invention consists in the construction and arrangement of parts that will appear clearly from the following description when read in conjunction with the accompanying drawings, the novel features being pointed out in the claim following the specification.

In the drawings:

Fig. 1 is a view in side elevation of a diaphragm housing and adjusting ring constructed in accordance with a preferred embodiment of the invention;

Fig. 2 is a vertical sectional view on line 2—2 of Fig. 1;

Fig. 3 is a view in end elevation of the structure, looking toward the fixed slotted guide plate;

Fig. 4 is an end elevation looking in a direction opposite to Fig. 3, and showing the operating ring;

Fig. 5 is a transverse sectional view on line 5—5 of Fig. 2, showing the diaphragm blades in closed position, and the concealed portion of one blade indicated in dotted lines;

Fig. 6 is a similar view showing the diaphragm blades in open position, with the concealed portion of the same blades as in Fig. 5 shown in dotted lines, and

Fig. 7 is a diagrammatic view illustrating the relative movement between one diaphragm blade and the indicating scale as the blade moves from its extreme open to its extreme closed positions.

Referring more particularly to the drawings in which like reference numerals refer to the same parts throughout the several views, 1 designates a housing that is attached to the wall of a camera as usual, and 2 is an adjusting ring threaded on the housing 1 and provided with an indicating scale 3 for an f/2.8 lens, showing aperture sizes from 2.8 to 22. The scale 3 cooperates with an index mark 4 on the housing and is threaded on the housing to permit adjustment to the extent of the scale 3.

To this end, the adjusting ring 2 carries a pin

5 that is movable through a slot 6 in the housing, such movement being limited by the ends of the slot 6, and the pin 5 extends into an opening in an operating ring 7 that carries the diaphragm blades, and has an oscillatory movement in the housing to open and close the diaphragm, while 8 designates a split ring that retains the operating ring 7 in the housing against a shoulder formed therein and against which the operating ring turns.

The parts thus far described, with the exception of the indicating scale, are old, but in prior types of diaphragms, the indicating scale has been considerably smaller or approximately one-half the length of the indicating scale 3, due to the adjusting and operating rings turning through a relatively short arc in order to actuate the blades from one extreme position to another, and this invention has to do with the formation of the blades whereby the ratio of movement of the adjusting ring to the extent of movement of the diaphragm blades is modified, resulting in turning of the adjusting ring through a distance of approximately one-third its periphery, or from 120° to 130° if desired. This is accomplished by constructing the blades in such fashion that a given movement of the blades in one direction or the other requires a much greater corresponding movement of the adjusting ring, and the particular construction of the blade whereby this is accomplished will now be described.

Each blade is preferably of the general shape illustrated in Fig. 7, and includes an outwardly widening supporting portion 9, pivoted at 10 to the operating ring 7, a narrow central portion 11, and an outwardly widening end portion 12 extending generally in a right-angular direction to the supporting portion 9 and has a pivotal connection 13 slidable in one of the radial slots 14 in the stationary guide plate 15 which is secured in or forms a part of the housing, as usual in this type of construction. Between the supporting portion 9 and the end portion 12 of the blade, the latter is provided with a generally V-shaped recess having along one side an aperture-defining edge that when in closed position extends in a general direction toward the pivotal connection 13 or its path of travel, and transversely of a straight line passing through the centers of the pivotal connections 10 and 13. Thus the two pivotal connections 10 and 13 form approximately a right-angled triangle with the apex of the V-shaped recess located therebetween.

In the specific structure shown, the aperture-defining edge includes a straight portion 16 at the center which cooperates with the other blades to vary the size of the opening within the range indicated, and terminates in a straight portion 17 arranged at a slight angle to the central portion 16 and functioning to define the larger apertures. The disposition and relation of the aperture-defining edges 16 and 17 may be varied as desired to establish the desired spacing between the several markings on the indicating scale and to vary the amount of movement of the blade required to adjust from fully open to fully closed positions, and the aperture-defining edge 16 is located so that at any given instant in the movement of the blade, it is nearly parallel to the direction of movement of the aperture-defining edge. As the blade moves to open or closed position, the aperture-defining edge 16 has a combined movement in two directions, namely, endwise of itself and



transversely of the aperture so that the effective movement of the edge 16 in closing the aperture is proportionately much less than the arcuate movement of the operating and adjusting rings. The same condition applies to the edge 17 which is adjacent to the edge 16 and functions after the latter has moved beyond the aperture, and at the extremity of edge 17, the blade includes an inwardly extending, preferably pointed nose 18 that insures proper overlapping relationship and movement of the blades in all positions.

In diaphragms as heretofore constructed, the aperture is opened and closed by movement of blades in direct proportion to the arcuate movement of the adjusting ring, whereas with this invention, owing to the form of the blade and the disposition of the aperture-defining edge in relation to the pivotal connections of the blade, a considerably greater movement of the aperture-defining edge is required between the extreme open and closed positions. Consequently a greatly increased arcuate movement of the adjusting and operating rings takes place to effect movement of the blades from open to closed position.

This is illustrated diagrammatically in Fig. 7 in which, for the sake of clarity, the blade is shown as turning around the pivotal point 10, and the successive positions of the end portion 12 are illustrated as moving from closed to open position in relation to the indicating scale. It is to be understood that in the actual mechanism, the pivotal point 13 moves radially in a slot 14, as shown in Figs. 3, 5 and 6, and the pivot 10 moves bodily with the operating ring from the position shown in Fig. 5 to that illustrated in Fig. 6, but the movement of the blade in relation to the scale on the adjusting ring is as shown in Fig. 7, with the ring turning through an arc of 120° more or less while the blade is operated from one extreme position to the other.

Fig. 5 illustrates the diaphragm with the blades in closed position, showing the concealed portion of one of the blades in dotted lines, and Fig. 6 shows the same blade partially in dotted lines after the diaphragm has been operated to open the aperture to its maximum size. The slidable pivotal connection 13 has moved inwardly in a straight line from the position shown in Fig. 5 while the operating ring 7 has turned to move the pivotal connection 10 from its lower position of Fig. 5 to its extreme upper position shown in Fig. 6.

While the invention has been disclosed in connection with a particular construction, it is not restricted to the details herein shown, and this application is intended to cover such modifications or departures as may come within the purposes of the improvement and the scope of the following claim.

We claim:

An iris diaphragm blade comprising an elongated flat body having two pivot points near opposite ends of the body and having an effective edge cooperating with the effective edges of other similar diaphragm blades to define a diaphragm aperture, one of said pivot points being mounted at a fixed distance from the center of such aperture, the other of said pivot points being at a variable distance from the center of such aperture, said effective edge starting at a point approximately midway of the length of the body and materially offset laterally to one side of a straight line joining said two pivot points, thence

extending in a series of approximately straight line segments, the first segment pointing approximately toward said variable one of said pivot points and being oblique with respect to said straight line joining the pivot points, an intermediate segment being oblique but at a greater angle to said straight line joining the pivot points, and a terminal segment of said effective edge lying approximately perpendicular to said straight line joining the pivot points, said terminal segment extending a material distance beyond said straight line joining the pivot points on the opposite side thereof from said starting point of said effective edge, successive portions of said effective edge from the first segment to the terminal segment thereof being adapted to lie substantially tangent to successively larger apertures defined by the diaphragm blade in conjunction with other similar blades.

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