350-273

CROSS REFERENCE

SEARCH ROOM

240

46.13

Feb. 21, 1956 L. ERHARDT ET AL 2,735,929

LIGHTING DIMMERS

Filed Sept. 3, 1952 2 Sheets-Sheet 1

X 256

Fig. 1.

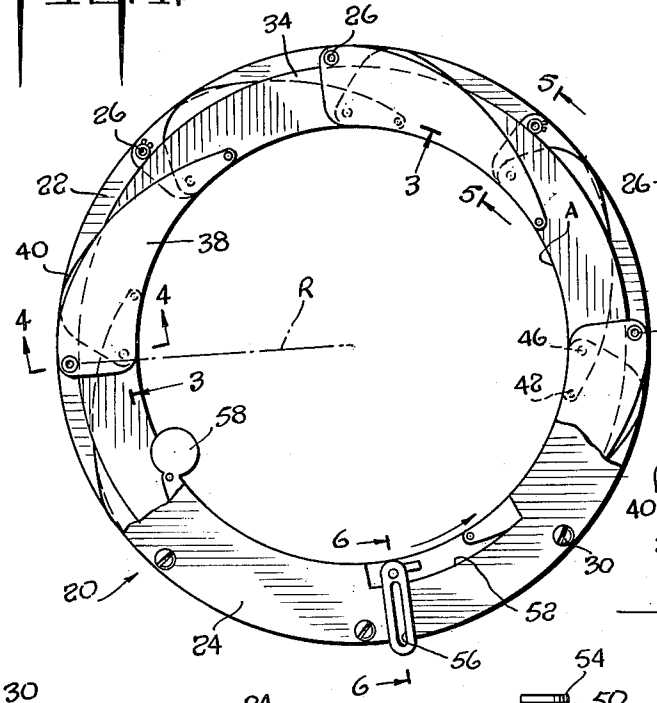


Fig. 4.

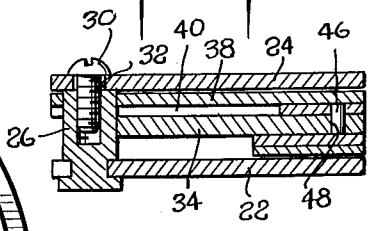


Fig. 5.

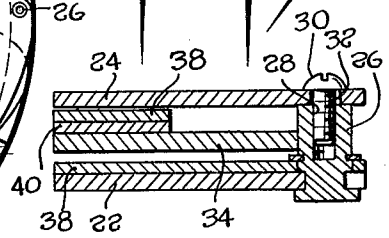


Fig. 2.

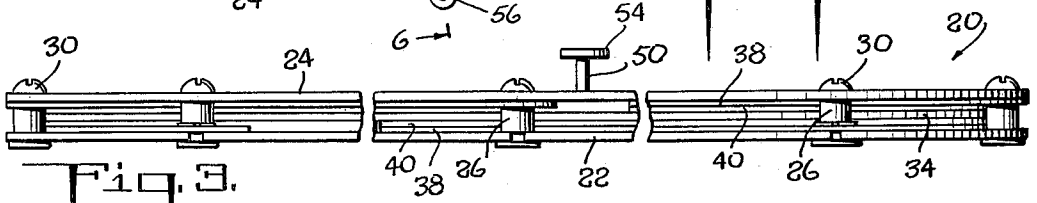


Fig. 3.

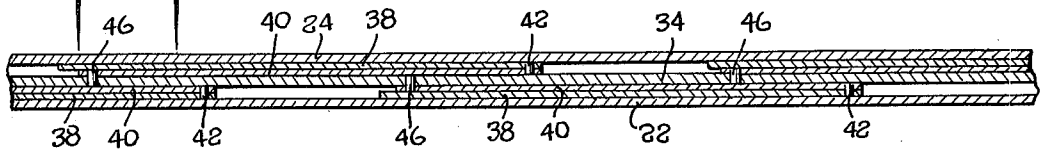


Fig. 11.

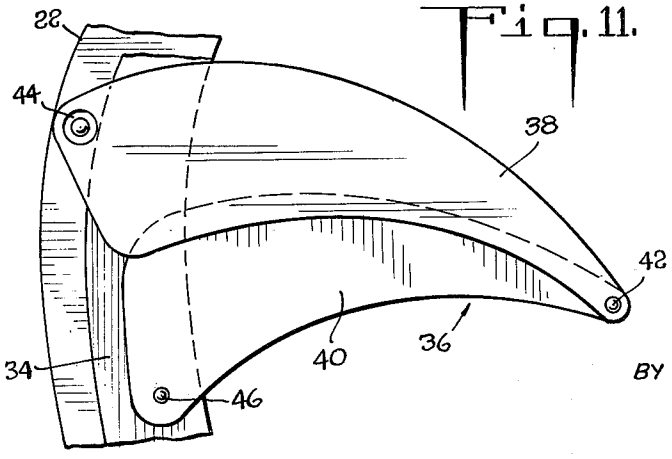
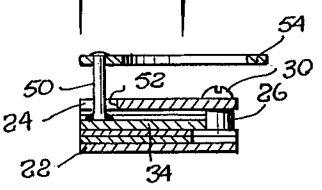


Fig. 6.



Inventor

LOUIS ERHARDT

TOMMY TEMPLE

BY

Louis Erhardt

Attorney

Feb. 21, 1956 L. ERHARDT ET AL 2,735,929

LIGHTING DIMMERS

Filed Sept. 3, 1952 2 Sheets-Sheet 2

Fig. 8.

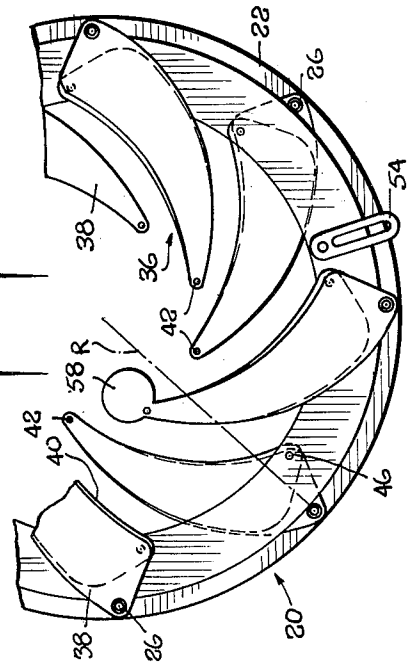


Fig. 10.

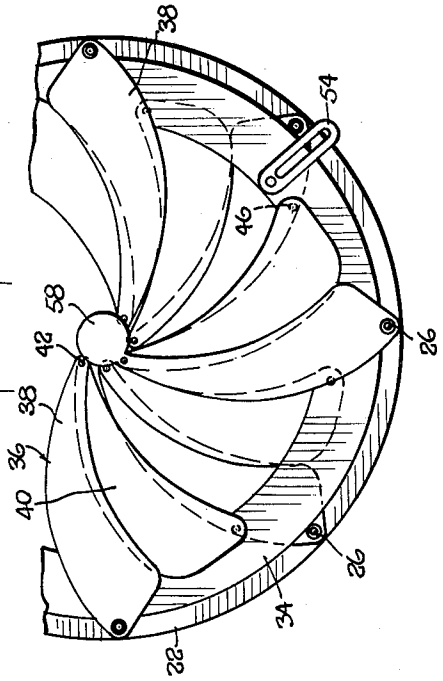


Fig. 7.

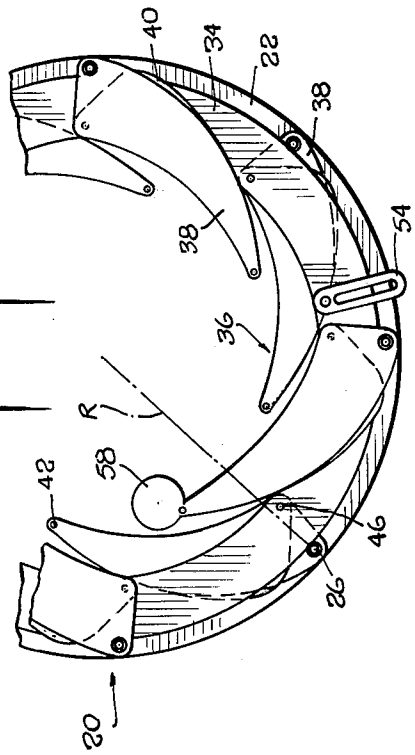
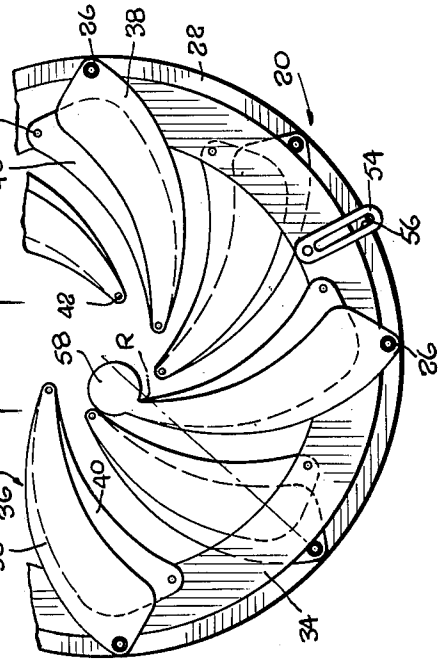


Fig. 9.



Inventor
LOUIS ERHARDT
TOMMY TEMPLE

By

Attorney

United States Patent Office

2,735,929

Patented Feb. 21, 1956

2,735,929

LIGHTING DIMMERS

Louis Erhardt and Tommy Temple, Los Angeles, Calif., assignors to Century Lighting, Inc., New York, N. Y., a corporation of New York

Application September 3, 1952, Serial No. 307,582

11 Claims. (Cl. 240—46.13)

This invention relates to dimmers of the type which, for example, is adapted to be employed for theatrical, television and display lighting. More particularly our invention is concerned with mechanical dimmers for spotlights.

It presently is not possible satisfactorily to dim, i. e. reduce the light output of, a conventional spotlight, e. g. a spotlight employing a parabolic reflector, or a Fresnel lens with or without a spherical reflector. In such standard spotlights present-day commercial dimmers either affect the specific distribution of light radiated by the spotlight at any set focus of the light source, or change the spectral characteristics of the output.

For example, one method of dimming now used is to vary the voltage supplied and thereby change the intensity of the light source. However, this alters the quality of the light causing a change in what is known as "spectral temperature." That is to say as the voltage is reduced the temperature of the incandescent source is lowered whereby to decrease its intensity. But lowering the temperature shifts the spectrum toward the infra red end. This change is spectral temperature is particularly undesirable for color photography and color television and must be taken into account even in black and white reproduction.

The other current method of dimming is to reduce the periphery of an opening through which a light beam passes. For this there is employed a standard shutter, such as an iris shutter or a "barn door" shutter, i. e. a shutter having blades swinging about axes lying in a plane perpendicular to the axis of propagation of the beam. Both shutters make the spot of light smaller as the opening of the shutter decreases and the barn door shutter has the further disadvantage that it shapes the spot of light into a polygon.

Thus in both methods some characteristic of the light in addition to its intensity is effected. In the first case the spectral temperature is varied and in the other case the distribution of light.

It is an object of the present invention to provide a dimmer of the character described which will vary the intensity of a spotlight without noticeably affecting any of its other characteristics.

It is another object of our invention to provide a dimmer of the character described which is rugged, compact, and efficient and is relatively inexpensive to manufacture.

Other objects of our invention will in part be obvious and in part will be pointed out hereinafter.

In general we provide a dimmer of the character described whose construction is such that it removes portions of the spotlight beam in a substantially symmetrical fashion and as nearly as possible from all parts of the beam at the same time. In other words parts are removed from the outside of the beam as well as from the central part and at a number of different points about the axis at the same time, the intensity of the light source being left constant. With this arrangement the apparent

distribution or shape of the light in the beam, and therefore illumination of an object on which the beam is trained, will remain unchanged and only the intensity of the beam will seem to vary.

More specifically we carry out our invention by providing a dimmer in which shutter blades swing toward the center of a diaphragm, as in an iris shutter, but in which the width of the blades as they swing inwardly is not sufficient to overlap whereby as the area of the shutter aperture is reduced light continues to pass through the aperture from the center to the periphery thereof, albeit as spokes rather than a spot of minimum circumference. The blades, moreover, are arranged to increase their widths as their tips approach, or after they substantially reach, the center of the aperture whereby to progressively narrow the spokes extending from the center to the periphery of the shutter at a number of different points about the axis of propagation.

Our invention consists in the features of construction, combinations of elements and arrangements of parts which will be exemplified in the device hereinafter described and of which the scope of application will be indicated in the appended claims.

In the accompanying drawings in which is shown one of the various possible embodiments of our invention,

Fig. 1 is a front view of a fully open dimmer constructed in accordance with our invention and with portions of the cover plate removed to better illustrate the internal construction;

Fig. 2 is a side view of the dimmer;

Figs. 3, 4, 5 and 6 are enlarged sectional views taken substantially along the lines 3—3, 4—4, 5—5 and 6—6, respectively, of Fig. 1;

Fig. 7 is a front view of the dimmer with the cover plate removed and the handle moved about one-sixth of the way to closed position;

Figs. 8 and 9 are views similar to Fig. 7 but with the handle moved about one-third and five-eighths of the way, respectively, to closed position;

Fig. 10 is a view similar to Fig. 7 but with the dimmer fully closed; and

Fig. 11 is an enlarged view of one of the shutter blades in fully closed position.

Referring now in detail to the drawings, and more particularly to Figs. 1–6, the reference numeral 20 denotes a dimmer constructed in accordance with our invention. Said dimmer consists of a pair of apertured supports, such as a base ring 22 and aligned cover plate 24, which are held in parallel spaced relationship by a plurality of pivot posts 26 equiangularly disposed around the peripheries of the ring and plate. The ring and plate have large central registered apertures A. One end of each post is permanently secured as by swedging in the base ring. The other end of each post terminates beneath the cover plate and is provided with a tapped bore 28 in which the shank of a bolt 30 is screwed. Each bolt extends through an opening 32 in the cover plate and its head is located on the outer surface of said plate. All the pivot posts are equiradially located with respect to the center of the ring and plate.

A drive ring 34 is sandwiched between the base ring and cover plate, the circumference of the drive ring being journalled on the posts 26 which jointly function as a bearing. The large central aperture in the drive ring is coincident with those in the base ring and cover plate.

The dimmer further includes a plurality of long flat shutter blades 36 substantially parallel to the base ring. Each blade consists of a long thin flat segment 38 and a short thin flat segment 40, the segments being pivotally secured to one another at their tips as by a flush rivet 42. The segments of each blade taper in width from their broad bases to their narrow tips and are of about the

same contour so that when superimposed they are substantially coextensive except for the protruding base of the longer segment. The protruding base of each long segment is formed with a pivot bearing 44 which is journalled on the pivot post 26. Each short segment has a pin 46 mounted on its base and journalled in an opening 48 in the drive ring. The openings 48 are equiangularly disposed in the drive ring. It will be observed that the pins 46 are closer to the center of the dimmer aperture than the bearings 44.

In the preferred form of our invention alternate blades 36 are disposed on opposite sides of the drive ring and are held flat against said ring by the base ring and cover plate.

Suitable means is included to rotate the drive ring relative to the base ring and cover plate. As shown herein, said means comprises a stud 50 fixed to the drive ring and extending through an arcuate slot 52 in the inner periphery of the cover plate. Said slot serves to limit the angular motion of the stud. A handle 54 is secured to the outer end of the stud, said handle being slotted, as at 56, to facilitate actuation thereof. When the stud is in the position illustrated in Fig. 1 the dimmer is fully open, i. e. the blades 36 are substantially at or outside the dimmer aperture. Movement of the shutter to the opposite end of the slot 52 fully closes the dimmer.

The relative positions of the bearing 44 and pin 46 and the use of two segments for each blade are primary features of our invention. As will be seen in Fig. 1, when the stud 50 is in fully open position the segments are substantially coextensive, the blades are at the peripheries of the apertures A and the pin 46 of each blade is approximately on the radial line R running from the center of the shutter to the associated bearing 44. In the preferred form of our invention each pin 46 lies slightly to one side of the associated line R—the side opposite to that on which said pin is disposed when the blade is in fully closed position. In other words in the preferred form of our invention each pin 46 crosses the associated radial line R from the bearing to the center of the dimmer as the pin moves from open to closed position or vice-versa.

Due to this arrangement of the parts, as the stud and drive ring initially are moved from open towards closed position, the two segments of each blade will swing almost jointly about the associated bearing 44, with the tips of the segments swinging inwardly toward the center of the dimmer. Such initial, i. e. early, movement of the segments is shown in Fig. 7 at which time each pin 46 has barely crossed the associated radial line R while the stud 50 has been moved over about one-sixth of its total travel from open to closed position.

It may be mentioned that as each blade moves from its Fig. 1 to its Fig. 7 position the short segment 40 will rotate in a clockwise position, as viewed in Fig. 10, relative to the long segment 38 about the rivet 42 until it is radially in line with the bearing 44. After the rivet 42 crosses the associated radial line R the short segment 40 will move in a counterclockwise direction relative to the long segment 38, as viewed in Fig. 10. However, the initial relative movement of the segments 38, 40 about the rivet 42 is very slight because in the open position of the dimmer the rivet 42 lies close to said radial line R. Accordingly, for a substantial arc of movement of the drive ring 34 and blade 36, the segments 38, 40 will experience very little relative movement. This is quite clearly demonstrated by comparing the location of the blades in the open position of the dimmer shown in Fig. 1, with the location of the blades illustrated in Fig. 7 and the location of said blades illustrated in Fig. 8. In this last position the stud has shifted approximately one-third of its entire movement to fully closed position. It will be seen that the blades have moved a substantial distance towards the center of the shutter and yet the segments still are in almost their original relative position wherein they were substantially coextensive. Indeed, until the

stud has shifted over approximately one-half of its entire permissible arc of motion, the blades remain substantially coextensive.

When the stud has shifted over approximately two-thirds of its permissible arc of motion the segments occupy the position shown in Fig. 9. At this time the tips of the blades are almost at the center of the dimmer aperture but by now the angular movement of the rivet 42 relative to the center of the dimmer has carried well past the radial line R of the associated bearing 44 so that the segment 40 has begun to experience a substantial movement with respect to the segment 38 about the rivet 42. Due to this movement the blade as a whole broadens from its tip toward its base. In other words the segments of each blade fan out although still overlapping.

When the stud is in fully closed position the blades are in the relative locations shown in Fig. 10 wherein the tips of the blades are juxtaposed close to the center of the dimmer aperture and the segments have fanned out to an extent such that the segments of each blade barely overlap one another. In this position the blades are wide enough for the edges of one blade to overlie or underlie the juxtaposed edges of the two adjacent blades so that all passage of light through the dimmer between the blades is blocked. Inasmuch as contact of the tips of the blades as they approach the center of the dimmer aperture prevents the center of said aperture from being completely covered, in order to prevent all passage of light through the dimmer, one of the blades is provided with a disk 58 so disposed that when the blades are in fully closed position the disk overlies the aperture defined by the tips of the blades.

From the foregoing it will be seen that over approximately the first half of the movement of the stud the blades swing inwardly substantially in the manner of the blades of an ordinary iris shutter except that the blades do not overlie one another so that spaces in the shapes of spiral spokes are left between the blades for the passage of light. Thus in this first half cycle of operation of the dimmer not only is light being blocked from the periphery of the dimmer aperture but also light progressively is being blocked toward the center of the aperture. In other words, during the first half of the cycle the segments of each blade swing jointly or substantially jointly toward the center of the aperture.

Motion of the stud during the second half of the closing cycle swings the blades farther toward the center of the aperture but such motion is comparatively slight. The major action of the blades during the second half of the cycle is a fanning out motion of the segments, i. e. a widening of the blades to fill out the spiral spoke-like spaces between adjacent blades. This latter motion substantially uniformly reduces the aperture from the center to the periphery thereof.

It thus will be apparent that our new construction fulfills the principal function necessary for an efficient dimmer, that is, it removes portions of the spotlight beam in a substantially symmetrical fashion from substantially all parts of the beam at the same time, i. e. from the outside of the beam as well as the central portion of the beam and from a number of different points about the axis of the beam at the same time without in any way interfering with the intensity of the light source.

It is clear that reverse movement of the stud from closed to open position initially will swing the segments towards one another into substantial registration while they experience a slight swinging movement outwardly about the bearing 44. During the second half of the movement of the stud toward open position the principal motion of the segments will be a joint swinging about the bearing 44 although at the same time they will experience a comparatively slight relative movement about the rivet 42.

It thus will be seen that we have provided a device

which achieves all the objects of our invention and is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein described, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

Having thus described the invention, we claim as new and desire to secure by Letters Patent:

1. A lighting dimmer comprising a support having an aperture, several elongated shutter blades, each of said blades having a base and a tip, each said blade tapering from its base toward its tip, each said blade being constructed and arranged to be transversely fan-expansible about its tip so that the breadth of the base is expansible and the breadth of the tip is constant, means pivotally mounting said blades adjacent their bases at spaced intervals on the support adjacent the aperture for movement from a first position in which the blades extend longitudinally along and are located at the periphery of the aperture and thereby provide a clear opening through the aperture to a second position in which the blades extend radially from their bases to their tips into the aperture and the tips of the blades are adjacent the center of the aperture, the spacing between the pivotal mounting means exceeding the unexpanded widths of the bases of the blades, and means to move the blades from the first to the second position and to expand the blades so as to close the aperture.

2. A lighting dimmer comprising a support having an aperture, several elongated shutter blades, each of said blades having a base, side edges and a tip, each said blade tapering from its base toward its tip, each said blade being constructed and arranged to be transversely fan-expansible about its tip so that the breadth of its base is expansible and the breadth of its tip is constant, means pivotally mounting said blades adjacent their bases at spaced intervals on the support adjacent the aperture for movement from a first position in which the blades extend longitudinally along and are located at the periphery of the aperture and thereby provide a clear opening through the aperture to a second position in which the blades extend radially from their bases to their tips into the aperture and the tips of the blades are adjacent the center of the aperture, the spacing between the pivotal mounting means exceeding the unexpanded widths of the bases of the blades whereby in the said second position the side edges of the blades are spaced laterally from one another to define spoke-like spaces, and means to move the blades from the first to the second position and to expand the blades so as to block off said spaces and thereby close the aperture.

3. A lighting dimmer as set forth in claim 2 wherein each shutter blade includes a plurality of elongated segments which taper toward the tip of the blade and means pivotally securing the segments to one another adjacent the tips whereby to permit transverse fan-expansion of the blade about its tip.

4. A lighting dimmer as set forth in claim 2 wherein the blades are arranged to expand as they pivot into the aperture.

5. A lighting dimmer as set forth in claim 2 wherein the blades are arranged to expand as they pivot into the aperture and wherein the blades move in a cycle, during the first half of which the blades principally move from the first to the second position and during the second half of which the blades principally expand.

6. A lighting dimmer comprising a support for an aperture, several shutter blades, each shutter blade including a pair of elongated segments having a tip, side edges and a base, said segments tapering from their bases

to their tips, means pivotally securing the segments of each blade to one another at their tips whereby each blade is transversely fan-expansible about its tip, means rotably mounting one segment of each blade on the support, the axes of rotary movement of said segments so mounted being spaced apart a distance greater than the widths of said segments, means to swing said blades about said axes from a first position in which the blades extend longitudinally along and are located at the periphery of the aperture and thereby provide a clear opening through the aperture to a second position in which the blades extend laterally from their bases to their tips into the aperture and the tips of the blades are adjacent the center of the aperture, the blades defining spoke-like spaces between their side edges as they move toward the center of the aperture, and means to fan out the segments of each blade about the pivotal securing means so as to block off said spaces and thereby close the aperture.

7. A lighting dimmer comprising a base ring, a drive ring, means to mount said drive ring co-axially of and for rotation relative to the base ring, several shutter blades, each shutter blade including a pair of elongated segments having a tip, side edges and a base, said segments tapering from their bases to their tips, means pivotally securing the segments of each blade to one another at their tips whereby each blade is transversely fan-expansible about its tip, means rotably mounting one segment of each blade on the base ring, the axes of rotation being spaced apart a distance greater than the widths of the bases of the segments, and means pivotally mounting the other segment of each blade on the drive ring, relative rotation of said rings swinging said blades about the axes of rotation and the axes of pivotal mounting from a first open position in which the segments extend longitudinally along and are located at the periphery of the aperture and thereby provide a clear opening through the aperture, through a second position in which the blades extend laterally from their bases to their tips into the aperture and the tips of the blades are adjacent the center of the aperture, the blades defining spoke-like spaces as they move toward the center of the aperture, to a third position in which the segments of each blade fan out to block off said spaces and thereby close the aperture.

8. A lighting dimmer as set forth in claim 7 wherein the segments of the blades are substantially coextensive when the blades are in open position.

9. A dimmer as set forth in claim 8 wherein the means rotatably mounting one segment of each blade on the base ring is radially further from the center of the base ring than the means pivotally mounting the other segment of each blade on the drive ring.

10. A dimmer as set forth in claim 9 wherein the means rotatably mounting one segment of any given blade on the base ring is in substantial radial registration with the means pivotally mounting the other segment of said blade on the drive ring when the blades are in open position.

11. A lighting dimmer as set forth in claim 7 wherein one segment of each pair is longer than the other and wherein the long segment is the one which is rotatably mounted on the base ring.

References Cited in the file of this patent

UNITED STATES PATENTS

1,422,460	Marks	July 11, 1922
2,695,547	Zander	Nov. 30, 1954

FOREIGN PATENTS

155,213	Great Britain	Mar. 10, 1922
585,691	Great Britain	Feb. 19, 1947