

Nov. 3, 1970

M. A. HANKINS
VARIABLE BEAM SPOTLAMP

3,538,324

Filed Sept. 29, 1966

3 Sheets-Sheet 1

FIG. 1.

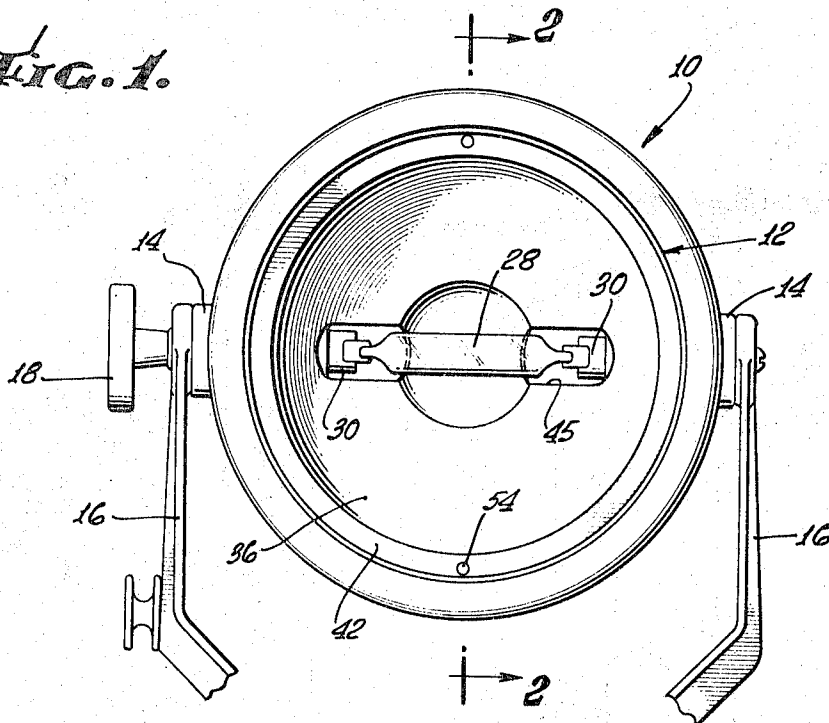
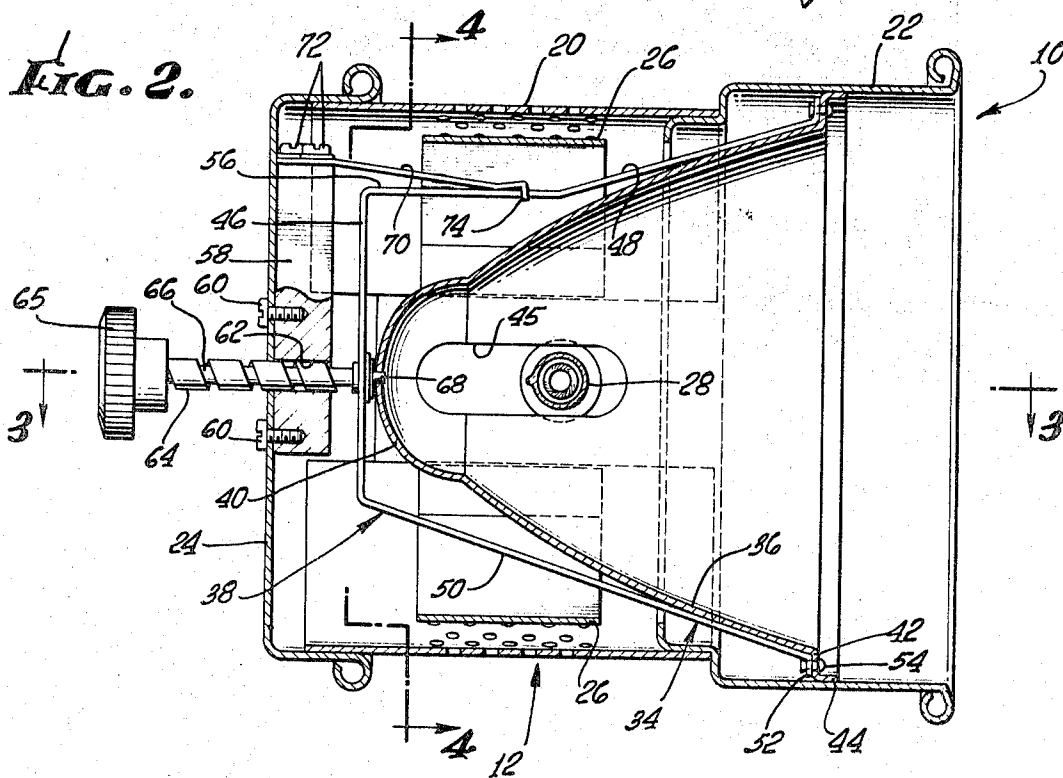


FIG. 2.



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FIG. 3.

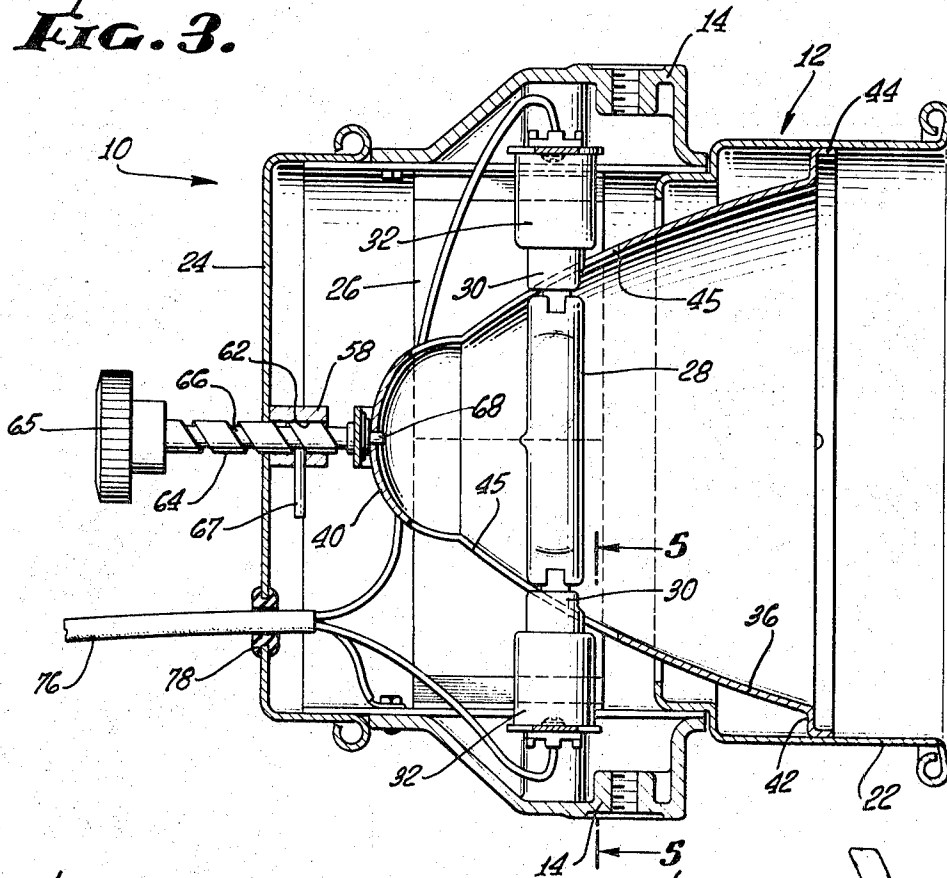


FIG. 4.

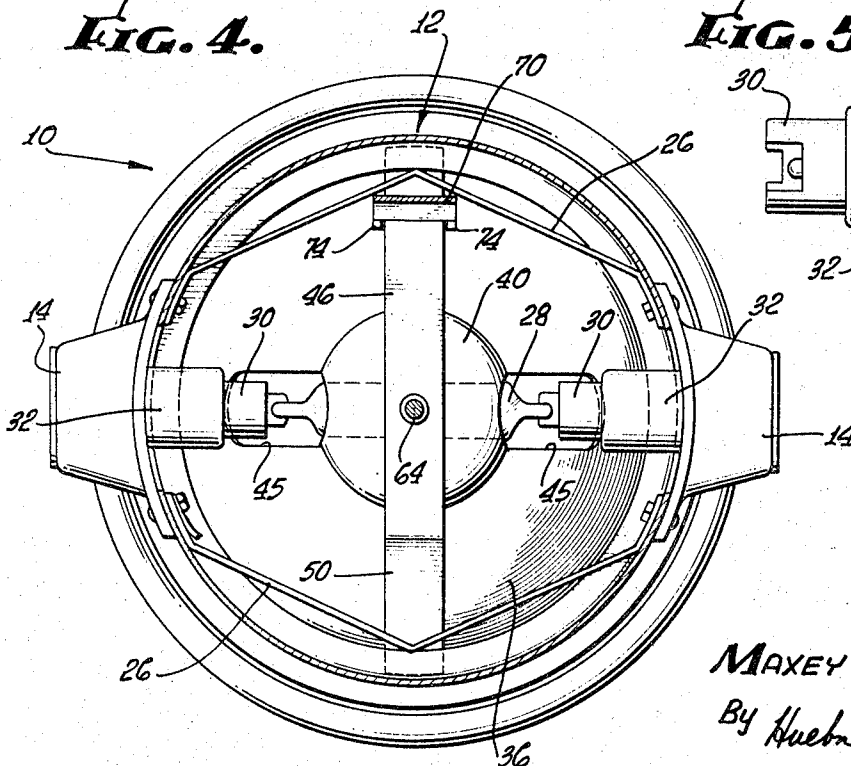
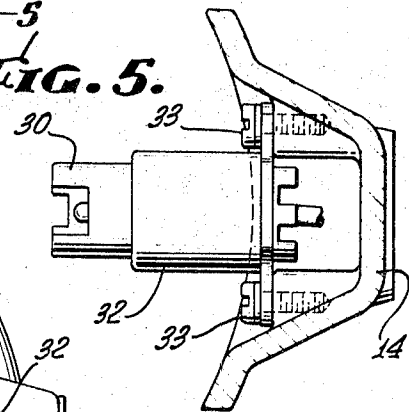


FIG. 5.



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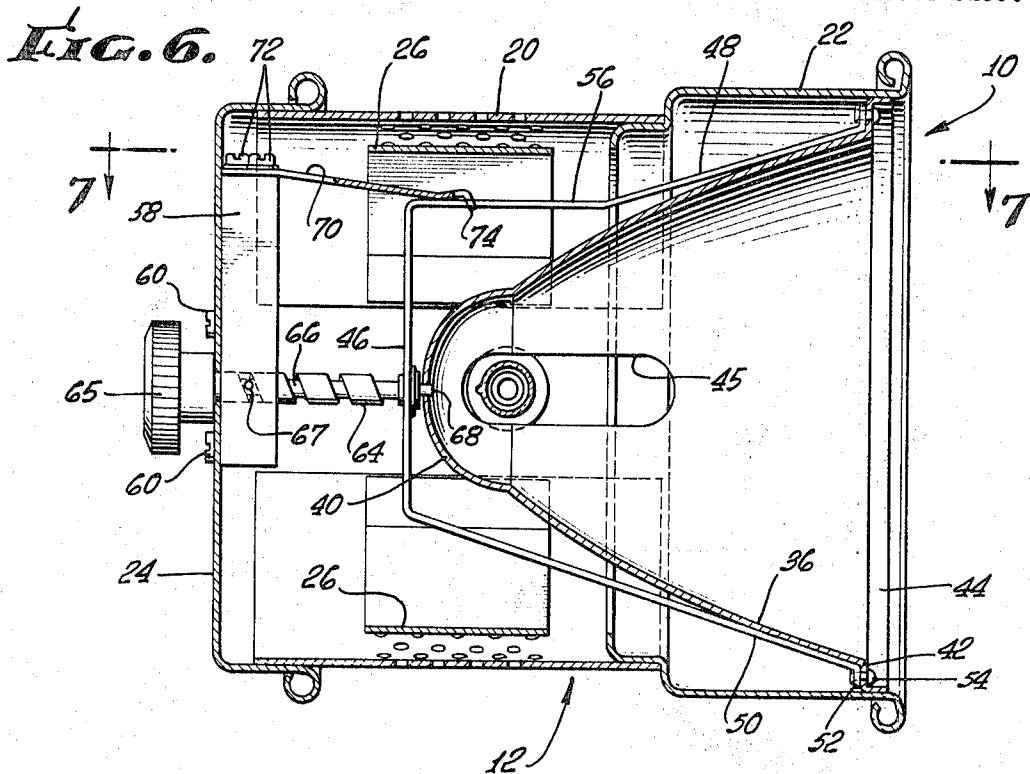
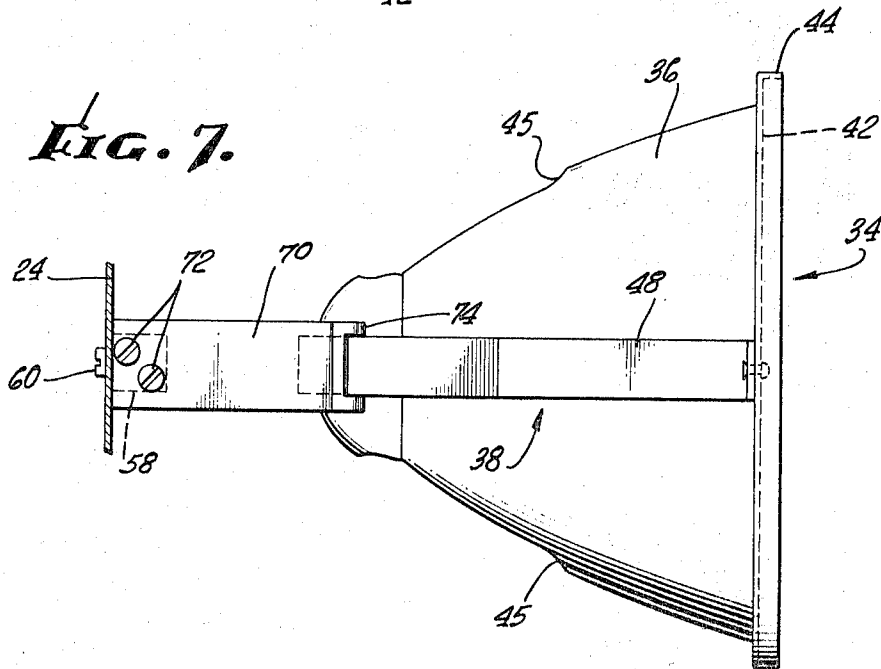
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3 Sheets-Sheet 3



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VARIABLE BEAM SPOTLAMP

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6 Claims

ABSTRACT OF THE DISCLOSURE

A variable spotlight embodying a double-ended, high intensity bulb, such as a double-ended quartz bulb, fixedly mounted transversely in the lamp housing in a pair of diametrically opposed sockets. Beam adjustment is accomplished by axial movement of a generally cup-shaped reflector in the housing. The reflector has diametrically opposed, elongated slots therein through which the ends of the bulb extend for engagement in the sockets. These slots allow movement of the reflector from a rearwardmost "flood" position to a forwardmost "spot" position.

The present invention relates to spotlamps of the type having an adjustable or variable beam, and it relates more particularly to a novel spotlight of this general type wherein the light bulb is fixedly mounted within the lamp housing and adjustability of the beam is accomplished by axial movement of a reflector in the housing.

It is well known in the lamp art to provide for adjustability in spotlamps to permit variation of the beam from a relatively narrow, "spot" type beam to a relatively wide, "flood" beam. Conventionally, the adjustment has been accomplished by moving the light bulb back and forth in the housing relative to a fixed focusing reflector or a fixed lens such as a Fresnel lens. In the past this type of adjustability has been generally satisfactory because spotlamps were of sufficient size to contain the necessary adjusting mechanism and for adequate heat dissipation. Also, the usual light bulb had a single socket mounting, which permitted relatively simple adjusting equipment.

However, recent advances in the lighting art have resulted in high-intensity light bulbs which are very small in size, and in particular the double-ended quartz lamp type of bulb which is a small cylindrical or tubular bulb having electrical contacting means at both ends thereof. An example of a typical double-ended quartz lamp of this type is a 1,000 watt quartz lamp having a bulb part that is only about 5/8 of an inch in diameter and about 1 3/4 inches in length, with the contacting means extending from the ends thereof. While such small, high intensity light bulbs have permitted a substantial reduction in the overall size of spotlamps which employ them, this has at the same time resulted in a number of problems associated with the provision of a movable bulb for focusing.

For example, where a double-ended, high intensity quartz lamp is movably mounted for focusing in a compact spotlight, an undesirably large amount of space is required by the fact that two movable sockets must be positioned in opposite sides of the lamp housing, and relatively complicated actuating mechanism must be provided for simultaneously moving both of the sockets back and forth in the housing. Such movable sockets nevertheless must be minimized in size because of the considerable amount of space which they displace in their back and forth travel to provide beam adjustment, and this generally results in an inadequate socket struc-

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ture for withstanding or dissipating the intense heat that is present in such a compact spotlight.

Another problem with modern high intensity, compact spotlamps which are made adjustable by movement of the lamp bulb is that various accessories which are mounted on the front of the lamp housing, such as barn doors, spun glass diffusers, color correcting plates, and others, are more or less vulnerable to excessive heat, and when the light bulb is moved to its forwardmost or "flood" position, these accessories are likely to become excessively hot from heat that is directly radiated from the bulb filament.

Another problem in connection with such movable bulb type spotlamps is that each time the bulb is moved, the wires providing electricity to the sockets are flexed, and electrical connections are stressed. This problem is, of course, magnified with the constricted space and intense heat of a high intensity, compact type of spotlight.

A still further problem in connection with such spotlamps having a movable bulb is that any accidental shock against the adjusting knob or lever will be transmitted directly through the movable socket structure to the bulb, and thereby cause a shock to the bulb which is liable to cause expensive damage.

In view of these and other problems in the art, it is an object of the present invention to provide a novel variable beam spotlight wherein the light bulb is fixedly mounted within the lamp housing, and adjustability of the beam is accomplished by axial movement of a reflector in the housing with respect to the light bulb.

Another object of the present invention is to provide a variable beam spotlight of the character described wherein a double-ended, high intensity bulb such as a double-ended quartz lamp is transversely mounted in the lamp housing in a pair of fixed, diametrically opposed sockets, and a generally cup-shaped reflector member is movably mounted for axial adjustment in the housing, the reflector member having diametrically opposed, elongated slots therein through which the ends of the bulb extend for engagement in the sockets, the elongated slots permitting axial movement of the reflector member relative to the light bulb from a rearwardmost "flood" position to a forwardmost "spot" position.

A further object of the invention is to provide a variable beam spotlight of the character described having a fixed light bulb and an axially adjustable reflector member, which includes particularly simple adjusting mechanism generally centrally located in the rear portion of the lamp housing for providing the axial adjustment of the reflector member, and wherein this adjusting mechanism includes novel spring stabilizing means for keying the reflector from rotation in the housing during axial adjustment thereof, for preventing accidental axial movement of the reflector when the lamp is tipped up or down from a horizontal position, and for biasing the reflector against the housing so as to prevent rattling in the lamp.

Briefly, the variable beam spotlight of the present invention includes a generally cylindrical housing having fixed, diametrically opposed sockets mounted therein for supporting a high-intensity, double-ended light bulb, such as a double-ended quartz lamp. Beam adjustability is accomplished by means of a generally cup-shaped reflector member which is axially slidably mounted in the housing. The reflector extends from a relatively narrow, closed rear end which is axially centered in the housing to the rear of the light bulb, the reflector flaring outwardly and forwardly to a rim which slides in the forward portion of the housing in front of the light bulb. Diametrically opposed, longitudinally extending slots are provided in the reflector to receive the opposite ends of

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the light bulb, and to permit the axial movement of the reflector without disturbing the bulb. The reflector is provided with a simple mounting bracket for attachment to an adjusting screw set in the rear end of the housing to provide the axial adjustment of the reflector, and this mounting bracket has a keyway section extending in a longitudinal direction parallel to the axis of the housing which is engaged by a novel stabilizing spring to key the reflector against rotation in the housing when the adjusting screw is rotated for axially shifting the reflector. This engagement of the stabilizing spring with the keyway section of the mounting bracket serves also to prevent accidental movement of the reflector longitudinally in the housing, and biases the reflector laterally against the housing to prevent objectionable rattling noises.

With this construction of the present invention, the two lamp sockets, by being fixedly positioned within the housing, may be provided with adequate bulk to withstand or dissipate the intense heat that is present in a compact spotlamp. This fixed mounting of the sockets also simplifies the adjusting mechanism, since only the single reflector unit is adjusted, rather than the two sockets. The stationary sockets also permit the entire electrical system to be fixed in the housing, thus eliminating the flexing and stressing of wires and electrical connections which accompanies adjustment of lamp sockets.

With the adjustable reflector of the present invention, the light bulb is disposed substantially rearwardly in the housing, at a fixed, maximum distance from the forward rim of the housing to which various accessories are attached. The reflector is then moved between the forwardmost minimum spot position and a rearwardmost flood position. This places the light bulb approximately twice as far back from the front of the housing in the present invention than the bulb of a movable bulb type spotlamp when the bulb is moved forward to the flood position. For example, assuming lamps of comparable size with reflectors of about $5\frac{1}{2}$ inches diameter, with 1,000 watt double-ended quartz bulbs, in the present invention the bulb will typically be set approximately 4 inches to the rear of the forward rim of the housing, while the bulb in a movable bulb type lamp will, in the flood position, be only about 2 inches from the forward rim of the housing. This means that approximately four times the radiated heat energy will be applied to accessories at the front of the housing in the flood position of a movable bulb type spotlamp as compared with the fixed bulb spotlamp of the present invention.

It will also be seen that the present invention has the additional advantage that accidental impacting of the adjusting knob will not be directly applied to the light bulb as is the case with an adjustable bulb type of lamp, and such impacting will only be indirectly applied through the relatively heavy lamp housing.

Further objects and advantages of the present invention will appear during the course of the following part of this specification, wherein the details of construction and mode of operation of a preferred embodiment are described with reference to the accompanying drawings, in which:

FIG. 1 is a front elevational view of a variable beam spotlamp according to the present invention.

FIG. 2 is an axial, vertical section taken on the line 2—2 in FIG. 1, showing internal details of the lamp, the reflector being adjusted to a generally rearward of flood position in FIG. 2.

FIG. 3 is an axial, horizontal section taken on the line 3—3 in FIG. 2.

FIG. 4 is a transverse, vertical section taken on the line 4—4 in FIG. 2.

FIG. 5 is an enlarged, fragmentary vertical section taken on the line 5—5 in FIG. 3 illustrating the mounting of one of the socket members in the housing.

FIG. 6 is an axial, vertical section similar to FIG. 2, 75

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but with the reflector adjusted to its forwardmost or spot position.

FIG. 7 is a horizontal section taken on the line 7—7 in FIG. 6, providing a plan view of the reflector assembly and stabilizing spring associated therewith.

Referring to the drawings, a spotlamp 10 according to the present invention includes a housing 12 which is preferably, but not necessarily, generally cylindrical in configuration. Mounted on opposite sides of the housing 12, in diametrically opposed relationship, is a pair of trunnions 14 which are engaged for pivotal mounting by the end portions of a support yoke 16. A clamp knob 18 is threadedly connected to one of the trunnions 14, loosening of the knob 18 permitting pivotal adjustment of the spotlamp 10 about a horizontal axis, and tightening of the knob 18 clamping the spotlamp 10 in its adjusted position. The housing 12 includes a barrel portion 20 intermediate its ends, which is preferably perforated for ventilation; a forward guide portion 22 in the form of a generally smooth cylinder and a back wall portion 24 providing a generally closed back of the housing. Light baffle members 26 are supported within the perforated barrel 20 to block the passage of light outwardly through the perforations of the barrel, while allowing freedom of ventilation through the perforations of the barrel.

A light bulb 28 of the elongated, double-ended type is removably mounted within the barrel portion 20 of the housing, the light bulb preferably being supported in a horizontal position at right angles to the axis of the housing, and symmetrically arranged with respect to the axis of the housing. While the present invention is not to be construed as limited to any particular type of light bulb, a presently preferred type of bulb is a small, high intensity double-ended quartz lamp. The light bulb 28 has electrical contacts at its ends which are received in respective spring-loaded sockets 30. Socket base members 32 carry the sockets 30 and are supported on the insides of the respective trunnions 14, as by means of screws 33.

It will thus be seen that when the light bulb 28 is operatively positioned in a lamp by engagement of its ends in the sockets 30, the light bulb is fixedly positioned with respect to the lamp housing 12. This fixed operative positioning of the light bulb is not in any way disturbed when the spotlamp beam is adjusted, as will be apparent from the discussion of the adjustment means set forth hereinafter. The sockets 30 are arranged so that the light bulb can be simply and conveniently removed from engagement with the sockets 30 and replaced by a new light bulb when necessary. As is apparent from FIGS. 1 and 3 of the drawings, the light bulb 28 is fully accessible from the open front end of the housing 12, whereby removal and replacement of a light bulb can be accomplished without requiring any disassembly of parts or special adjustments.

Variability of the spotlamp beam is accomplished by means of a longitudinally movable reflector assembly 34 mounted in the housing 12, and comprising a forwardly flaring reflector 36 and a strap type of mounting 38 attached to the reflector 36 and disposed generally rearwardly of the reflector. Any desired reflector configuration may be chosen according to the specific qualities of the spotlamp beam that are desired. Preferably, the reflector 36 is annular, having a cupped rear end portion 40 disposed to the rear of the light bulb 28, and the reflector flaring forwardly and outwardly from this rear portion to its forward edge, at which it is provided with an out-turned flange 42 and a forwardly turned annular rim 44. The annular rim 44 is slidably engaged within the forward guide portion 22 of housing 12 for axial sliding movement of the reflector 36 in the housing.

The reflector 36 is provided with longitudinally arranged, diametrically opposed slots 45 through which the light bulb 28, and as seen in FIG. 3, sometimes the sockets 30, extend. Accordingly, the elongated slots 45 in the reflector permit free axial sliding movement of the re-

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flector relative to the light bulb 28 and the sockets 30 without disturbance to the fixed positioning of the light bulb 28. Also, the slots 45 permit full access to the light bulb 28 from the open front end of the housing for removal and replacement of the light bulb.

The mounting bracket 38 includes a base portion 46 which is preferably vertically arranged, and is disposed generally at right angles to the axis of the housing immediately to the rear of the rear end portion 40 of the reflector. Leg portions 48 and 50 of the mounting bracket are integral with the base portion 46, and extend forwardly and outwardly to the out-turned flange portion 42 of the reflector, the legs 48 and 50 having outwardly directed ears 52 at their respective forward ends. These ears 52 are secured to the reflector flange 42 by suitable fastening means, as for example, by pop rivets 54.

The upper leg portion 48 of the mounting bracket 38 is provided with a keyway section 56 immediately forward of the base 46 of the mounting bracket, this keyway section 56 extending parallel to the axis of the housing, and hence in alignment with the path of axial movement of the reflector assembly in the housing.

A support bar 58 is fixedly secured in the rear portion of the housing, preferably by attachment to the back wall 24 as by means of screws 60. The support bar 58 is preferably vertically arranged, and extends across the central axis of the housing. A bore 62 aligned with the central axis of the housing extends through the back wall 24 and the support bar 58, to receive an adjusting shaft 64 for rotational movement therein. The adjusting shaft 64 has an adjusting knob 65 secured to its rear end to the rear of the back wall 24 of the housing, and shaft 64 is provided with a helical groove 66. A roll pin 67 is supported in a suitable aperture in the support bar 58, and has an end that is engaged within the helical groove 66 of the adjusting shaft, whereby rotation of the knob 65 and hence of the shaft in one direction will cause the shaft to advance forwardly along the axis of the housing, and rotation of the knob and shaft in the opposite direction will cause the shaft to retract rearwardly along the axis of the housing. The forward end portion of the shaft 64 extends through an opening in the base portion 46 of the bracket, being rotatable with respect to the bracket but being keyed against axial movement relative to the bracket, so that the axial traveling movement of the shaft 64 which results from rotation of the knob 65 will be imparted to the bracket 38. The forward tip 68 of the shaft 64 is rotatably engaged within a small opening in the rear end portion 40 of the reflector, to secure the rear end portion of the reflector against lateral movement in the housing. Thus, the bracket 38 and the reflector 36 are effectively secured together at three points, two points being where the ears 52 are secured to the flange 42 of the reflector, and the third point being the point where the forward tip 68 of the shaft engages the rear end of the reflector.

A stabilizing spring 70, in the form of a leaf spring, is fixedly secured at its rear end to the upper end of support bar 58, as by means of screws 72. The spring 70 is bifurcated at its forward, free end, to provide a pair of laterally spaced positioning tangs 74 which are bent downwardly along the opposite sides of the axial keyway section 56 of the mounting bracket 38. The body of the spring 70 immediately to the rear of the tangs 74 is engaged against the upper surface of the keyway section 56 of the bracket and applies a downward biasing force to the keyway section 56, and the positioning tangs 74 are thereby secured in their operative positions along the side edges of the keyway section 56 as best shown in FIGS. 6 and 7 of the drawings.

Engagement of the spring 70 with the keyway section 56 of the reflector mounting bracket serves a number of important functions. First, the engagement of positioning tangs 74 along the side edges of the keyway section 56 keys the entire reflector assembly 34 against rotation in

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the housing, and thereby prevents the edges of the reflector slots 45 from being shifted against either the light bulb 28 or the sockets 30, insuring the free axial sliding action of the reflector assembly. Another function of the spring 70 is that the frictional engagement of the spring against the upper surface of the keyway section 56 prevents the inadvertent sliding of the reflector assembly from the weight of the reflector assembly when the spotlight is tilted up or down from a horizontal position on the trunnions 14. A further function of the spring 70 is to bias the reflector rim 44 downwardly against the forward guide portion 22 of the housing to prevent rattling in the spotlight when the spotlight is moved. This latter function of the spring is important to prevent undesired noise when the lamp is being dollied from one position to another during the photographing of a motion picture.

As shown in FIG. 3, the electrical input cable or cord 76 preferably enters the housing 12 through an opening in the back wall 24, being secured in position by a suitable cable grip 78, and the wiring from the cable within the housing is positioned so as to avoid any moving parts. In this manner, none of the wiring or electrical connections will be in any way flexed or stressed during operation of the spotlight.

Adjustment of the spotlight beam is accomplished simply by rotating the adjusting knob 65 at the rear of the housing so as to move the reflector assembly back and forth within the housing. When the reflector is adjusted to a generally rearward position in the housing, as illustrated in FIGS. 2 and 3, the light beam cast from the spotlight will be a "flood" type of beam, while movement of the reflector to its forwardmost position as illustrated in FIG. 6 will provide a minimum "spot" type of beam.

While the instant invention has been shown and described herein in what is conceived to be the most practical and preferred embodiment, it is recognised that departures may be made therefrom within the scope of the invention, which is therefore not to be limited to the details disclosed herein, but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

I claim:

1. A variable beam spotlight which comprises a housing having an open front end and a rear end, a stationary light source in said housing comprising fixed electrical socket means having an electric light bulb removably mounted therein, a generally cup-shaped, forwardly opening reflector movably mounted in the housing, said reflector having aperture means in the wall thereof through which said light source extends, said bulb being disposed generally within said reflector so that the reflector directs light from the bulb in a forwardly projecting beam, adjusting means connected to said reflector for moving the reflector generally axially of the beam so as to vary the width of the beam, said aperture means permitting such movement of the reflector without mechanical interference between the reflector and said light source, said light source comprising a pair of opposed socket members fixedly mounted in the housing on opposite sides of the reflector and a double-ended bulb supported at its respective ends in said sockets, said aperture means comprising a pair of opposed slots in the reflector through which said light source extends, said reflector having a mounting bracket attached thereto which has a longitudinally arranged section, and spring means mounted in the housing and frictionally slidably engaging said section of the bracket to restrain the reflector against undesired movement in the housing.

2. A spotlight as defined in claim 1, wherein said spring means applies a substantial lateral biasing force against said section of the bracket so as to bias the reflector against the housing to limit rattling of the reflector in the housing.

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3. A spotlamp as defined in claim 2, wherein said mounting bracket includes a base portion adjacent to the rear of the reflector, and said adjusting means comprises rotatable threaded adjusting means generally aligned with the axis of the reflector and engaged between the housing proximate the rear end thereof and said base portion of the bracket, said longitudinally arranged section of the bracket being radially offset from said axis and keyed by said spring means against rotation of said bracket and reflector when said adjusting means is rotated.

4. A variable beam spotlamp which comprises a housing having an open front end and a rear end, a stationary light source in said housing comprising fixed electrical socket means having an electric light bulb removably mounted therein, a generally cup-shaped, forwardly opening reflector movably mounted in the housing, said reflector having aperture means in the wall thereof through which said light source extends, said bulb being disposed generally within said reflector so that the reflector directs light from the bulb in a forwardly projecting beam, and adjusting means connected to said reflector for moving the reflector generally axially of the beam so as to vary the width of the beam, said aperture means permitting such movement of the reflector without mechanical interference between the reflector and said light source, said light source comprising a pair of opposed socket members fixedly mounted in the housing on opposite sides of the reflector and a double-ended bulb supported at its respective ends in said sockets, said aperture means comprising a pair of opposed slots in the reflector through which said light source extends, said reflector having a mounting bracket attached thereto which has a longitudinally arranged section, and spring means mounted in the housing frictionally slidably engaging said section of the bracket to restrain the reflector against undesired movement in the housing, said spring means applying a substantial biasing force against said section of the bracket so as to bias the reflector against the housing to limit rattling of the reflector in the housing, said mounting bracket including a base portion adjacent to the rear of the reflector, and said adjusting means comprising rotatable threaded adjusting means generally aligned with the axis of the reflector and engaged between the housing proximate the rear end thereof and said base portion of the bracket, said longitudinally arranged section of the bracket being radially offset from said axis and keyed by said spring means against rotation of said bracket and reflector when said adjusting means is rotated, said spring means comprising a leaf spring which is bifurcated at its free end to provide a pair of spaced tangs disposed on opposite sides of said longitudinally arranged section of the bracket.

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5. A spotlamp as defined in claim 4, wherein said housing has a generally cylindrical forward guide portion, and said reflector has a generally annular forward rim engaged in said guide portion for axial sliding movement.

6. A variable beam spotlamp which comprises a housing having an open front end and a rear end, a stationary light source in said housing comprising fixed electrical socket means having an electric light bulb removably mounted therein, a generally cup-shaped, forwardly opening reflector movably mounted in the housing, said reflector having aperture means in the wall thereof through which said light source extends, said bulb being disposed generally within said reflector so that the reflector directs light from the bulb in a forwardly projecting beam, and adjusting means connected to said reflector for moving the reflector generally axially of the beam so as to vary the width of the beam, said aperture means permitting such movement of the reflector without mechanical interference between the reflector and said light source, and slight source comprising a pair of opposed socket members fixedly mounted in the housing on opposite sides of the reflector and a double-ended bulb supported at its respective ends in said sockets, said aperture means comprising a pair of opposed slots in the reflector through which said light source extends, said reflector having a mounting bracket attached thereto, and said adjusting means being engaged between said bracket and the housing, said mounting bracket including a base portion adjacent to the rear of the reflector, and said adjusting means comprising threaded adjusting means engaged between the housing proximate the rear end thereof and said base portion of the bracket.

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240—11.4