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Federico

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[54] **COMBINATION SPOTLIGHT AND FLOODLIGHT**

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[51] **Int. Cl.** **F21r 7/00**

[58] **Field of Search** 240/44, 44.1, 41.37, 10.69; 350/295

[56] **References Cited**

FOREIGN PATENTS OR APPLICATIONS

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Primary Examiner—Richard M. Sheer

[57] **ABSTRACT**

The light of this invention may be operated so as to emit a floodlight beam or can be focused into a spotlight beam. The apparatus includes a reversible drive for moving the light reflector between a floodlight position wherein the reflector has its least curvature, and a spotlight position wherein the reflector has its greatest (parabolic) curvature.

18 Claims, 6 Drawing Figures

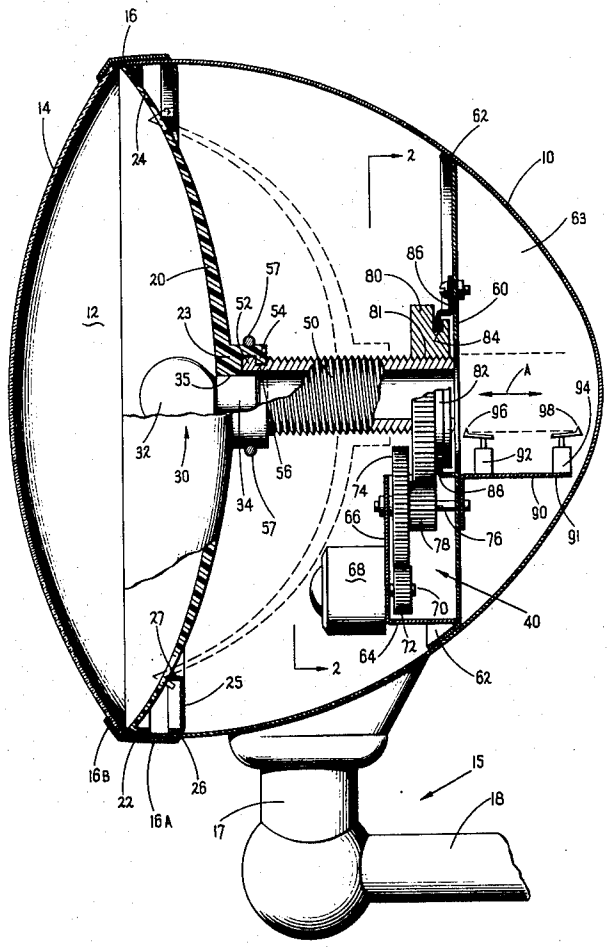


FIG. 1

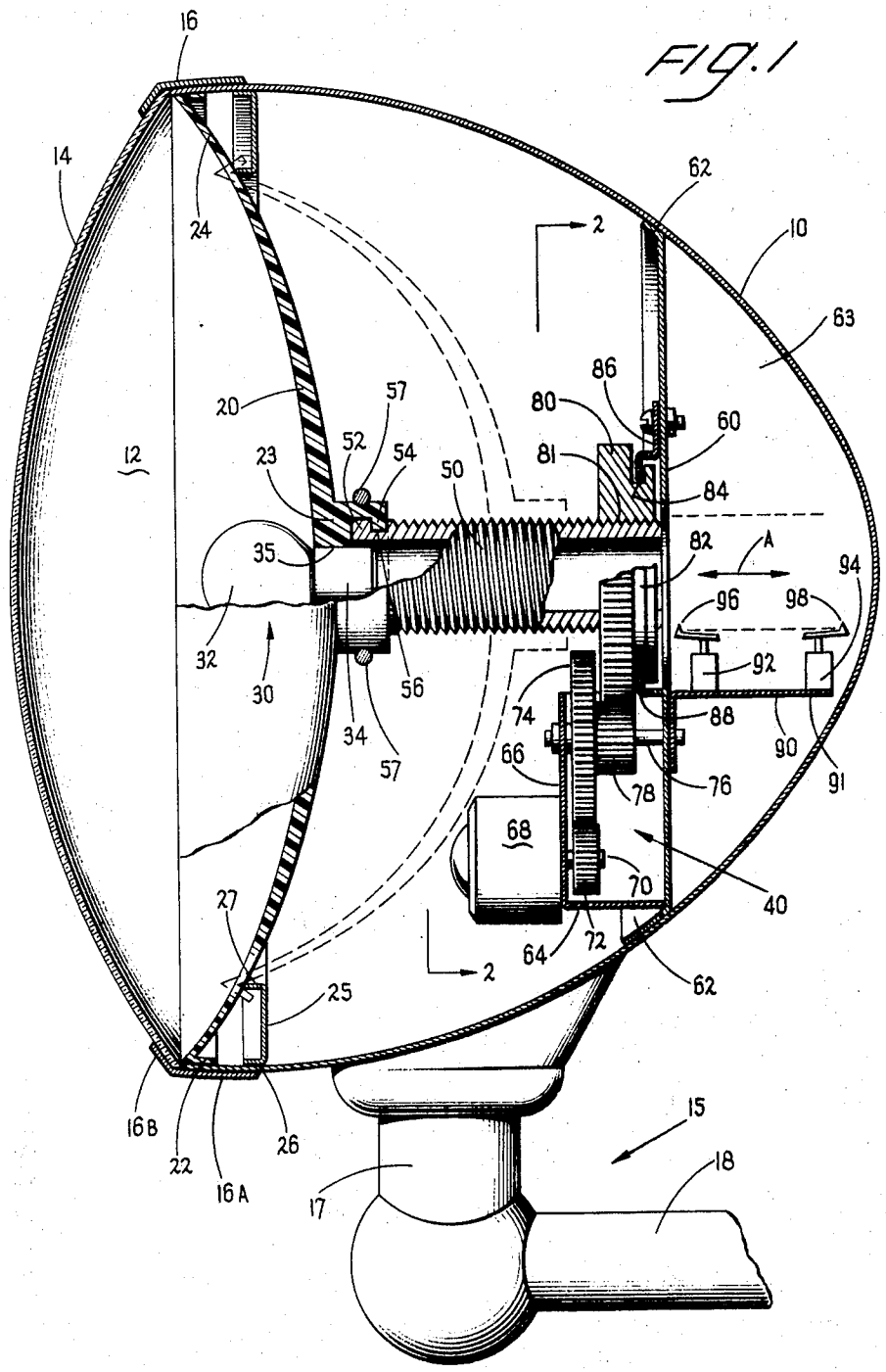
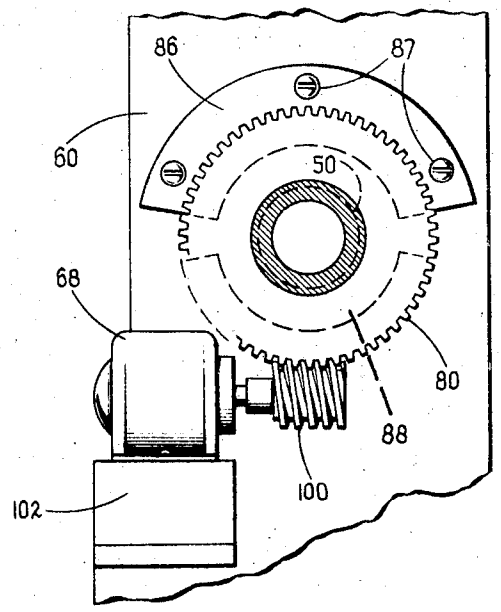

16
14
24
62
10
63
2
20
57
86
80
60
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23
52
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81
84
35
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A
94
96
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32
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56
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74
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57
66
90
91
78
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72
62
25
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16B
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16A
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17
18

FIG. 3



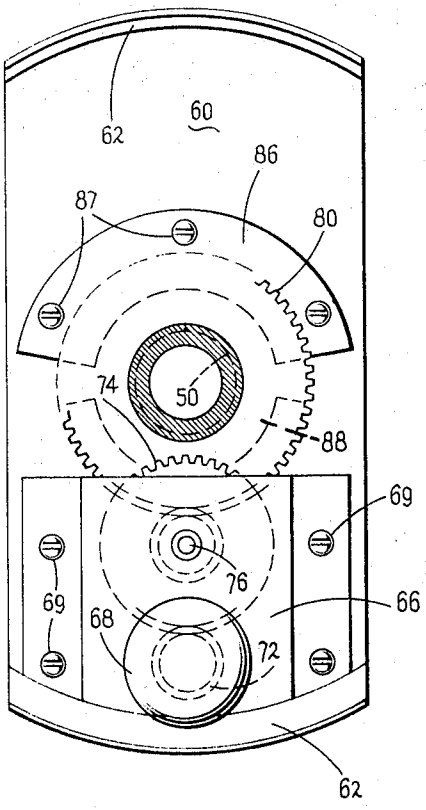
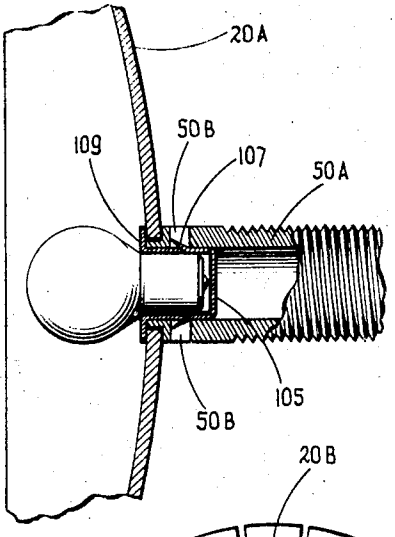


FIG. 2

FIG. 4



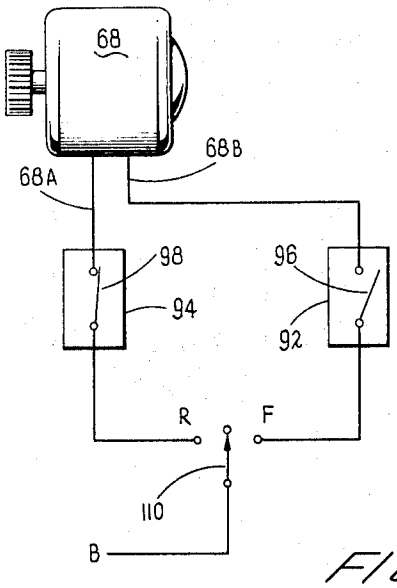


FIG. 5

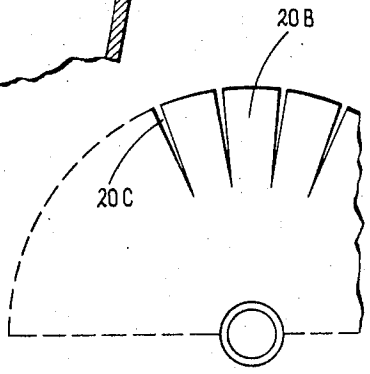


FIG. 6

COMBINATION SPOTLIGHT AND FLOODLIGHT

BACKGROUND AND OBJECTS OF THE INVENTION

The present invention relates in general to a searchlight or the like, and pertains, in particular to a combination spotlight and floodlight wherein the reflector comprising the light is deflectable between a floodlight position and a focused spotlight position.

There does exist in the prior art patents which show different means for focusing a spotlight. Usually, this focusing is accomplished by means of some type of a lens arrangement. In some other prior art structures the reflector itself may be movable longitudinally.

However, the prior art does not appear to disclose a combination spotlight and floodlight including a reflector that is deflectable or deformable and can assume a floodlight position and a focused spotlight position.

Accordingly, one important object of the present invention is to provide a combination floodlight and spotlight having a reflector that is deformable or deflectable.

Another important object of the present invention is to provide an apparatus in accordance with the preceding object and which can assume a floodlight position with its reflector at its least curvature or a spotlight position with its reflector curved parabolically.

A further object of the present invention is to provide an apparatus in accordance with the preceding objects and which includes a drive means operable by the user of the apparatus for moving the reflector between the spotlight and floodlight positions.

Still another object of the present invention is to provide a combination spotlight and floodlight that is as compact as conventional searchlights, such as those used on an automobile, and wherein all of the mechanism for deforming or deflecting the reflector may be contained within a typical housing for the apparatus.

SUMMARY OF THE INVENTION

To accomplish the foregoing and other objects of this invention there is provided a searchlight or the like that may be operated either as a spotlight or a floodlight. The apparatus generally comprises a housing having an opening through which light is transmitted. This opening is preferably covered by a transparent glass lens. A reflector is disposed in the housing and a light source is positioned on one side of the reflector at its center. The light source is disposed relative to the reflector in a position to reflect light toward the opening.

In accordance with the present invention means are disposed on the opposite side of the reflector for moving at least the center of the reflector linearly between a first position or floodlight position wherein the reflector has its least curvature and a second position or spotlight position wherein the reflector has its greatest curvature. In one embodiment this means for moving the reflector comprises a reversible motor which is coupled to a gear train and which in turn is coupled to a lead screw connected to the reflector. In another embodiment the gear train is replaced by a worm gear.

BRIEF DESCRIPTION OF THE DRAWINGS

Numerous other objects, features and advantages of the invention will now become apparent upon a reading of the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. **1** is a partially cross sectional side view of one embodiment of the light of this invention;

FIG. **2** is a cross sectional view taken along line **2—2** of FIG. **1** showing the drive means of this invention;

FIG. **3** is a view similar to that shown in FIG. **2** for an alternate embodiment of the drive means;

FIG. **4** is a fragmentary view of a light similar to that shown in FIG. **1** but employing a metal reflector;

FIG. **5** is a schematic diagram showing the drive motor and limiting switches positionally depicted in FIG. **1**; and

FIG. **6** is a fragmentary view of another embodiment of the reflector.

DETAILED DESCRIPTION

Referring now to the drawings and in particular to FIG. **1** there is shown one embodiment for the focusable searchlight of this invention. The device generally comprises a housing **10**, reflector **20**, light source **30** and drive means **40**. The housing **10** has a generally conventional and parabolic shape and defines at its front end an opening **12**. This opening **12** is typically covered by a translucent arcuate lens **14** which is secured to housing **10** about its circumference by bracket **16**. Bracket **16** includes leg **16A** which is appropriately affixed to housing **10** such as by being spotwelded, and leg **16B** which engages with the outer circumference of lens **14** and maintains lens **14** fixed in position relative to the housing.

FIG. **1** also shows a support member **15** including arms **17** and **18**. Member **15** may be of a conventional type, and if the light is of the type that is used with a motor vehicle, then the arm **18** connects to the vehicle in a suitable position for use. The arms **17** and **18** are preferably hollow and may have electrical wires extending therethrough. FIG. **5** referred to hereinafter, shows a schematic diagram of the wiring associated with the device of the present invention. For the sake of clarity the electrical connections have not been shown in FIG. **1**.

The reflector **20** is shown in a cross section and in the embodiment of FIG. **1**, and is constructed of rubber or plastic. The reflector may have a reflective coating or paint deposited thereon.

FIG. **1** also shows the reflector in dotted outline in its spotlight position. The reflector may be moved between either of the positions shown in FIG. **1** by the drive means **40** which is discussed in more detail hereinafter.

The reflector **20** has a circumferential lip **22**, and has a thickness that varies from its center portion **23** to its edge portion **24**. The reflector is thickest at its center portion and gradually tapers in thickness to a thinner cross section at its edge portion **24**. The reflector is constructed in this manner so that when the reflector deforms it will form a parabola in its spotlight position thereby focusing the light from source **30** into a relatively narrow beam.

The reflector **20** is limited in its movement between the two positions shown in FIG. **1**. The reflector is limited in its floodlight position as the edge of the reflector

touches the peripheral edge of lens **14.** Regarding the spotlight position of the reflector, there is provided an annular bracket **25** having one side **26** fixed to the inner surface of housing **10** by suitable means such as spot welding, opposite to leg **16A** of external bracket **16.** Bracket **25** also includes circumferential flange **27** which engages with lip **27,** as shown in dotted outline in FIG. **1,** thereby limiting movement of the reflector to its greater curvature position.

The light source **30** includes a spot light bulb **32** and socket **34.** The socket **34** typically has terminals which connect to the bulb **32** and to which wires connect. These wires are not shown in FIG. **1** but would extend through lead screw **50** and couple by way of member **15** to an appropriate power source. In an automobile the light source would be powered from the storage battery of the automobile. The socket **34** fits within an aperture **35** defined in the center section **23** of the reflector. The socket may be force fitted in aperture **35,** for example, or may be glued in place.

The reflector is coupled to and moved by lead screw **50** which moves linearly in the direction or arrow A. Thus, a connection is provided between end **52** of the lead screw and the center section **23** of the reflector. The reflector is provided with an arm **54** which fits within a recess **56** in the end of the lead screw **50.** Because the reflector is constructed of a resilient material, the arm **54** is deflectable and will separate sufficiently to permit the arm to engage with recess **56** in the lead screw. A clamp **57** may also be provided around the periphery of arm **54** for maintaining the reflector and lead screw in a united condition. The clamp **57** may be an annular band that fits within a slight groove provided about the circumference of arm **54.**

Regarding the drive means **40,** reference is now made to FIGS. **1** and **2.** Means **40** is primarily supported by vertical mounting plate **60** which has a circumferential outer lip **62** which is secured to an inner surface of housing **10** in a position to define a suitably large compartment **63** into which lead screw **50** may extend when the reflector is in its spotlight position.

An L-shaped bracket **64** extends from bracket **60** at edge **62** and includes an upright arm **66** to which motor **68** attaches. Motor **68** may be connected to mounting bracket **64** by means of bolts **69** shown in FIG. **2.** In addition to the electrical connections made to motor **68,** the motor also includes an output shaft **70** which may be driven in opposite directions by motor **68,** as explained hereinafter with reference to FIG. **5.**

A pinion gear **72** suitably connects to shaft **70** and engages with a first drive gear **74** which is mounted for rotation on shaft **76.** Shaft **76** is suitably journaled at one end in bracket **64** and at the other end in mounting plate **60.**

Drive gear **74** has a pinion gear **78** associated with and rotatable with drive gear **74.** Pinion gear **78** is also supported on shaft **76** and engages with a second drive gear **80** which engages with lead screw **50.** Gear **80** has an extension section **82** that defines a circular channel **84.** Brackets **86** and **88** fit within channel **84** and support gear **80** in a fixed position relative to plate **60.** Bracket **86** has one end that extends into channel **84** and has its outer end affixed to plate **60** by means of three bolts **87.** The lower bracket **88** also has one end that extends into channel **84,** and in the embodiment shown in FIG. **1** is constructed as a integral part of plate **60.**

The gear **80** has a central threaded section **81** that mates with lead screw **50.** As gear **80** is rotated the lead screw **50** moves in the direction of arrow A. When the lead screw is in the position shown in FIG. **1,** the gear may be rotated in one direction to cause the reflector to move to its spotlight position. Once in the spotlight position the gear **80** may then be rotated in the opposite direction to move the lead screw toward the left, as viewed in FIG. **1.**

FIG. **1** also shows an L-shaped bracket **90** which extends from mounting plate **60** on the opposite side of drive means **40.** This bracket **90** includes a horizontal leg **91** for supporting limit switches **92** and **94.** Each of these limit switches **92** and **94** have contacts **96** and **98** associated therewith. Switch **92** may be included for limiting the displacement of the lead screw in a leftward direction, and similarly limiting switch **94** may be included for limiting the movement of the lead screw in a rightward direction. The connection of the switches **92** and **94** is discussed in more detail hereinafter with reference to FIG. **5.**

In FIG. **3** reference characters that are the same as those associated with FIGS. **1** and **2** will be used where appropriate. In the embodiment of FIG. **3** the gear train comprising gears **72, 74** and **78** is essentially replaced by a single worm gear **100.** This worm gear is driven by motor **68** which is suitably supported in the housing on a mounting bracket **102.** Worm gear **100** engages the primary drive gear **80** which may be supported by brackets **86** and **88.** Gear **80** may be supported in substantially the same manner as discussed with reference to FIG. **1** and is rotated by way of the worm gear and motor **68** to drive the lead screw in the same manner as discussed with reference to FIG. **1.** The output shaft of motor **68** to which the worm gear is affixed may be rotated in opposite directions to cause opposite linear movement of the lead screw.

FIG. **4** is a fragmentary view showing another embodiment for the device of this invention. This embodiment includes a reflector **20A** that is preferably constructed of brass. The lead screw **50A** has at least two apertures **50B** and the reflector **20A** rests at the end of lead screw **50A.**

The light source comprises a socket **105** having at least a pair of wings **107.** When the socket is forced into the end of the lead screw, after the reflector has been positioned as shown in FIG. **4,** the wings **107** deflect into apertures **50B** and the reflector, lead screw and light source are connected as a unitary piece. The socket includes an annular ridge **109** for holding the reflector in place.

FIG. **5** is a schematic diagram showing the motor **68** and the input control lines **68A** and **68B.** When power is received on line **68A** the motor goes in the reverse direction and when power is received on line **68B** the motor goes in the forward direction. For the sake of explanation and as it relates to the view shown in FIG. **1,** the forward direction shall be that to the left in FIG. **1** and the reverse direction shall be that to the right in FIG. **1.** The switch contacts **96** and **98** are shown in their normal, non-actuated position.

Assuming that the end of the lead screw is disposed intermediate switches **92** and **94,** then contact **96** is actuated or in its closed position. Contact **98** is not actuated and is also in its closed position. If switch **110** is moved from its middle position, as shown, to the F position, contact **96** remains closed until the lead screw no

longer covers contact **96**. Forward operation then terminates as power is interrupted to line **68B**. Alternatively, when switch **110** is moved to the R position, motor **68** turns in the reverse direction until contact **98** is actuated and opens. At that time reverse movement of the lead screw is interrupted.

The reflector shown in FIGS. **1** and **4** has been shown in a cross sectional view. It has also been considered as being of solid construction. In an alternate embodiment shown in FIG. **6** the reflector **20B** is relieved by means of the slit **20C** provided therein. In this embodiment there is preferably a plurality of such relief slits.

Having described a limited number of embodiments of the present invention, it should now become apparent that there are numerous other embodiments and modifications thereof that may be envisoned and all of which are contemplated as falling within the spirit and scope of this invention. For example, for some applications such as for use in an automobile or boat, the focusing or movement of the reflector may be controlled by a rocker switch located in the positioning handle of the light. Also, the reflector could be constructed or neoprene or teflon impregnated with a reflectant or could be made of stainless steel or chrome plated flexible brass or bronze. Moreover, the reflector could be of the telescoping type comprising different sections, having one section moving relative to another as the reflector is deformed.

What is claimed is:

1. A light of the searchlight type comprising:
- a housing having an opening through which light is transmitted,
- a unitary reflector having a concave reflective surface disposed within said housing with said concave reflective surface facing said opening, said reflector having a thickness that gradually tapers from a greater thickness at the center of the reflector to a lesser thickness at the periphery of the relfector
- means within said housing for moving at least the center of said reflector between opposite positions wherein said reflector has less of a curvature in a first position and a greater curvature in a second position,
- a light source within said housing,
- means within said housing for securing said light source at the center of said reflector so that said light source is movable with at least the center of said reflector,
- means on said housing engageable with the outer periphery of the reflector for limiting the movement of the reflector between the first and second different curvature positions.

2. The light of claim **1** wherein said moving means displaces said reflector in a linear direction.

3. The light of claim **1** wherein said limiting means includes an interlocking bracket associated with said housing and an outer lip of said reflector.

4. The light of claim **1** wherein said reflector assumes a parabolic shape in said second position.

5. The light of claim **1** wherein said means for moving includes a first means engageable with the reflector on the back side of the reflector opposite the light source, and a second means for driving said first means in opposite linear directions.

6. The light of claim **5** wherein said first means includes a lead screw and said second means includes a gear train and drive motor.

7. The light of claim **5** wherein said first means includes a lead screw and said second means includes a worm gear and drive motor.

8. The light of claim **1** wherein said reflector has reliefs therein.

9. The light of claim **1** including switch means operatively associated with said means for moving for limiting the movement thereof in opposite directions.

10. The light of claim **5** including a pair of switches spaced apart and engageable with said first means for controlling and limiting movement of said first means and in turn said reflector.

11. The light of claim **1** wherein said reflector has a central aperture for receiving said light source and positioning said light source on the front side of said reflector.

12. The light of claim **11** wherein said means for moving includes a lead screw and said reflector includes means on its back side for holding an end of said lead screw.

13. The light of claim **12** wherein said means for moving further comprises means for selectively driving said lead screw and means secured within said housing for supporting said driving means.

14. The light of claim **13** including at least one switch disposed within the path of travel of said lead screw and engageable therewith, said switch being coupled to said driving means for interrupting operation thereof when said lead screw has reached one of its limiting positions.

15. The light of claim **14** including a pair of spaced switches both of which couple to said drive means, one of said switches being normally open and the other normally closed.

16. The light of claim **1** wherein said limiting means of the housing includes a bracket having a flange extending in direction of the opening and said reflector has a lip engageable with the flange to limit the position of greatest curvature of the reflector.

17. A light of the searchlight type comprising;
- a housing having an opening through which light is transmitted,
- a curved reflector disposed in said housing,
- a light source positioned at the center of said reflector,
- and means within said housing for moving at least the center of said reflector between opposite positions wherein said reflector has less of a curvature in a first position and a greater curvature in a second position,
- said reflector having a central aperture for receiving said light source and positioning said light source on the front side of said reflector,
- said means for moving at least the center of said reflector including a lead screw and means for selectively driving said lead screw and means secured within said housing for supporting said driving means,
- said reflector including means on its backside for holding an end of said lead screw,
- said means for selectively driving said lead screw including a drive motor and a series of interengageable gears one of which has a central toothed aperture for receiving said lead screw.

18. A light of the search light type comprising;
- a housing having an opening through which the light is transmitted,

a curved reflector disposed in said housing,
a light source positioned at the center of said reflector,
and means within said housing for moving at least the center of said reflector between opposite positions wherein said reflector has less of a curvature in a first position and a greater curvature in a second position,
said reflector having a central aperture for receiving said light source and positioning said light source on the front side of said reflector,
said means for moving at least the center of said reflector including a lead screw and means for selectively driving said lead screw and means secured within said housing for supporting said driving means,
said reflector including means on its backside for holding an end of said lead screw,
said means for selectively driving said lead screw including a drive motor, a worm gear rotated by said drive motor and a drive gear having a central toothed aperture for receiving said lead screw.

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