June 4, 1946. S. UNGER 2,401,390

RETRACTABLE LAMP STRUCTURE

Filed June 26, 1945 2 Sheets-Sheet 1

Fig. 1

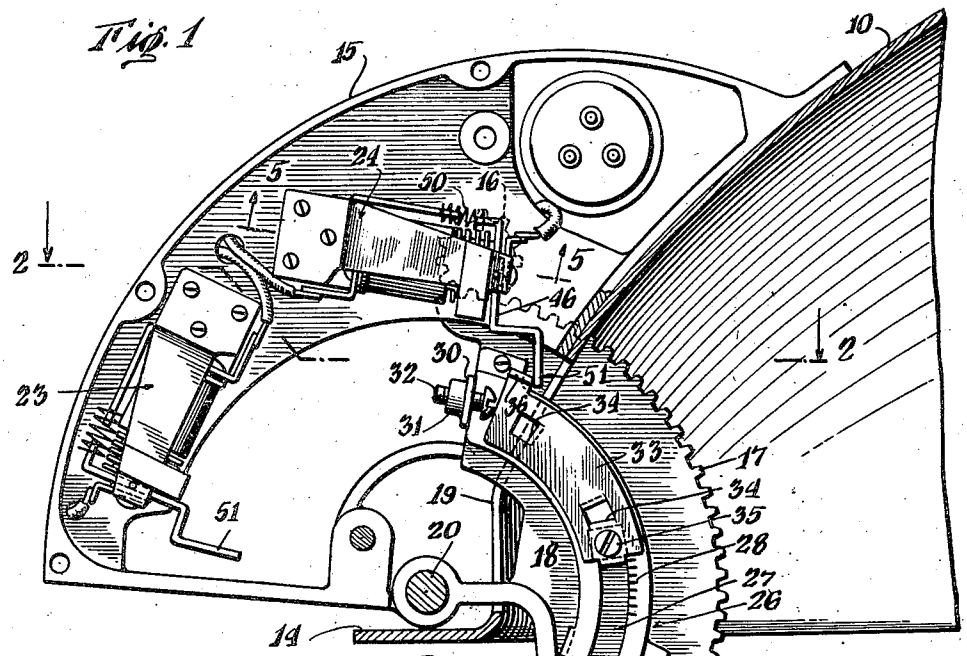


Fig. 3

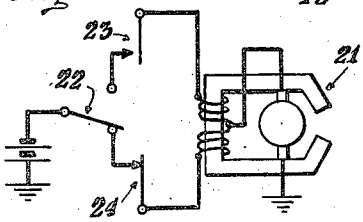


Fig. 2

INVENTOR.
Sidney Unger
BY
Dorsey, Kane & Lucas
ATTORNEYS

June 4, 1946. S. UNGER 2,401,390

RETRACTABLE LAMP STRUCTURE

Filed June 26, 1945 2 Sheets-Sheet 2

Fig. 3

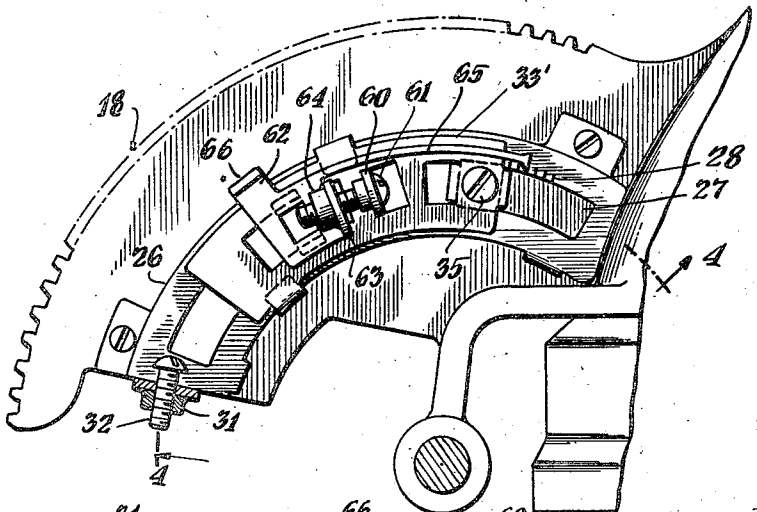


Fig. 4

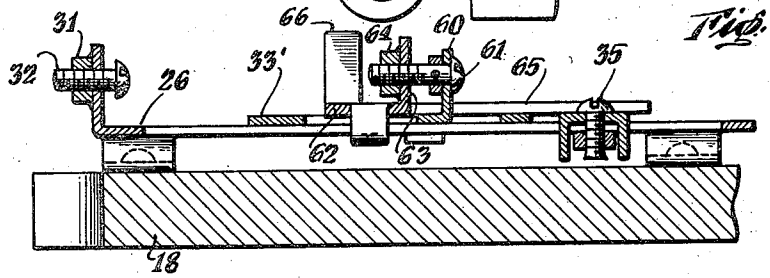


Fig. 7

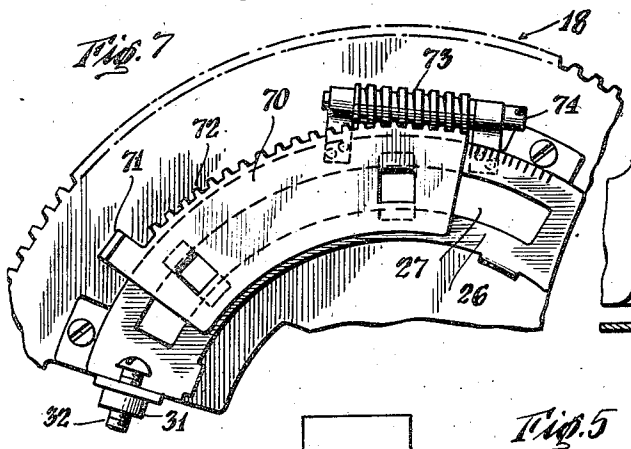


Fig. 6

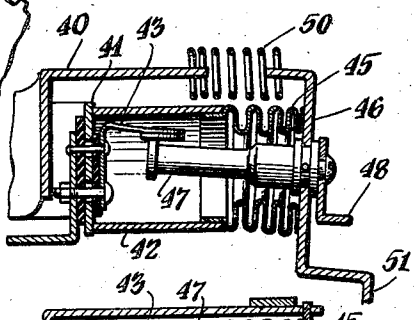


Fig. 5

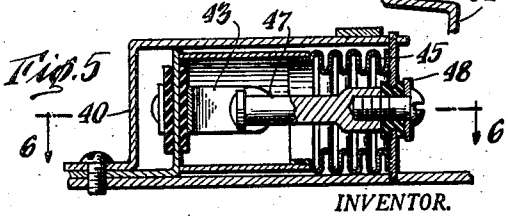
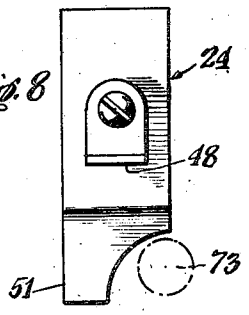


Fig. 8



INVENTOR.

Sidney Unger

BY

Duell, Kane & Smoot

ATTORNEYS

Patented June 4, 1946 2,401,390

UNITED STATES PATENT OFFICE

2,401,390

RETRACTABLE LAMP STRUCTURE

Sidney Unger, New York, N. Y., assignor to E. A. Laboratories, Inc., Brooklyn, N. Y., a corporation of New York

Application June 26, 1945, Serial No. 601,613

7 Claims. (Cl. 240—7.7)

1

This invention relates to retractable lamps, and particularly to improved retractable lamps for aircraft use.

It is a principal object of the invention to provide a retractable lamp having improved means for adjusting the extension and retraction range over which the lamp operates.

It is an object of the invention to provide an improved retractable landing lamp in which adjustment of the extended and retracted positions may be made without removing the lamp from the wing or other structure to which it is secured.

It is another object of the invention to provide a retractable lamp in which the retracted and extended positions are established by stop means which are adjustable without requiring disassembly or dismounting of the lamp.

It is an object of the invention to provide a retractable lamp having improved switch means.

It is a further object of the invention to provide a retractable lamp having limit switch means which are completely protected against gaseous vapors, moisture, and dirt.

The invention has particular application to retractable lamps such as are mounted in the wings of aircraft to serve as landing lamps. Such lamps comprise a casing or housing secured within the wing of the aircraft; said housing pivotally mounts an electric lamp which, usually by means of an electric motor, may be rotated from an inoperative position wherein the lens of the lamp is flush with the under surface of the wing, to a position wherein the lamp extends downwardly to project a forward beam at any desired vertical angle. Such lamps are automatic in their projection and retraction in that under the control of a main pilot-operated switch the motor starts and continues to rotate the lamp until a preset limit point is reached, whereupon a switch actuated by stop means opens the motor circuit. Operation of the manual switch to retract the lamp reverses the motor rotation and withdraws the lamp into the shell, until a second automatic switch again opens the motor circuit upon the complete retraction of the lamp. In the field, it has been found that it is most desirable to be able to adjust the motor cut-off point for the retracted position and the extended position of the lamp. Government specifications, for example, require a range of adjustment for the projected position of the lamps over an arc of from 55 to 80 degrees of lamp rotation from its retracted position.

Previously, it has been necessary to remove the lamp assembly from the wing and to remove a

2

cover plate enclosing the switch housing to adjust the respective projection and retraction stops. This is obviously time consuming and introduces the possibility of accidental damage to the lamp structure or to the connections thereof.

The present invention provides means whereby all necessary adjustments may be accomplished without removal of the lamp from its supporting structure, and without requiring the opening or removing of any cover plate or associated lamp parts. It is only necessary to project the lamp to a suitable extent, whereupon the adjustment means are rendered accessible from without. Adjustment may be accomplished by simply screwing or unscrewing certain screw-threaded elements.

An additional feature of the present invention resides in the completely housed, and correspondingly vapor and corrosion proof, circuit switches which automatically open circuit at the end of the retraction or projection movement. Again using aircraft installation as typical of a wide use of the present invention, it is obvious that a leak in a wing tank or a gas line therefrom may release explosive vapors in the immediate vicinity of the motor switch means. Also, and particularly with sea planes, salt spray may be deflected upwardly into the lamp housing during landing operations. The sparking of the open-contact switches previously used with landing lamps may ignite the explosive vapors; salt spray or water vapor within the switch chamber may corrode the switch contacts and impair the operation of the structure, and sand or grit raised during the landing and takeoff of land planes may foul the contacts.

The retractable lamp of the present invention utilizes an improved completely enclosed switch which is protected against explosive, or corrosive vapors or dirt, thereby eliminating the explosion hazard and the operational deficiencies of the open switch types.

Other features and advantages will hereinafter be described.

In the accompanying drawings:

Fig. 1 is a partial side elevation, in section, of a landing lamp embodying one form of the present invention;

Fig. 2 is a plan section taken on lines 2—2 of Fig. 1;

Fig. 3 is a side elevation of the arcuate gear segment of the lamp, provided with a second form of projection and retraction adjustment means;

Fig. 4 is a section taken on lines 4—4 of the structure of Fig. 3;

Fig. 5 is a plan view, in section, of a preferred form of vapor proof switch;

Fig. 6 is a vertical elevation in section of the said switch;

Fig. 7 is an elevational view showing another form of lamp adjustment device;

Fig. 8 is a front elevation of a form of circuit switch; and

Fig. 9 is a schematic wiring diagram of the motor circuit.

Referring to the drawings, Fig. 1 shows as much of a retractable lamp as is necessary for understanding the present invention. A casing or housing 10, suitably shaped to accommodate the reflector portion 11 of a landing lamp 12, is provided with a peripheral flange 14 by means of which the housing may be affixed within a wing surface or other structural part of an airplane. Rigidly secured to said casing 10 is a switch housing 15, mounted on the further side wall of which is an electric motor (not shown). A gear train driven by the said motor terminates in a pinion 16 which engages with an arcuate rack 17 carried by or formed on the lamp pivot bracket 18 secured to lamp reflector 11 and pivotally mounted for rotation about a fixed pivot 20. Bracket 18 passes freely through an opening 19 provided in the wall of the casing adjacent the periphery thereof.

Fig. 1 shows the lamp 12 in a projected position whereby its light beam will be directed forwardly and downwardly of the wing of the aircraft. A clockwise rotation of the pinion 16 will rotate the lamp structure counterclockwise about its pivot 20, and the lamp 12 may thus be completely withdrawn into its casing 10. The motor is preferably of the well-known reversible field-winding type pursuant to which the motor may be driven in one direction for projection of the lamp and in reverse direction for the retraction thereof.

A typical wiring diagram is schematically shown in Fig. 9. The motor is illustrated at 21 and the switch for controlling the direction of rotation is schematically shown as a single pole double throw switch 22. The main control switch circuit contains the series switches 23, 24, which are fixedly mounted within the switch housing 15. The said switches are normally closed. Switch 24 is in the projection circuit, and when the pilot operates switch 22 to project the lamp from its casing, the current path is through the appropriate position of switch 22, thence through normally closed switch 24 to the field coil which effects rotation of the motor in the desired direction. Switch 23 will go to closed position after the lamp begins its rotation, as later explained, but will not affect the operation of the motor because the pilot operated switch will be open in the reverse-rotation circuit.

Fixed upon the pivot bracket 18 is an arcuate index plate 26 having an elongate slot 27 therein; and inscribed on the face of said plate are graduations 28 establishing a means of arcuate measurement over a range of from, say, 50 to 85 degrees of rotation of the lamp 11. One end of said plate 26 has an ear 30 fixed to which is a stop nut 31 such as is known in the trade as an "elastic stop nut." Cooperating with the stop nut 31 is a machine screw 32 which engages a switch member at the desired retraction position to open the motor circuit.

Fixed to the index 26 for slidable adjustment therealong is an arcuate plate 33, downwardly

struck tabs 34 of which ride within the slot 27 of index 26 to guide the movement of plate 33. A screw 35 engages a nut (not shown) slidably disposed behind the index plate 26 and affords means whereby the plate 33 may be locked against movement with respect to the index 26. The graduations 28 are read against forward edge of plate 33 and show the angular adjustment of the plate 33. At the rear end of plate 33 there is a lug 36 which engages with the operating member of switch 24 to open the motor circuit and halt further projection of the lamp.

In Figs. 5 and 6 are shown detailed views of the switches 23 and 24, it being understood that the respective switches are identical in operation. Each switch includes a frame portion 40 to be fixed to the housing. The frame carries on a bracket 41, and in gas and vapor-proof engagement, an imperforate cylindrical housing 42 within which is supported a contact spring member 43, suitably insulated from the bracket. At the opposite end of housing 42 there is secured a tubular metallic bellows 45 in gas and fluid-tight relationship therewith. Soldered to the bellows and pivotally carried upon the frame 40 is a switch actuating arm 46 insulatedly carrying a contact bar 47 which extends into the chamber 44. The bar 47 and the spring contact 43 are preferably provided with silver or other suitable contacts which are of adequate current carrying capacity.

A soldering lug 48 is electrically connected to the contact post 47. Spring means 50, carried by the frame 40 and bearing against the lever 46, urges the said lever clockwise about its said pivot, whereupon the respective contacting elements of the contact means 43 and 47 are brought into engagement, the spring contact 43 yielding under the pressure exerted by the contact rod 47 and wiping across the contact element of the rod 47 as the circuit is made or broken.

The bellows 45 provides an impervious flexible neck or joint which permits free movement of rod 47 without exposing the interior contacts to external atmospheric conditions. The housing 42 may be charged with a suitable pressure of nitrogen or other inert gas, or evacuated to a suitable sub-atmospheric pressure.

The switch actuator 46 terminates in an arm 51; as shown in Fig. 1 the arm 51 of switch 23 is in the path of rotation of the screw 32, whereas in switch 24 it is in the path of rotation of the abutment 36. In Fig. 1, the lamp 12 has been projected sufficiently for the lug 36 to rotate the switch actuator 46 sufficiently against the bias of spring 50 to disengage the contact members 47 and 43, thereby opening the motor circuit and stopping the drive thereof.

When the pilot actuates his control switch to withdraw the lamp into the casing 10, the motor will continue operation until the tip of the screw 32 strikes the arm 51 and rotates the actuator 46 sufficiently to break the circuit within the enclosure of the switch 23.

Arm 51 of switch 24 acts as a safety stop to prevent bracket 18 from being rotated so far that its rack 17 would disengage from or bind upon the pinion 16, as might occur if the motor were removed and the lamp 12 permitted freely to rotate about pivot 20 by reason of its own weight.

In making adjustments of the Fig. 1 embodiment, the lamp may be actuated to bring it into approximately the projected position shown. The opening 19 provided in the casing 10 is adequate to permit the mechanic to insert a screw driver and

to turn the screw 32 in whichever direction is appropriate to the desired adjustment. The screw 35 is likewise conveniently accessible for a screw driver, wrench or the like, and upon loosening the said screw, the plate 33 may be manipulated upon the index plate 26 until the desired angular position is attained, as indicated by the graduations 28. Adjustment range provided by the screw 32 is a matter of a few degrees only because the retracted position of the lamp does not permit the wide limit of adjustment desirable and attainable with plate 33.

In the embodiment of Fig. 3, the pivot bracket 18 and arcuate index plate 26 may be identical with those described with respect to Fig. 1. The said plate 26 carries the stop nut and therewith associated screw 32, also as previously described.

The index plate 26 carries, for adjustment along the surface thereof, a plate 33', the forward edge of said plate serving to register with the graduations 28 provided on the member 26. A screw 35 serves to retain plate 33' in its adjusted position.

Plate 33' has, intermediate its end, a lug 60 within which is rotatably carried a screw 61. A stop plate 62 is mounted for guided slidable movement upon the plate 33', and has an ear 63 to which is affixed a nut 64 for cooperation with the screw 61. A lug 66 is the counterpart of the lug 36 of the Fig. 1 embodiment, and engages with the arm 51 of the switch 24 when the lamp approaches its fully extended position.

The advantage of the Fig. 3 embodiment is that a micrometric adjustment of the position of the lug 66 is afforded, and such adjustment requires the use only of a screw driver. When it is desired to adjust the effective position of lug 66, the lamp is rotated so that it is brought to substantially fully open position, whereupon the screw 61 will be available, within the confines of the casing 10, for manipulation by the mechanic. The plate 33' is presumed to have been set at the approximate point desired, say sixty degrees, whereupon adjustment of lug 66 may be made plus or minus a one or two degree range. In order for the mechanic to gauge the extent of his adjustment, the member 62 has a forwardly extending index arm 65 the end of which overlies the graduations 28 and thus shows the effective angular operating position of the lug 66. The presence of the screw 61 and its associated structure does not prevent access to or adjustment of the screw 32, the head of which may be reached through opening 52 as previously noted.

Fig. 7 shows yet another form of adjustment for the extension range of the lamp. It is convenient to mount the graduated plate 26 on the bracket 18 although the side wall of the bracket may be graduated, if desired. When plate 26 is used, it is preferable to use it as a means of slidably securing a plate 70 which carries at one end the lug 71 which is engageable with the switch 24. The plate 70 is provided with rack teeth 72, cooperating with which is a worm 73, mounted for rotation on the bracket 18, and having a head 74 provided with a screw driver slot. In this embodiment, movement of the lamp to its projected or Fig. 1 position will bring the head of the worm 73 into easily accessible position, and the mechanic by suitable rotation of the worm causes the member 70 to move with respect to bracket 18 to the desired angular position.

In apparatus embodying the Fig. 7 adjustment means, the arm 51 may be configurated as necessary to clear the worm 73, as suggested in Fig. 8.

It is apparent from the above, therefore, that the present invention provides for an adjustable retractable lamp having improved adjustment facilities and efficient control switch means.

It is to be understood that the invention is applicable to many uses other than as an airplane landing lamp and the specification therefore is not to be interpreted in a limiting sense. Also, it should be borne in mind that switch housing is intended to be merely generally descriptive of any fixed casing or housing within which the motor-switches and associated mechanism are located.

Whereas it is obvious that among others the several objects of the invention as specifically afore noted are achieved, it is apparent that numerous changes in construction and rearrangements of the parts might be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. In a retractable lamp having a casing provided with a relatively large opening in its wall adjacent a marginal edge thereof, a housing secured thereto, a lamp normally within said casing, a lamp-supporting bracket rotatably mounted upon said housing and securing said lamp, said bracket extending through the opening of said casing and affording means whereby said lamp may be rotated to be projected from and retracted into said casing, and means including an electric circuit for effecting desired rotation of said bracket: a pair of switches in said circuit and fixedly disposed within said housing respectively at the opposite extremes of rotation of said bracket; actuator means for each said switch for operating the same to open or closed circuit status; screw means fixed to said bracket and arranged to engage with one of said switch actuator means upon rotation of the bracket in one direction; a relatively long plate mounted on said bracket for movement therealong, said plate and said bracket being adjustably secured to each other at the end of said plate adjacent said casing, said plate having at its opposite end means for engaging the other of said switch actuator means upon rotation of the bracket in the opposite direction; said screw means and said plate securement means each being accessible for adjustment through said casing opening.

2. Apparatus according to claim 1, in which the second-named bracket-carried means comprises a pair of mutually adjustable members, one of which is provided with the switch actuator engaging means.

3. Apparatus according to claim 1, in which the second-named bracket-carried means is provided with gear teeth and said bracket carries a worm gear in engagement with said teeth for adjusting said means with respect to said bracket.

4. In a retractable lamp having a casing provided with an opening in its wall, lamp means pivotally mounted for projection from and retraction within said casing and electric motor means for rotating the lamp about its pivot: a switch housing fixed to said lamp casing; a plurality of switch means secured within said housing and electrically in circuit with said motor means; switch actuator means comprising an arm individual to each switch means for operating the same to open or closed circuit status; a member secured to said lamp means for rotation therewith; screw-threaded means secured to said member and adjustable with respect thereto for engagement with one switch arm for operation of said switch at a point approaching one extreme

of movement of said lamp; and an assembly supported upon said member for operating another of said switch means at a point approaching the other extreme of movement of said lamp, including a switch operator for engagement with the arm of said other switch; a mounting for said operator; means carried by said mounting for adjustably positioning said operator for relatively fine-scale adjustment with respect to its associated switch arm; and means for adjustably positioning said assembly on said member for relatively coarse adjustment of said switch operator with respect to said switch arm; each said switch arm engagement means and said assembly being accessible for adjustment through the opening in said casing.

5. In a retractable lamp having a casing provided with an opening through the wall thereof adjacent its periphery, a lamp pivotally mounted for projection from and retraction into said casing, and electro-motor means for rotating the lamp about its pivot: a structure fixed to said casing; a pair of switch means secured to said structure and electrically in circuit with said motor means, each switch means having an actuator arm for operating the switch to open or closed circuit status; a bracket member secured to said lamp means for rotation therewith; a screw secured to said member for adjustable engagement with one switch arm for switch actuation at a point approaching the desired retracted position of the lamp; a second switch actuating means including a lug for operating engagement with the arm of the second of said switches at a point approaching the desired projected position of the lamp; a carrier plate for said lug, said plate being mounted on said bracket member for movement therealong; means for adjusting the position of said lug relative to said switch for fine-scale adjustment with respect thereto; and means for adjustably positioning said carrier plate along said bracket member for relatively coarse adjustment of said lug with respect to said switch, each said switch arm engaging means being accessible for adjustment through said casing wall opening.

6. In a retractable lamp having a casing, a lamp pivotally mounted for projection from and retraction into said casing and electro-motor means for rotating the lamp about its pivot: an

arcuate member secured to said lamp means for rotation therewith; a pair of switch means in circuit with said electro-motor for controlling the operation thereof at the desired limitation of projection or retraction of said lamp, said switch means having actuator arms; means carried by and adjustable with respect to said arcuate member for engagement with one switch arm for switch actuation at a point approaching one desired extreme of movement of the lamp; a plate secured to and guided for movement along said arcuate member, said plate having gear teeth provided thereon; a cooperating gear structure fixed to said arcuate member and engageable with the gear teeth of said plate for shifting the latter with respect to said arcuate member; and means on said plate for actuating the switch arm of another of said switches upon rotation of said arcuate member for a distance approaching the other desired extreme of movement of said lamp.

7. In a retractable lamp having a casing provided with a wall opening adjacent a marginal edge, a housing secured thereto, a lamp, an arcuate bracket pivotally mounted on said housing and fixed to said lamp, said bracket extending through said casing opening and providing means whereby said lamp may be retracted into or projected from said casing, and reversible electric motor means within said casing for rotating said bracket in clockwise or counter-clockwise direction: a pair of switches fixed within said housing and respectively controlling forward or reverse movement of said motor, means on said bracket for operating a switch to open or closed circuit position; an adjustment device for said switch operator, and accessible through the opening in said casing wall when said lamp is in projected position; and a second switch operator for the other of said switches, said second switch operator including an elongate member slidably mounted on said arcuate bracket, said elongate member being accessible through said wall opening for manually moving said member into desired position on said bracket, and means accessible through said opening with said lamp in projected position to secure said member to said bracket in fixed position relative thereto.

SIDNEY UNGER.