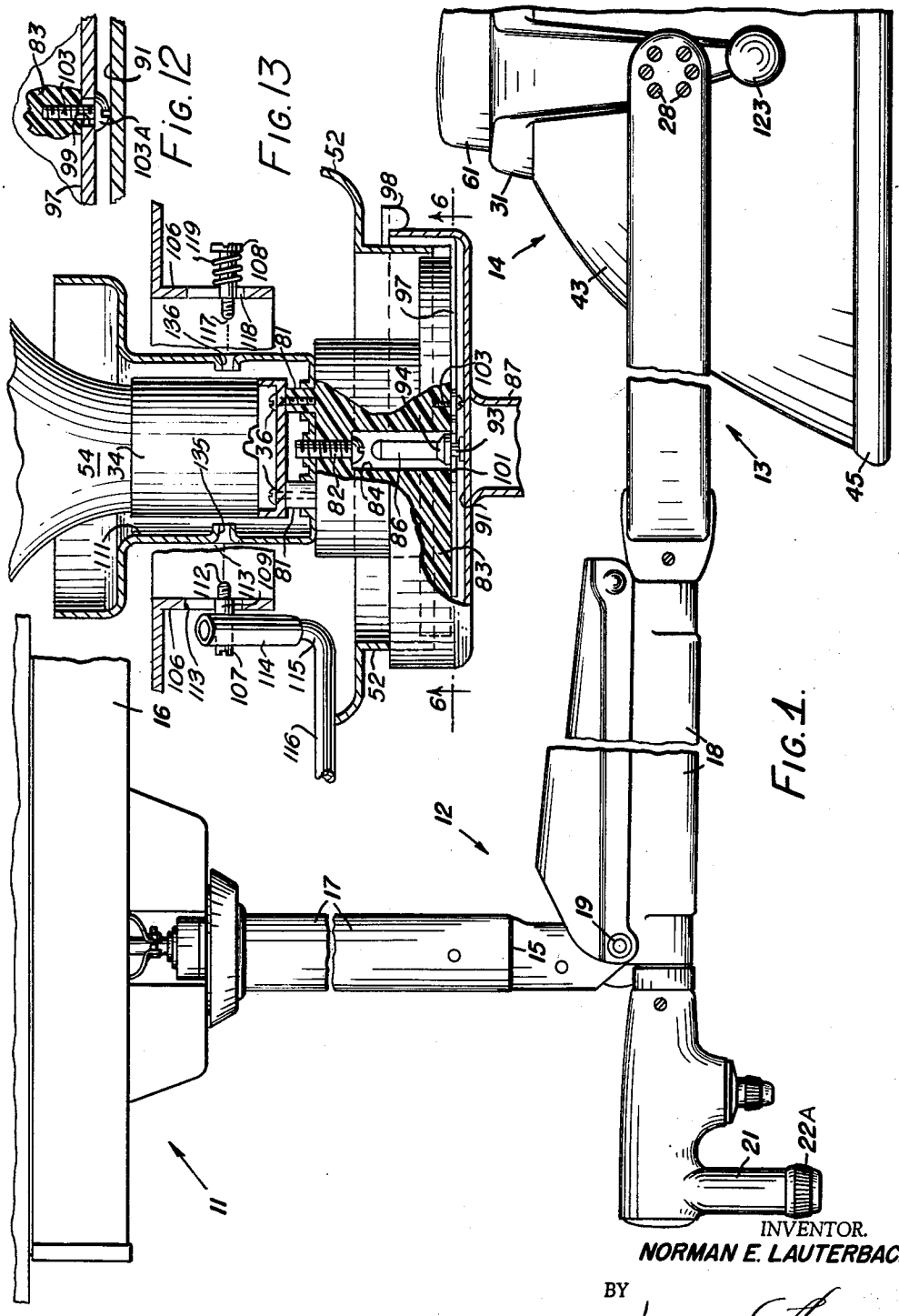
Jan. 22, 1963 N. E. LAUTERBACH 3,075,071

STERILIZABLE FOCUSING MEANS FOR SURGICAL LIGHTS

Filed Sept. 4, 1958 4 Sheets-Sheet 1



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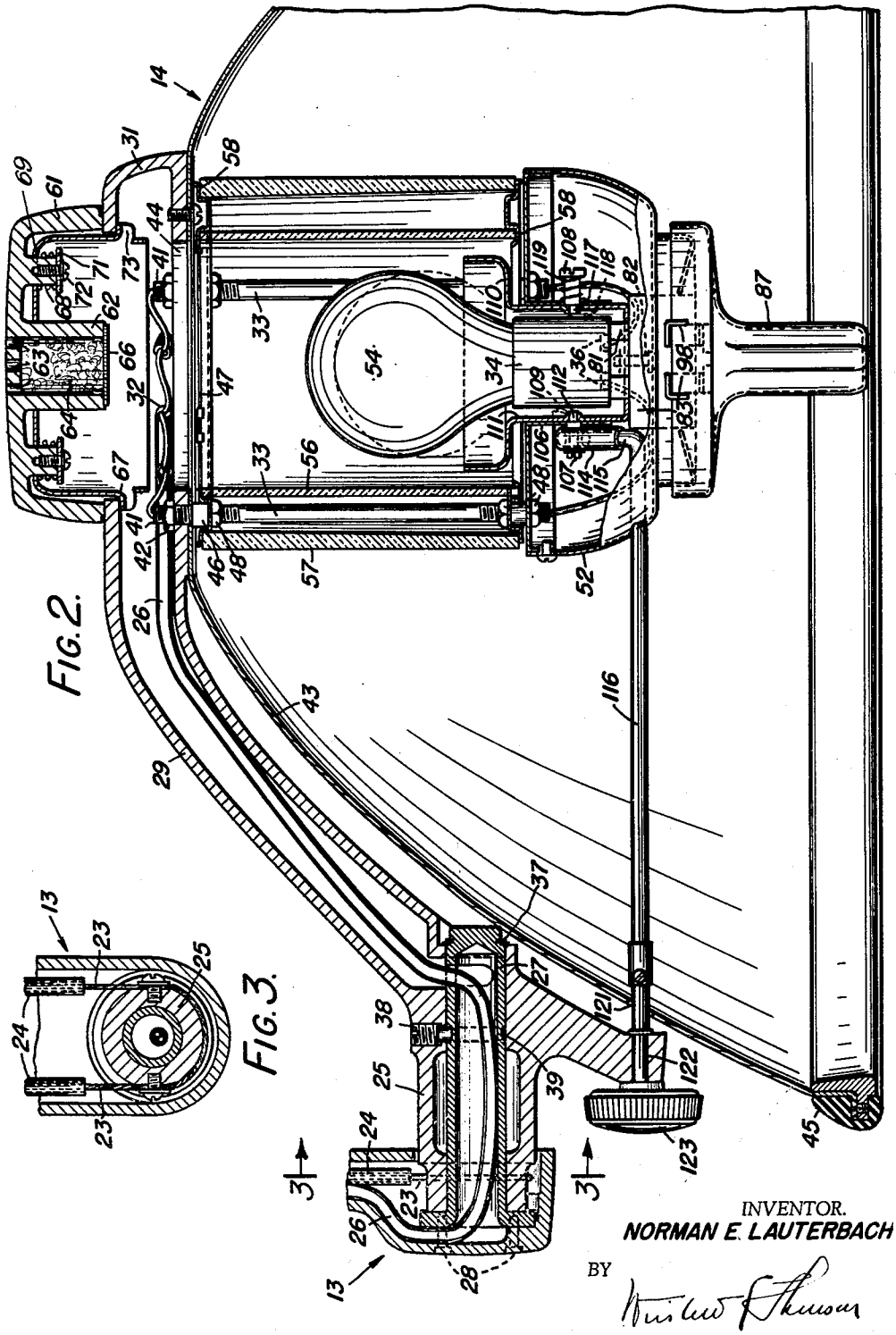


FIG. 2.

FIG. 3.

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STERILIZABLE FOCUSING MEANS FOR SURGICAL LIGHTS

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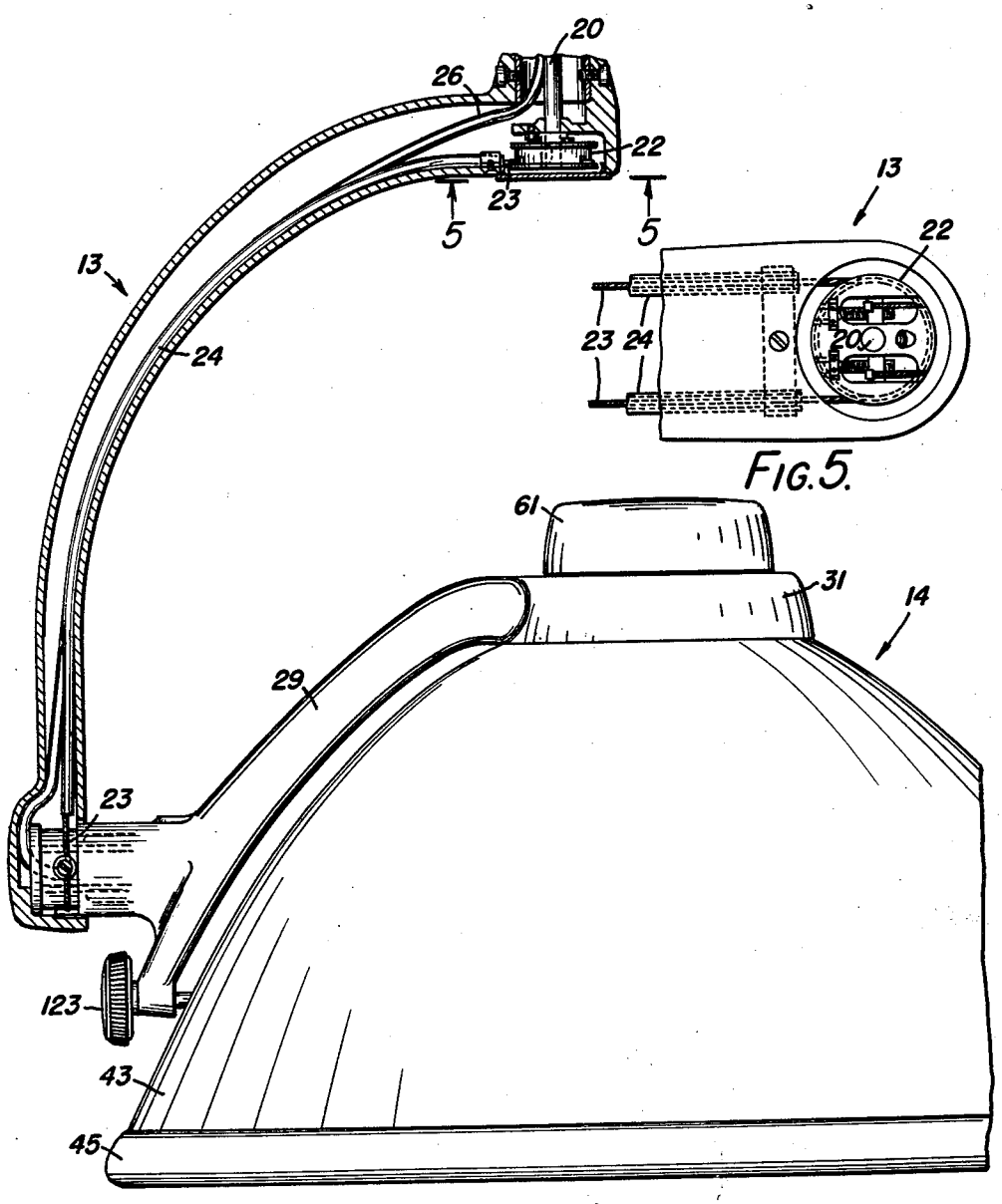


FIG. 5.

FIG. 4.

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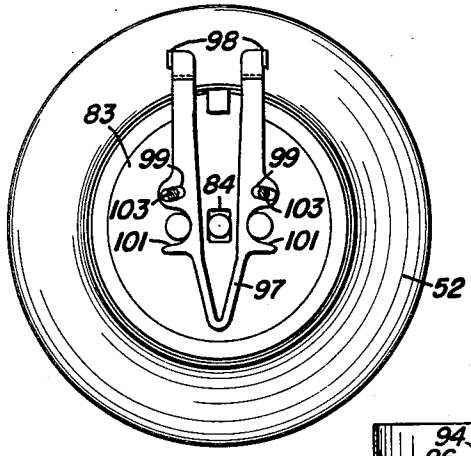


FIG. 6.

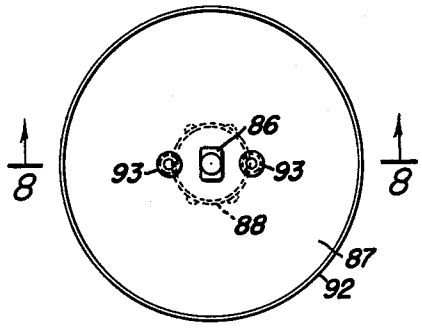


FIG. 7.

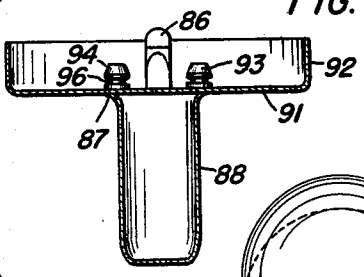


FIG. 8.

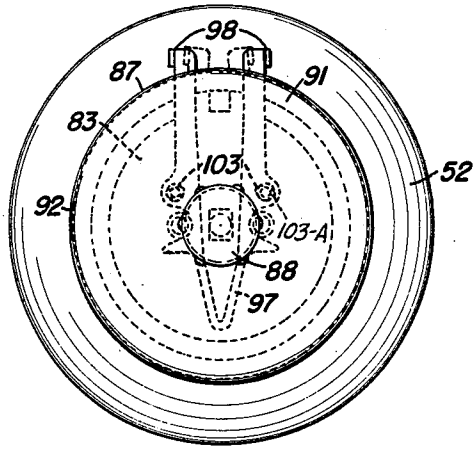


FIG. 9.

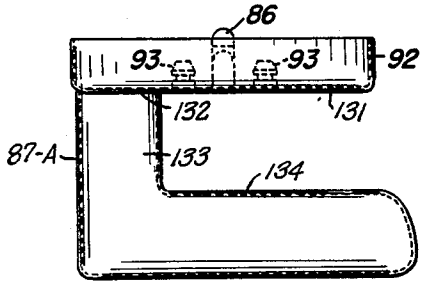


FIG. 10.

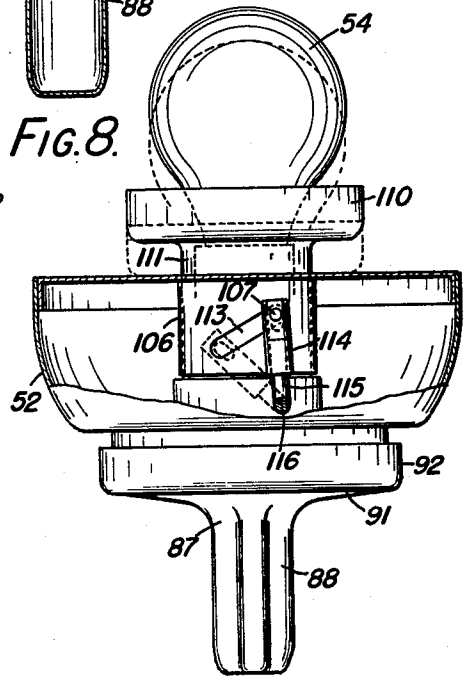


FIG. 11.

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3,075,071

STERILIZABLE FOCUSING MEANS FOR SURGICAL LIGHTS

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Filed Sept. 4, 1958, Ser. No. 758,938
7 Claims. (Cl. 240—1.4)

This invention relates to surgical lights and is more particularly concerned with a removable sterilizable means for manually adjusting the position of the reflector and for focusing the light.

An object of my invention is to provide a surgical light which is versatile in its operation so as to be readily adjustable to focus the light beam as desired by the surgeon.

Another object of my invention is to provide a surgical light which is substantially universally adjustable by means of a removable sterilizable handle extending along the axis of the light source.

A further object of my invention is to provide means for moving the light source toward and from the reflector to focus the light in accordance with the necessities of the particular operation being performed by the surgeon.

More specifically, my invention contemplates a universally adjustable surgical light in which a single removable and sterilizable handle is located along the axis of the light source and may be used both to adjust the direction in which the rays from the light source are reflected and is capable of movement so as to shift the light source toward and away from the reflector to thereby adjust the focus of the light in accordance with the requirements of the particular operation being performed by the surgeon.

Other objects and advantages of my invention will be set forth in the claims and will be apparent from the following description, when taken in connection with the accompanying drawings, in which:

FIG. 1 is an external general assembly view of the surgical light of my invention in which only part of the reflector has been shown;

FIG. 2 is a vertical sectional view through the reflector and associated parts only part of the reflector having been shown;

FIG. 3 is a sectional view taken substantially on the line 3—3 of FIG. 2 in the direction indicated by the arrows;

FIG. 4 is a view partly in section showing the partial yoke;

FIG. 5 is a view taken substantially on the line 5—5 of FIG. 4;

FIG. 6 is a view taken on the line 6—6 of FIG. 12 looking in the direction indicated by the arrows;

FIG. 7 is a top plan view of the handle per se;

FIG. 8 is a sectional view taken substantially on line 8—8 of FIG. 7 in the direction indicated by the arrows;

FIG. 9 is a bottom view similar to FIG. 6 illustrating the lower part of the light assembly, parts thereof being shown in dotted lines;

FIG. 10 is an alternate form of handle which may be employed;

FIG. 11 is a view showing the means for focusing the light;

FIG. 12 is an enlarged sectional view of the circled portion of FIG. 13; and

FIG. 13 is an enlarged view of a portion of FIG. 2 with parts broken away and parts removed, and the handle 87 and spring member 97 turned 90° for purposes of illustration.

The surgical light of my invention is employed directly over the operating table and, although it may be mounted

in fixed position, is preferably adjustably mounted on a rail assembly, designated generally by the numeral 11. The rail assembly carries a counterbalancing and an adjustment arm generally indicated by the numeral 12, and a partial yoke, generally indicated by the numeral 13, which in turn carries a reflector and light assembly, generally indicated by the numeral 14.

A separate application entitled "Supporting Mechanism for Surgical Operating Lights," Serial No. 793,584, filed February 16, 1959, of which I am the inventor, describes the general elements above enumerated and these will therefore be but briefly described herein. This invention is primarily concerned with the reflector and light assembly generally indicated by the numeral 14.

For the purposes of this application, it is sufficient to describe the rail assembly as including a pair of rails which are hidden in FIG. 1 by a partial enclosure 16, a depending tubular support 17 which carries rollers (not shown) adapted to ride along the rails. Usually the surgical lights with which this invention is concerned are mounted in parallel so that two sets of rail assemblies are provided. This arrangement enables the surgeon either to cover a wider area of the patient being operated upon or to intensify the light on a particular area of the patient's body.

The rail assembly also includes electrical connections which extend downward through the tubular support 17, the upper ends of which are connected to copper bus bars (not shown). The counterbalance assembly 12 includes a tubular member 18 pivoted to the lower end of the tubular member 17 as indicated at 19. The tubular support 17 is actually in two parts telescopically fitted and pinned together adjacent 15. The tubular support 17 is rotatable with respect to its support.

A handle 21 having a knurled and rotatable lower end 22–A is connected by bevel gearing in the handle to a shaft 20 (FIG. 4). Upon swinging the handle 21 the light assembly may be swung about the tubular member 18 as an axis.

The shaft 20 has a pulley or drum 22 mounted on the end thereof and rigidly secured thereto. Wrapped around the pulley 22 and secured thereto are the ends of a cable 23 (FIGS. 4 and 5) enclosed within a wear protecting sheating 24. The manner in which the ends of the cable are fixed to the drum has been shown in FIG. 5. The center of the cable 23 extends outward from the sheathing and is wrapped around and fixed to a cylindrical extension 25 (FIG. 2). The electrical connections 26 are sheathed and extend through the tubular member 18 and through the partial yoke as shown in FIG. 4.

As shown in FIG. 2, a sleeve 27 is fixed with respect to the partial yoke 13 by means of screws 28. The electrical connections extend through the sleeve, outward through an opening therein, as shown, and through a hollow support arm 29. The support arm 29 is enlarged at the top of the light to form a dome-like member 31 (FIG. 4). In the dome-like member 31 the electrical connections 26 are branched, as shown at 32, and extend downward through tubular posts 33 and are attached to the base of a light socket 34 as shown by screws 36.

The sleeve 27 has a snap ring 37 and a set screw 38, to hold it in position endwise. The end of the screw 38 rotates in a slot 39. It will now be appreciated that as the rotatable lower end 22–A of handle 21 is rotated, through the cable 23 above described, the entire light assembly is rotated by the support arm 29, the parts rotating on the sleeve 27.

The ends of the tubular posts 33 are threaded for reception in the dome-like casting 31 as shown at 41. Nuts 42 are threaded on the posts holding the parts in assembled relation with the lighting unit suspended therefrom. A reflector 43, somewhat elliptical in shape, is open at

its upper center to correspond with an opening 44 in the dome-like casting 31 and is supported by the tubular posts 33 as shown at 46. The bottom of the reflector is open and its edge is provided with a protective rubber or plastic ring 45 which covers the flanged lip of the reflector shell and an extruded, rolled butt welded aluminum protective ring to maintain rigidity of the reflector contour. The posts also carry upper and lower sheet metal annular locating rings 47, nuts 48 being provided to hold the sheet metal locating rings 47 in position.

The lower ends of the posts are adapted in addition to support a shell 52. These parts are held in position by the nuts 48 threaded on the posts. The shell 52 may be made of sheet metal in a single piece or in two pieces as shown in the drawings. The light source 54 mounted in the socket 34 is enclosed by two lenses 56 and 57. The lens 56 may be in two or more separate parts to allow for expansion and contraction due to heat from the light source. The vertically split lens sections forming the lens 56 define a substantially cylindrical enclosure extending around the light source. The lens 57 is of special glass to control heat and provide for color correction to provide light substantially the equivalent of daylight. The lenses 56 and 57 are held in spaced relation by forming the sheet metal locating rings 47 with annular sockets, such as shown at 58, for the reception of the ends of the lenses.

The upper part of the light has a removable cap 61 which is substantially cup shaped and provided with a cylindrical centrally located boss 62. The cap has openings 63 for the dissipation of heat. The cylindrical boss contains steel wool 64 to filter out dust and the lower end thereof is closed by a screen 66 held in position in any suitable manner. A cup shaped sheet metal member 67 is resiliently carried by springs 68 on bosses 69 provided in the cap 61. Washers 71 serve as a backing for the springs 68, the parts being held in position by screws 72. The sheet metal cup shaped member 67 is provided with bayonet projections 73 which register with corresponding parts on the periphery of the annular opening in the top of the dome shaped casting 31. By the above arrangement heat generated by the light source is partially dissipated through the openings 63 and the spring connections 68 permit expansion and contraction of the parts and resiliently hold the cap 61 in position.

Secured to the underside of the light socket 34 and having openings receiving screws 36 are members 81 of insulating material enabling the wiring leads 26 to be attached to the light socket members 81 are integral with a disc-like support member 83 of insulating material which is fixed by means of a screw 82 to a depending sleeve part 111 of a light shield 110.

Referring now to FIGS. 6 through 9 inclusive and 13, the insulating member 83 has an opening 84 centrally located with respect thereto adapted to receive a locating pin 86 fixed to a cup shaped handle member 87. The locating pin 86 is rounded at its upper end so that it may be readily received in the opening 84. The cup shaped handle includes a hand grip 88, a preferably flat wall part 91 and a cylindrical flange 92. Carried by the flat wall 91 of the handle 87 are two projecting latch elements or connecting members 93 which have conical portions 94 and annular recesses 96 defining shoulders. It will be noted that the handle is spaced from the shell and the insulating disc 83 is interposed between them so that the handle remains relatively cool.

A hairpin shaped spring latch or connecting member 97 has downwardly extending finger pieces 98 (FIG. 2), slots 99 (FIG. 6) and recessed portions 101 adapted to receive the pins or projections 93 (FIG. 8), the recessed portions 96 and shoulders thereby defined of the latch elements 93 being adapted to be embraced by the recessed portions 101 of the spring 97. The slots 99 are adapted to receive pins 103 (FIG. 6) fixed on the lower face of the insulating disc 83, these pins also serving to support the spring by means of flanges 103A shown in broken lines in FIG. 9. FIG. 12 illustrates in section the manner in which spring 97 is retained on insulating pad 83 by the flange 103A of pin 103. As shown most clearly in FIG. 9 the finger pieces 98 of the spring project beyond the flange of the handle to enable their finger operation.

Upon reference to FIGS. 6, 8, 9 and 12, it will be appreciated that with the parts in the position of FIG. 9, the handle 87 is locked in position by the pin embracing parts 101 of the spring which, as previously stated, is carried by the insulating disc 83. By pressing upon the finger pieces 98 with the thumb and forefinger, the slots 99 may be shifted with respect to the pins 103 so as to release the spring member 97 from engagement in the margins of the recesses 96 thus permitting removal of the handle 87.

As above described and as appears from FIG. 2, the handle 87 is located on the axis of the light source 54 and the reflector. Since all of the elements including the reflector, the light source and the parts associated therewith may be rotated on the sleeve 27, the entire unit may be pivoted about the sleeve 27 as an axis. Moreover, the entire lighting unit may be pivoted about the axis of tubular member 18. In addition, the lighting unit may be swung upward and downward about the pivot 19 or rotated about the axis of the depending tubular member 17. All of these movements may be accomplished by the surgeon from his operating position below the light. These same movements may be accomplished by an attendant to the surgeon by operation of the handle 21 and the knurled end 22–A thereof. Since the handpiece 87 is located on the axis of the field of illumination it is a simple matter for the operating surgeon to swing the lighting unit to illuminate the field he may desire. Moreover, it is possible for him or an attendant to remove the handle 87 easily and quickly for purposes of sterilization upon releasing the spring 97.

In FIG. 10 I have shown an alternative form of the handle 87 which is generally designated by the numeral 87–*a*. In this embodiment, the handle is not located on the axis of the light source and the reflector. The handle may be secured to the bottom wall 131, as shown at 132, and is provided with a downwardly extending part 133 and a part 134 which extends preferably at a right angle to the part 133. The cooperation between the elements of the handle and the spring 97 is the same as in the preferred embodiment.

Referring now to FIGS. 2, 11, and 13 the shell 52 has a depending sleeve part 106 which has openings or slots 113 and 118 therein at opposite sides thereof for the reception of screws or pins 107 and 108 respectively. The light shield 110 has the depending sleeve part 111 slidable in 106. The screw 107 has a bearing part 109 seated in the margin or the opening or slot 113 in the sleeve 106. The innermost end 112 of the screw 107 registers with a hole 135 in the sleeve 111. The slot 113 extends angularly in an upward direction as shown in FIG. 11. A sleeve 114 is adapted to receive the bent end 115 of a rod 116 and the screw 107 extends through the sleeve 114. The bent end of the rod serves as a stop and the upper end of the sleeve also serves as a stop thus providing a lost motion connection between the screw 107 and the rod 116.

The screw 108 registers with a slot 118 similar to the slot 113 and its end 117 is threaded into a hole 136 in the sleeve 111. The spring 119 provides sufficient friction between the parts so that the screws or pins 107 and 108 will frictionally engage in the slots 113 and 118 and remain in an adjusted position.

The rod 116 extends through the wall of the reflector 43, as shown at 121, and is journaled in a bore 122 in the support arm 29. The projecting end of the rod 116 is provided with a knurled finger piece 123 for rotating the rod 116.

It will now be understood, when the spring **97** is locked with respect to the projections **93** (as in FIG. 9), that rotation of the handle **87** will rotate the insulating disc **83**, the light socket **34**, light source **54** and the light shield **110**. This rotation, due to the fact that the screw ends **112** and **117** (FIG. 2) register with the slots **113** and **118** (see slot **113**, FIG. 11), will cause the entire unit above set forth to be raised or lowered depending upon the direction of rotation of the handle **87**. This operation is shown by the relative dotted and solid line positions of the parts in FIG. 11. Rotation of the rod **116** (FIG. 2) through the finger piece **123** will have the same effect as rotating the handle **87**.

It will now be appreciated that the focus of the light may be varied so as to increase the intense field of illumination. With the particular light shown the intense field of illumination may be varied from approximately a six inch field when the light source is in its raised position to a ten inch field when the light source is lowered to the dotted line position of FIG. 11. Moreover, the light intenstiy of the field illuminated is increased when the light source is in its uppermost position and decreased when the light source is in its lowered position.

By means of the handle **87**, two important functions may be accomplished by the surgeon assuming he has one hand free. He may adjust the field of illumination by gripping the handle **87** and rotating the light as desired on the various axes above described. In addition, he may vary the focus of the light to vary the field of intense illumination and the light intensity of the field illuminated by rotating the handle **87**. The same functions may be accomplished by an attendant by means of the handle **21—22–A** and the finger piece **123**. At any time the handle may be removed for sterilization by pressing inward on the finger piece ends **98** of the spring **97**. When the handle **87** is to be replaced with respect to the lighting unit after sterlization, the conical parts **94** of the projecting latch elements **93** will cam the spring arms of the spring **97** aside without pressing the finger parts **98** together. Thus the handle may be replaced on the lighting unit with a minimum of effort.

While I have shown and described the preferred forms of my invention, it will be apparent that various changes and modifications may be made therein, particularly in the form and relation of the parts, without departing from the spirit of my invention as set forth in the appended claims.

I claim:

1. A surgical light comprising, in combination, a reflector, a light source mounted in said reflector, a support for said reflector providing at least partial universal movement thereof to adjust the light source and reflector and change the field of operation illuminated in accordance with the requirements of the operator, actuating means approximately on the focal axis of the reflector connected to the light source for moving the light source toward and away from the reflector to vary the focus, manually operated handle means for operating said actuating means, at least one connecting member carried by one of said means and having a latch engaging portion projecting from one of said means and the other of said means receiving said member and being provided with a latch member engageable with said portion, one of said members being resiliently urged into a position in which said portion and said latch member are in locking engagement and being movable to a position in which said members are disengaged.

2. A surgical light in accordance with claim 1 in which one of said members comprises a finger compressible spring and in which said members are constructed to lock said means against rotation with respect to each other.

3. A surgical light in accordance with claim 1 in which one of said members comprises a hairpin shaped finger compressible spring, and the other of said members comprises two spaced pins, each of said pins having a recess adapted to receive a side of said hairpin spring, said recesses cooperating to receive opposite sides of said spring in locking relationship.

4. A surgical light comprising, in combination, a reflector having a depending rim, a support for said reflector providing at least partial universal movement, a light source within the reflector along substantially the focal axis thereof, actuating means approximately on the focal axis of the reflector connected to said light source for moving the light source toward and away from the reflector to vary the focus, detachable sterilizable handle means, a finger compressible spring member mounted on one of said means and at least one projection member having a shoulder portion and mounted to the other of said means, said spring releasably embracing said shoulder portion for releasably latching said handle to said actuating means to enable quick removal of the handle for purposes of sterlizing the handle.

5. A surgical light in accordance with claim 4 including a second projection member being spaced from the first mentioned projection member, each projection member having a shoulder disposed to face each other, and in which said spring member is of hairpin configuration adapted to be received intermediate said projection members and on said shoulders.

6. A surgical light in accordance with claim 4 in which said actuating means comprises a depending member rigidly connected to said light source and depending below said light source, a stationary member connected to said reflector and mounted parallel to said depending member, an angularly extending slot in one of said depending and stationary members and a pin slidably received in said slot, said pin being connected to the other of said stationary and depending members.

7. A surgical light in accordance with claim 4 in which one of said means has a pilot pin and the other of said means has a socket for the reception of said pilot pin to guide said handle means during the locking of said spring member to said projection member.

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