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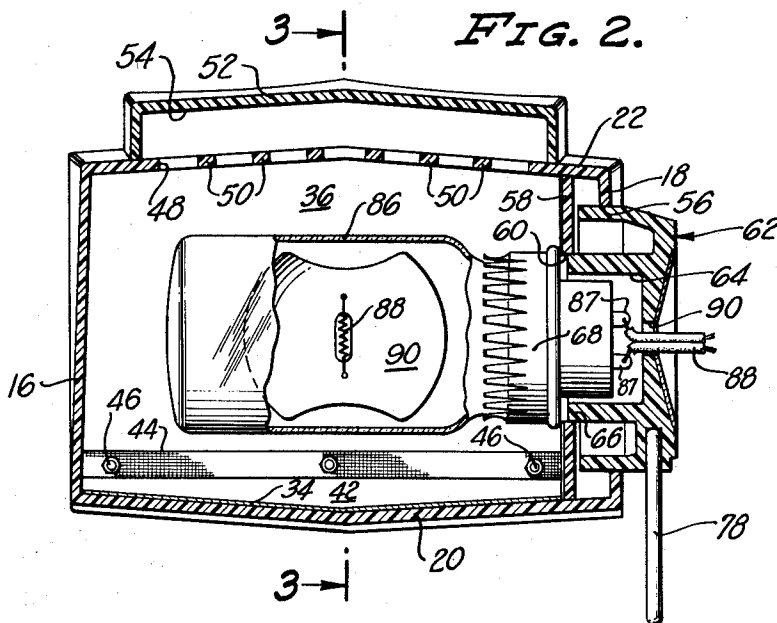
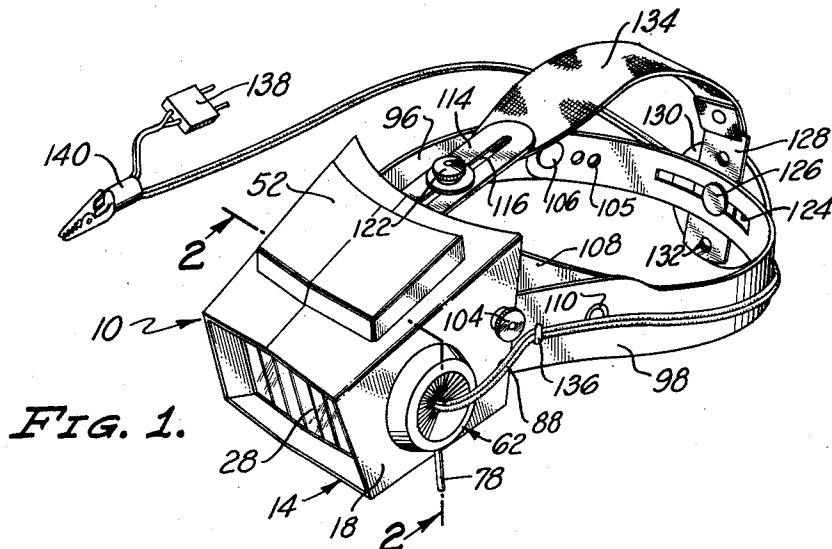
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SURGEON'S HEADLAMP

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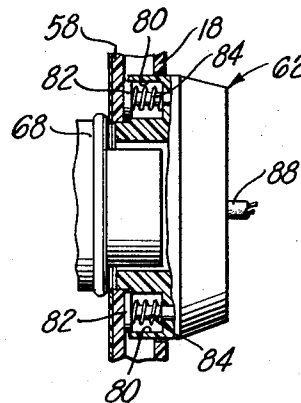
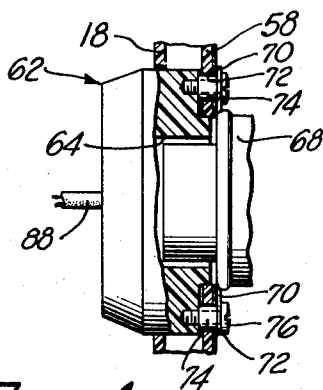
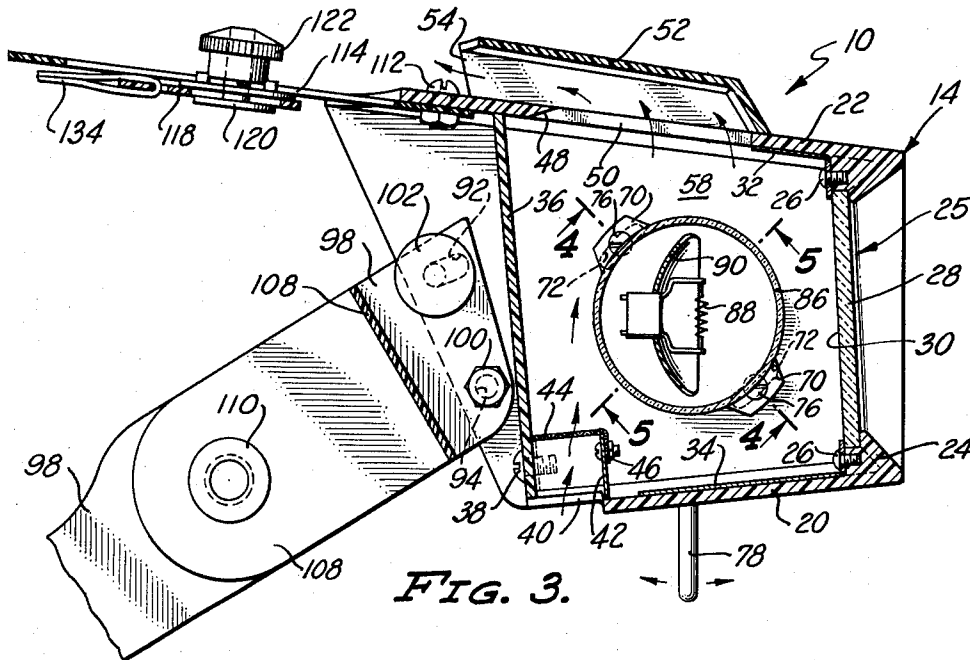


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2 Sheets-Sheet 2



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SURGEON'S HEADLAMP

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6 Claims. (Cl. 128—23)

The present invention relates generally to the illumination art, and more particularly to a novel, high-intensity headlamp for use by surgeons and the like.

Briefly stated, the device includes a housing and head-engaging means for supporting the housing adjacent a wearer's forehead. The housing contains a light-transmitting panel in the front portion thereof, which has its inner surface coated with reflectance material so as to screen out infra-red and dominant heat-producing wave lengths. A lamp is mounted within the housing in back of the panel, the lamp containing a filament and a reflector mounted in back thereof for directing a beam of high-intensity light through the panel. Shielded openings are provided in the housing for circulating air there-through to cool the lamp and the housing, and means are provided for adjusting the position of the lamp in the housing and for adjusting the position of the housing relative to the head-engaging means.

Although lighting conditions in operating rooms have been greatly improved within the past fifteen years, the lighting equipment in use at the present time is not completely satisfactory. The two main problems are shadows and low light intensity in the wound cavity. In endeavoring to overcome these problems, some operating rooms use a single source of overhead illumination which is re-directed by mirrors or reflecting surfaces, whereas others utilize widely separated multiple light sources. However, even with the best of these devices, shadows are caused in the wound area by the head and shoulders of the surgeon and other members of the operating team, and the light intensity is not as high as is desired.

There are some headlamps in use at the present time, but these were designed primarily for the nose and throat specialists and provide only from about 75 to 200 foot candles of illumination at fourteen inches from the light source, and are therefore completely unsatisfactory for use by neurosurgeons.

It is an object of the present invention therefore to provide a novel surgeon's headlamp which provides a brilliant, high-intensity illumination directly in the wound cavity. More particularly, it is an object to provide such a headlamp which produces a high-intensity illumination which is under the direct control of the operating surgeon and which is completely free from shadows and outside interference. Specifically, it is an object to provide a headlamp which produces in the neighborhood of 1500 to 1800 foot candles of direct illumination fourteen inches from the device, in a pattern approximately four inches square.

Another object is to provide a headlamp which produces high-intensity, relatively cool illumination in the wound cavity, as for example, in the neighborhood of not more than 98° F. in an ambient room temperature of 70° F. More particularly, it is an object to provide such a headlamp which filters the infra-red and dominant heat-producing wave lengths from the projected light and vents the heat from the lamp housing in a direction away from the patient.

Yet another object is to provide a headlamp in which the beam of light is substantially coaxial with the operating surgeon's line of vision. More particularly, it is an object to provide such a device in which the light source is positioned adjacent the wearer's forehead immediately

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above his eyes so as to produce a beam of light which is substantially coaxial with his line of vision, and which also includes means for adjusting the beam of light in the vertical direction relative to the lamp-supporting housing.

Additional objects are to provide a novel surgeon's headlamp which is relatively light in weight and counter-balanced so as not to unduly tire the wearer, which is adjustable to fit any head size, and which can be safely used in operating rooms.

Further objects and advantages of the present invention will be apparent from the following detailed description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is shown.

In the drawings:

FIG. 1 is a perspective view of a surgeon's headlamp constructed in accordance with the teachings of the present invention;

FIG. 2 is an enlarged vertical sectional view taken on the line 2—2 in FIG. 1;

FIG. 3 is a vertical sectional view taken on the line 3—3 in FIG. 2;

FIG. 4 is a vertical sectional view taken on the line 4—4 in FIG. 3; and

FIG. 5 is a vertical sectional view taken on the line 5—5 in FIG. 3.

Referring to the drawings more particularly by reference numerals, 10 indicates a headlamp embodying the teachings of the present invention which is normally used with a 110—6 volt transformer (not shown).

The headlamp 10 includes a box-like housing 14 which is preferably made from lightweight plastic and which contains opposed outer side walls 16 and 18, a bottom wall 20, and a top wall 22. A molding or beading 24 at the front of the housing defines an opening 25 through which the light is projected, as will be described more fully hereinafter. Mounted in the molding 24 by means of screws 26 is a light-transmitting lens panel 28 which has its inner surface 30 coated with a reflectance material such as vacuum-deposited gold, aluminum, silver, or the like, which limits the passage of infra-red and dominant heat-producing wave lengths. Pressure-sensitive-reflector sheets 32 and 34 are attached to the inner surfaces of the top and bottom walls, respectively, for intensifying the light within the housing. A rear wall or panel 36 is removably fastened in the rear portion of the housing by screws 38 which engage bosses (not shown) within the housing.

As shown in FIG. 3, the rear edge of the bottom wall 20 terminates short of the rear wall 36 so as to provide an opening 40. Extending transversely of the housing adjacent the rear edge of the bottom wall 20 is a short partition wall 42. A screen member 44 is mounted on the partition wall 42 by means of screws 46, the screen member extending horizontally rearwardly from the partition wall to the rear wall 36 so as to cover the opening 40.

The top wall 22 contains an opening 48 which is traversed by spaced louvre-like strips 50 (FIG. 2) which provide additional strength. Formed integral with the top wall 22 and extending above the opening 48 is a hood member 52 which has an opening 54 at the rear end thereof.

Referring to FIG. 2, the outer side wall 18 contains a circular opening 56 and spaced inwardly therefrom is a vertically extending supporting wall 58 which also contains a circular opening 60 which is coaxial with the opening 56. A lamp-supporting hub 62 which is mounted on the supporting wall 58 (as will presently be described) extends through the opening 56 to outside the housing. The hub 62 (FIG. 2) contains a central cavity 64 and an annular ridge 66 which fits within the opening 60. A

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lamp base 68 which contains two diametrically opposed mounting tabs 70 is positioned within the housing 14 with the tabs 70 adjacent the inner face of the supporting wall 58 (FIG. 4), the bottom of the lamp base extending into the cavity 64. Arcuate slots 72 (FIG. 3) are contained in the supporting wall 58 adjacent the tabs 70, and receive guide bushings 74 which extend between the tabs 70 and the hub 62. Screws 76 extend through the bushings 74 and fasten the lamp base 68 to the hub 62. It will be noted that the hub 62 can be rotated relative to the housing 14, but the amount of rotation is limited by the length of the arcuate slots 72. A handle or shaft 78 extends downwardly from the hub 62 for adjusting the position of the latter, as will be described more fully hereinafter.

As shown in FIG. 5, the hub 62 contains diametrically opposed wells 80 which have flat-headed pressure members 82 mounted therein for axial movement within the wells, the heads of the members 82 being held in frictional engagement with the outer face of the supporting wall 58 by coiled springs 84. Thus, when the hub 62 is rotated relative to the housing 14 by means of the handle 78, the frictional engagement of the pressure members 82 with the wall 58 maintains the hub 62 in its adjusted position.

The lamp base 68 removably supports a 150 watt, 6 volt vacuum lamp 86 which contains a coiled filament 88 which has an arcuate reflector 90 positioned within the glass envelope in back of it. The filament 88 extends transversely of the lamp so that when the latter is positioned within the housing 14 in a horizontal position, the filament 88 is in the vertical position. Also, the reflector 90 is shaped so that the projected light which passes through the lens panel 28 forms approximately a four-inch square of illumination fourteen inches from the front of the housing 14. It is to be understood that in some situations, as for example in oral surgery, it is advisable to provide an elongated light pattern, and in such cases the position of the filament and the construction of the lens would be changed accordingly. As mentioned hereinabove, the flat reflectors 32 and 34 reinforce the light within the housing 14 and the special coating 30 on the panel 28 screens out a large portion of the infrared and other heat-producing wave lengths so that at about fourteen inches from the front of the housing, the intensity of the light is in the neighborhood of 1500 to 1800 foot candles and the temperature is no more than about 98° F. This provides the operating surgeon with high-intensity, relatively cool illumination right in the wound cavity without any interfering shadows. As shown in FIG. 2, the lamp base 68 is provided with soldering ears 87 to which are attached wires 88 which pass through the outer face of the hub 62 through an opening 90.

Referring to FIG. 3, it will be noted that cooling air enters the housing 14 through the screened opening 40, passes upwardly around the lamp 86 and thence out through the louvred opening 48 and the hood member 52. Because the hood opening 54 faces rearwardly, any light which escapes from the housing 14 therethrough is directed away from the work area so as not to produce any interfering illumination which might cause shadows.

Turning to a consideration of the structure for supporting the housing 14 on a user's head, it will be noted that the outer side walls 16 and 18 of the housing extend rearwardly of the rear wall 36 (FIG. 3) and each contains an upper slot 92 and a lower tapped hole 94. One end of each of two strap-like head-encircling members 96 and 98 is pivotally fastened to each of the side walls 16 and 18, respectively, by means of a machine screw 100 which is positioned in the tapped hole 94. Special screw members 102 which have large, flat, head portions extend outwardly through the ends of the members 96 and 98, and the slots 92. Mounted on the outer ends of the screw members 102 are knurled nuts 104 for use in binding the members 96 and 98 in adjusted angular posi-

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tion relative to the housing. The strap-like members 96 and 98 are preferably made of plastic, and the overlapping ends thereof are provided with spaced holes 105, which, together with a screw and knurled nut assembly 106, provide means for adjusting the effective size of the head encircling members. A forehead band 108 is fastened between the members 96 and 98 with rivets 110. The rearward portion of the top wall 22 also extends beyond the rear wall 36 of the housing 14 (FIG. 3) and fastened thereto by a screw and nut assembly 112 is a short plastic strap 114 which contains a longitudinally extending slot 116 in the free end thereof. A bracket 118 is fastened in the slot 116 by means of a screw 120 and a knurled nut 122, whereby the position of the bracket 118 relative to the strap 114 can be varied within predetermined limits.

As shown in FIG. 1, the head-encircling strap member 98 contains a slot 124 adjacent the back portion thereof and adjustably mounted therein by means of a screw and knurled nut assembly 126 is a second bracket member 128. A counterweight 130 is fastened to the second bracket member 128 by screws 132 and fastened to both of the bracket members 118 and 128 so as to extend therebetween is a relatively wide cloth head strap 134. The aforementioned counterweight 130 is approximately the same weight as the weight of the housing 14 so that the entire headlamp assembly will rest comfortably on the head of the wearer without causing any discomfort or undue pressure on his forehead. It has been established that, without the counterweight, the headlamp becomes uncomfortable after twenty minutes' use, whereas when the counterweight is employed, the device can be used continuously for as long as six hours without any side effects.

The two-wire conductor 88 which is connected to the lamp base 68, as previously described, is mounted on the strap member 98 by means of clips 136, and contains a connecting plug 138 at the free end thereof. An alligator clamp 140 is fastened to the conductor 88 adjacent the plug 138, for fastening the conductor assembly to the back of the surgeon's gown.

Because of the safety requirements in an operating room, the headlamp 10 is preferably used with a 110—6 volt transformer (not shown) which contains a connecting plug which is the counterpart of the plug 138.

In operation, the effective size of the head-encircling members 96 and 98 and the length of the top strap 134 are varied by means of the previously described adjusting means until the supporting structure fits the wearer's head without any discomfort. After the housing 14 is positioned adjacent the wearer's forehead immediately above his eyes, the knurled nuts 104 on both sides of the housing 14 are loosened and the housing tilted relative to the head-encircling members until the beam of light is approximately coaxial with the surgeon's normal line of vision. As previously described, the amount of this adjustment is controlled by the length of the slots 92. The nuts 104 are then tightened. Thereafter, if the surgeon wishes to make a further finer adjustment in the direction of the projected light, as for example during the operation, he can do so by rotating the hub 62 and the lamp 86 by means of the handle 78. It is preferred to use a hemostat on the handle 78 in order to maintain sanitary conditions in the vicinity of the patient during the operation. As previously mentioned, the pressure friction members 82 maintain the hub 62 in its adjusted position. Because the counterweight 130 is approximately the same weight as the housing assembly, the entire headlamp structure fits comfortably on the surgeon's head without any localized pressure and therefore the device can be used for long periods of time without any side effects.

The coated lens panel 28 screens out a large percentage of the heat rays so as to maintain the temperature of the projected light at the wound area at no greater than about 98° F. in a 70° F. ambient room temperature.

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Also, the constant flow of air over the lamp 86 from the opening 40 and out under the hood member 52 maintains the operating temperature of the lamp and the housing at a reasonably low level. Because the outlet 54 from the hood is directed away from the patient, none of the hot air or extraneous light from the lamp 86 reaches the work area. In addition, the housing 14 extends over the surgeon's eyes so as to function as an eye shade and shield his eyes from the overhead light.

Thus, it is apparent that there has been provided a novel surgeon's headlamp which fulfills all of the objects and advantages sought therefor. It is to be understood that the foregoing description and accompanying drawings have been given only by way of illustration and example, and that changes and alterations in the present disclosure which will be readily apparent to one skilled in the art, are contemplated as within the scope of the present invention which is limited only by the claims which follow:

I claim:

1. A surgeon's headlamp, comprising: a housing having a front opening and a side wall; a light-transmitting panel positioned across the front opening; a hub member rotatably mounted in the side wall for limited rotational movement, one end of the hub member extending outside of the housing; a handle member fastened to the outer end of the hub member for adjusting the rotational position thereof; means maintaining the hub member in adjusted rotational position; a lamp base supported in the hub member within the housing; a lamp removably mounted in the lamp base, the lamp containing a filament and also containing a reflector positioned in back of the filament for providing a beam of light; and head-engaging means connected to the housing for supporting it adjacent a wearer's forehead.

2. A surgeon's headlamp, comprising: a housing having opposed side walls and a front opening; a light-transmitting panel mounted across the front opening, the inner surface of the panel being coated with reflectance material which reflects dominant heat-producing wave lengths; a lamp mounted within the housing in back of the panel, said lamp containing a filament and also containing a reflector in back of the filament for providing a beam of light, the lamp being positioned to direct the beam of light through the panel; external means

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mounted on at least one of said side walls and interconnected with the lamp for angularly adjusting the lamp within the housing whereby the angular position of the light beam relative to the housing can be adjusted; and head-engaging means connected to the housing for supporting it adjacent wearer's forehead.

3. A surgeon's headlamp according to claim 2 wherein said lamp is a tubular lamp mounted so as to extend transversely of the housing, said filament being positioned vertically to the housing.

4. A surgeon's headlamp according to claim 2 wherein the external adjusting means is a hub member rotatably mounted through one of said side walls, a lamp base supported in the hub member within the housing, and said lamp being mounted in the lamp base.

5. A surgeon's headlamp according to claim 4 comprising hub position maintaining means mounted between the wall and hub member for maintaining the hub member in adjusted position.

6. A surgeon's headlamp according to claim 5 wherein said hub position maintaining means is a yieldable friction means.

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