ABSTRACT: A surgical lighting fixture having a high kelvin rating is disclosed, said fixture supplying light at the color temperature of approximately 6,000° K. The color temperature thus attained is written an accepted tolerance of perfect average daylight and is achieved by raising the illumination source of 3,000° K. by means of an internal cylindrical filter and a dichroic reflector surrounding said internal filter. The lamp housing assembly contains means for cooling the lamp seal during operation of the lamps as well as cover means for sealing the interior of the housing against dust and to prevent unwanted heat from passing to the front of the surgical fixture to the patient and the doctors below.
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HIGH KELVIN SURGICAL LIGHTING FIXTURE

BACKGROUND OF THE INVENTION

This invention relates generally to surgical lighting fixtures and more particularly to a new and novel high kelvin surgical lighting fixture wherein the correlated color temperature approaches that of average daylight. The proper lighting of surgical operating sites in addition to requiring certain levels of illumination, also require that the light source approach as closely as possible the color of the average daylight in order for the surgeon to be able to more clearly and readily discern the tissues, organs and blood of the patient. The optimum lighting conditions for an operating site require that there be no dense shadows to prevent the surgeon from seeing past his own hands and surgical instruments and to prevent him from adequately seeing the patient's tissue, organs and blood as they actually exist; since the examination, diagnosis and treatment of these organs may be related to the color or change of color of the particular organ.

The term "color temperature" relates to the color of a completely radiating black body source and of correlated light sources whose spectral outputs match such a source. Most tungsten filament lamps approach the energy distribution of a black body quite closely with the color temperature varying with the current passing through them. In order to reach a proper illumination level for surgical operating lights, prior art devices varied the voltage across such a lamp and/or added filtering means to obtain a color temperature up to approximately 4,000°K, which is, of course, 2,500° below the ideal color clarity of 6,500°K. The application of an overvoltage to the lamp proper, under the prior art practices, resulted in raising the illumination and color temperature to higher levels but also had the effect of shortening the lamp life, since it is well known in the illumination art that the application of overvoltage to an incandescent lamp results in a marked decrease in lamp life.

A second consideration in the design of a surgical operating light relates to the physical discomfort of those under the light. A properly designed fixture requires that minimum amounts of heat energy reach the open wound and also the back of the surgeon's head and neck. The surgeon must be able to work for hours at a time, without discomfort. In addition, the patient's tissue must not be excessively dried or damaged by lamp heat.

Accordingly, it is an object of the invention to provide a new and novel surgical lamp having color temperatures approaching those of average daylight thereby allowing the surgeon to perform his work with more accuracy in discerning the visual black source.

Still another object of the invention is to provide a new and novel surgical lamp having means contained within the lamp for cooling the light source and the light socket.

Yet another object of the invention is to provide a new and novel surgical lamp which is capable of being positioned within certain predetermined distances from the operating surgeon without giving off undesirable heat which would prove discomforting to the operating surgeon, and damaging to the patient.

A further object of the invention is to provide a new and novel surgical lamp having a pivotally mounted dichroic reflector positioned on the lamp housing to allow quick access to the interior of the surgical lamp and for replacement of the dichroic reflector.

These and other objects and advantages of the invention will become more apparent from a study of the attached drawings and from a reading of the description of the preferred embodiment.

SUMMARY OF THE INVENTION

The foregoing objects and advantages are achieved by the present invention wherein there is provided an individual lamp fixture assembly comprising a housing having a forward, light transmitting face, a centrally mounted, rearwardly extending lamp and a dichroic reflector carried by the rear edge of the housing. Surrounding the lamp is a filter element. The filter element and dichroic reflector cooperate in the manner more fully described below to raise the color temperature from 3,000°K to about 6,000°K while directing undesired wave lengths of light away from the operating area.

The lamp fixture of this invention provides high intensity, high Kelvin light with minimum heat transmitted to the field of illumination. The fixture of the invention may be used singly or in groups such as, for example, in groups of six whereby high intensity light, about 5,000 foot candles, having color temperatures approaching daylight can be provided for surgical purposes while maintaining the temperature within established safety comfort levels for patient and surgeon. By the use of the lighting fixture of this invention, either singly or in groups, light of suitable color temperature and intensity can be obtained without the necessity of exceeding the rated voltage of the lamp and in many cases can be operated below the rated voltage of the lamp thereby extending the service life of the lamp.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view of the surgical fixture shown partially in section; and

FIG. 2 is a cross-sectional view of the fixture viewed through line 2-2 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings, the lighting fixture of the invention is shown generally by the numeral 10 and comprises an annullar-shaped housing 12 having a front edge 11 and a rear edge 13 and having mounted in the central portion thereof a rearwardly extending light source 14, preferably a quartz halogen lamp having a color temperature rating of approximately 3,000°K and an illumination level of suitable intensity.

The lamp 14 is mounted in a lamp socket 16 in such a manner so as to direct a major portion of its illumination rearwardly towards reflector 44. The light source 14 is connected to an electrical power supply by means of the electrical terminals 18. Surrounding the lamp 14 and lamp socket 16 is a cup guard 20 which is positioned in the central portion of the fixture 10 by means of the cantilevered arms 22 and 22' rigidly fastened to the housing 12 by suitable means, such as by bolts 24. Socket 16 is maintained in proper position within cup guard 20 by means of leg 21 so that at least a portion of the illumination portion of lamp 14 extends beyond cup guard 20.

The forward edge 11 of the annular housing 12 carries cover plate 26 which is mounted by suitable means such as between a bent portion of edge 11 and clips 28. The cover plate 26 serves to seal the interior of the surgical lamp 10 from the outside environment. The cover plate 26 may be preferably formed of a textured material, such as a suitable plastic, which will permit the front reflected illumination to pass through the cover plate.

The open end of cup guard 20 terminates with radially outwardly extending flange 30 upon which is positioned a removable baffle plate 32 having a plurality of louvers 34. The baffle plate 32 contains a central aperture 36 which is positioned over the lamp socket 16 so that lamp 14 will extend therethrough when placed in socket 16. Adjacent the closed bottom of the cup guard 20 are a multiplicity of openings 38 which serve as the means of ingress of air into the cup guard for circulating around the lamp 14 and lamp socket 16 thereby preventing overheating of the lamp and seal during operation. The circulating air passes upwardly to the baffle plate 32 and through the louvers 34 and central aperture 36 and egresses upwardly away from the light source 14. The baffle plate 32 with louvers 34 serves to allow the circulating air to egress upwardly while preventing heat energy from the light source 14 from passing downwardly to the lamp seal area. The cup guard 20 and the baffle plate 32 thusly described serve as the means
for cooling the lamp seal by permitting circulating air around said light and socket.

Resting on the baffle plate 32 and supported by the flange 30 of cup guard 20, is a tubular filter element 42 which is held by a plurality of extension springs 40. The filter element 42 is constructed of glass having sufficient properties to raise the color temperature of the rays passing through the element from the source color of 3,000° K. to an approximate color of 3,500° K. This initial color correction augments the further color correction function performed by dichroic reflector 44.

Mounted on the rear edge 13 of housing 12 is reflector 44 which is formed of suitable translucent material. Inner surface 45 of reflector 44 is provided with a multilayer dichroic coating which reflects a major portion of the spectrum but which allows rays of infrared wave lengths to pass through the coating and subsequently through reflector 44. Dichroic coatings and the principles of operation are well understood in the art and need not be elaborated here.

For quick access to the interior of the surgical lamp 10, the dichroic reflector 44 is pivotally mounted by means of a pair of hinges 46 positioned on the interior of the housing 12. The hinges 46 are pivotally connected to the ring 48 which is rigidly fastened to a portion of the rim 50 of the dichroic reflector 44. The ring 48 is latched to the housing 12 by means of the latch clip 52 mounted internally in the housing 12. When mounted in the manner thus described, the dichroic reflector 44 may be quickly and readily pivoted about the hinge 46 to expose the internal components of the lamp in general and the light source 14 in particular for replacement purposes.

As mentioned above, the fixture of this invention may be used individually or, when higher illumination is desired, in groups. It is unnecessary when using a group of fixtures to enclose the grouped fixtures in any additional housing. For example, for major surgical illumination, it is highly preferred to use a group of six fixtures which at design voltage combine to produce a total illumination of about 5,000 foot-candles with a color temperature of approximately 6,000° K. When thus combined, it is desirable to space the individual fixtures apart so as to allow for free circulation of air between the fixtures. Since, as mentioned above, no additional housing is necessary, the arrangement of the individual fixtures of the group is highly flexible and a matter of choice depending on the purpose for which illumination is desired and the number of fixtures in the group. Thus, a surgeon operating under illumination provided by fixtures of this invention is able to operate for a maximum length of time without physical discomfort caused by heat from the surgical operating lamps since a maximum amount of heat energy generated by the lamp is transmitted rearwardly away from the surgeon while at the same time the illumination provided is of high color temperature, close to that of average daylight, allowing him to better discern tissue, and the like, color.

While there has been described the preferred embodiment of the invention, it is clear that many modifications may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A lighting fixture for producing high color temperature illumination with low heat transmission, said lighting fixture comprising an annular housing member having a forward edge and a rear edge, mounting means carried by said housing member for mounting a lamp socket at substantially the axis of rotation of said housing member, said socket being positioned so that a lamp mounted therein directs a major portion of its illumination radially rearwardly of said housing member, electric means connecting said socket to a source of electricity, said lamp being powered by electric current supplied from said source of electricity, a filter element carried by said socket mounting means radially surrounding the illuminating portion of a lamp mounted in said socket for subjecting at least a portion of illumination from said lamp to an initial color temperature correction, a light-transmitting cover plate mounted at the front edge of said housing member, said plate forming the light-transmitting face of said lighting fixture, and a dichroic reflector mounted on the rear edge of said housing member in surrounding relationship to said lamp in said socket and said filter element and forming the rear wall of said lighting fixture, said dichroic reflector transmitting light of undesired wave lengths in the infrared region rearwardly from said lighting fixture and reflecting the remaining higher color temperature wave lengths forwardly through said light-transmitting face of said fixture.

2. The lighting fixture of claim 1 wherein the rear edge of said housing member is adapted for pivotally mounting said dichroic reflector whereby quick access to the interior of said lighting fixture is afforded.

3. The lighting fixture of claim 1 wherein said mounting means comprises at least one arm affixed at its outer end to said housing member and extending radially inwardly therefrom, an annular clamp affixed at the inner end of said arm, a cylindrically shaped cup guard having a closed bottom and an open end held by said annular clamp and coaxially aligned with the axis of said housing member, the closed end of said cup guard facing the forward portion of said lighting fixture and being adapted for mounting said socket so that the illuminating portion of a lamp mounted in said socket extends rearwardly through the open end of said cup guard.

4. The lighting fixture of claim 1 wherein the open end of said cup guard is provided with a radially outwardly extending flange and a removable louvered plate carried by said flange, said louvered plate having a central aperture through which a lamp extends when mounted in said socket, the forward portion of said cup guard adjacent the closed bottom thereof being provided with a multiplicity of openings whereby during operation cooling air circulates through said opening around said socket and lamp and passes through said louvers of said plate to prevent overheating of the lamp seal.

5. The lighting fixture of claim 1 wherein said filter element comprises a tubular-shaped member carried by said louvered plate and said flange of said cup guard radially surrounding the illuminating portion of a lamp in said socket, said filter element being constructed of transparent material capable of filtering certain light rays whereby the color temperature of at least a portion of the light emanating from the lamp during operation is corrected from about 3,000° K. to about 3,500° K.

6. The lighting fixture of claim 1 wherein light reflected from said reflector is corrected to a color temperature of about 6,000° K.