June 30, 1931. N. T. GORDON 1,812,745

LAMP

Filed Oct. 2, 1929

Fig. 1.

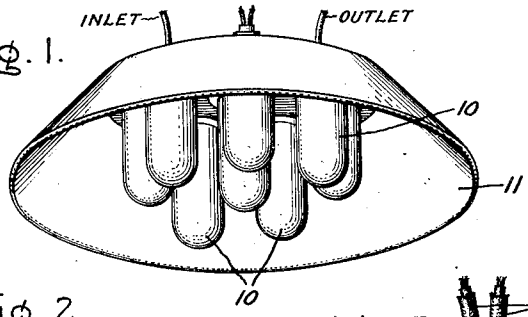


Fig. 2.

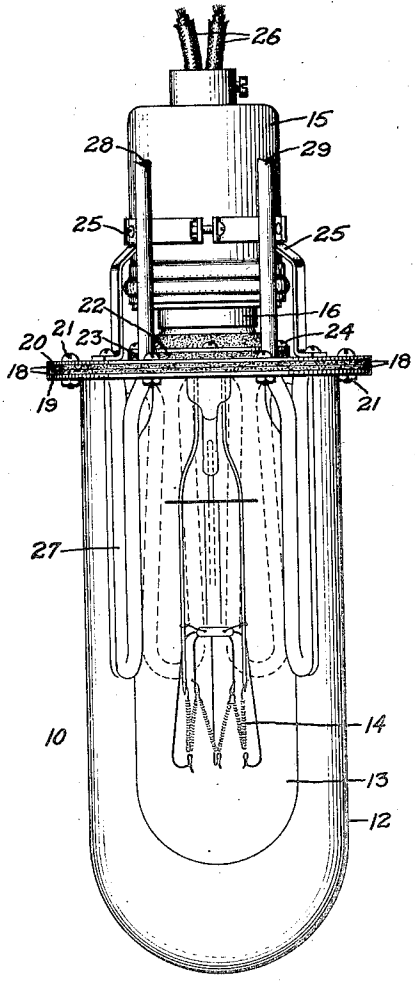
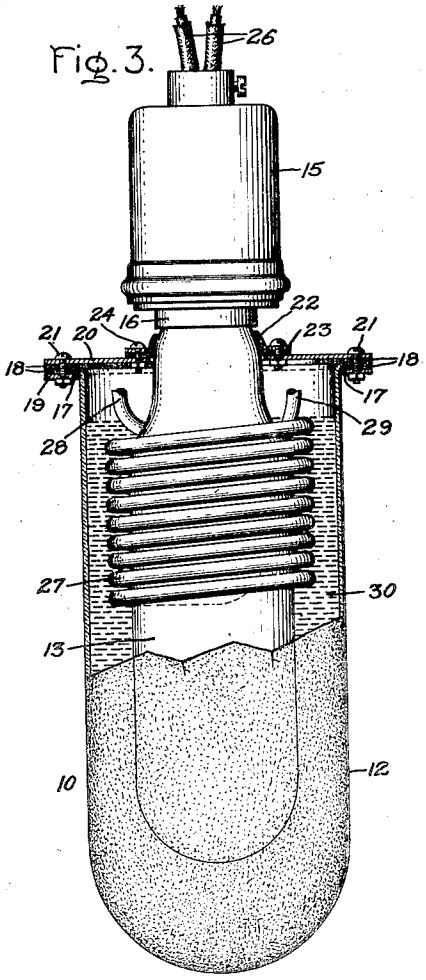


Fig. 3.



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UNITED STATES PATENT OFFICE

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LAMP

Application filed October 2, 1929. Serial No. 396,779.

This invention relates to a novel fluid cooled lamp and has for its primary object the provision of a lamp which will transmit visible light and eliminate to a very great extent the heat energy outside of the visible spectrum which is developed during the operation of the lamp.

Another object of this invention is the provision of a novel cooling arrangement for a lamp.

A further object of this invention is the production of a high intensity lamp wherein the desired intensity of light is obtained with the use of a comparatively smaller envelope for the light source than has heretofore been possible.

The practical application of lamps, especially of high intensity lamps, has been limited because of the fact that a large amount of energy in the form of heat is generated by such lamps when in use, due to the emission of rays outside of the visible spectrum range. Attempts have been made to provide cooling means of various sorts in order to reduce this heat energy but the apparatus which has been employed has either been too cumbersome or too complicated for general practical use

In accordance with my invention I have produced a novel fluid cooled lamp which is simple in its construction, compact and rugged in its nature, and easy to handle and use.

In carrying my invention into effect I may use either one lamp or a series of lamps and due to the construction and arrangement of the cooling system, I am enabled to effectively absorb the undesirable heat radiations and transmit only the desirable, visible light radiations. The lamp of my invention is effectively cooled and in such a manner that the visible light is transmitted without obstruction due to the deposit of dirt or other particles which may be in the cooling liquid and the lamp is always comparatively cool.

Referring to the accompanying drawings forming part of this application:

Fig. 1 is a perspective diagrammatic view of a bank of lamps of my invention employed in conjunction with a reflector,

Fig. 2 is a view in elevation of an embodiment of my invention, and

Fig. 3 is an elevational view, partly broken away and partly in cross-section showing another embodiment of my invention, certain parts being omitted for the sake of clearness.

In Fig. 1, I have shown for purposes of illustration an application of my invention. A bank of lamps 10 of my invention are shown connected up in conjunction with a reflector 11 for use where a bank of such lamps may be necessary in order to have present the requisite amount of light and where the use of a bank of ordinary lamps with a reflector would be prohibitive due to the great amount of heat energy radiated therefrom. For example, such an outfit finds practical application where a high intensity cool medical lamp is desired.

Referring to Figs. 2 and 3, the lamp proper is designated generally at 10. This lamp consists of an outer envelope 12 and an inner envelope 13 both of which may be of any suitable transparent medium, such, for example, as glass, quartz and the like. The inner envelope 13 contains the light source 14, as for example, a closely coiled tungsten filament which operates at high temperature in a gas, such as argon at substantial pressure. The outer envelope 12 is attached to the electrical socket connection 15, as more fully shown in Fig. 2, to which the inner envelope 13 having the usual screw base 16 is also attached. The outer envelope 12 is provided with a flange 17 which is clamped between two gaskets 18 of flexible and yieldable material, such as rubber, which gaskets are in turn clamped between two metal rings 19 and 20 held together by means of fastening elements, such as the nuts and screws 21. The metal ring 19 is designed to fit around the outer surface of the outer envelope 12, while the ring 20 is designed so as to fit over the opening of the envelope 12 and to provide sufficient space for the base portion of the inner envelope 13 of the lamp, which base portion protrudes therethrough for connection to the socket connection 15. In order to firmly clamp this portion of the lamp and to

protect it against breakage by pressure thereon, it is held by a collar 22 of yieldable, flexible material, such as rubber, which collar 22 is in turn held in place by being clamped between a ring member 23 and the ring 20 by means of fastening elements 24. The ring 20 is fastened by means of the collar and yoke fastening means 25 to the outer surface of the socket connection 15 as most clearly shown in Fig. 2. Electrical connection to the lamp body is made by means of the lead-in wires 26 which are suitably connected to any convenient source of power and in the usual way to the socket connection 15.

The cooling means comprises a cooling pipe or tubular means 27 provided with an inlet 28 and an outlet 29 for the fluid which is circulated therethrough. The inlet and outlet portions of the tubular means 27 enter and leave, respectively, the outer envelope 12 of the lamp structure through the ring 20 to which these portions are suitably fastened. In the embodiment shown in Fig. 2 of the drawings the tubular means 27 is shown as surrounding the outer surface of the inner envelope 13 for a portion of the surface of the latter and is formed as a series of bends. While the tubular means 27 is shown in Fig. 2 as surrounding only an arcuate portion of the circumference of the inner envelope 13, it is to be understood that it may extend completely around the circumference, if so desired. A fixed body of liquid 30 is present in the space between the outer and inner envelopes 12 and 13 respectively, this liquid being shown in the embodiment of the invention illustrated in Fig. 3 but being omitted from the embodiment shown in Fig. 2 merely for purposes of clearness. The outer envelope 12 in Fig. 3 is also shown as being of frosted glass while that in Fig. 2 is shown as being of plain glass.

In the embodiment of the invention shown in Fig. 3 the tubular means 27 is in the form of a spiral surrounding the upper portion of the inner envelope 13. It will be noted that the level of the liquid present in the lamp in the space between the outer and inner envelopes is below the top of the outer envelope 12 but above the tubular means 27 so that the latter is within the liquid 30. The level of the liquid in the embodiment shown in Fig. 2 would be the same and correspond to that shown in Fig. 3.

Any suitable fluid may be circulated through the tubular means 27 for the purpose of cooling the lamp. The fluid ordinarily employed and preferred is tap water but air or any cooling medium may be used for this purpose. The liquid which may be employed in the space between the outer and inner envelopes may be a heat absorbing liquid such as tap water if it is clear, or else distilled water. If desired, the liquid constituting the body of liquid 30 may be one which will absorb more selectively than pure water the heat radiating rays and transmit the visible light rays, such, for example, as a solution of copper chloride.

The cooling fluid is circulated through the tubular means 27 which surrounds the outer surface of the inner envelope 13. This tubular means it will be noted is immersed in the body of liquid 30 which is confined in the space between the outer and inner envelopes. As the cooling fluid is circulated through the tubular means 27 the surrounding body of liquid 30 is cooled. It will be obvious that due to the heat radiated from the light source the portion of the body of liquid 30 adjacent the said light source becomes heated. This heating produces convection currents in the liquid 30 causing it to move upwardly and to contact with the cooling means 27 where it is cooled. A difference in temperature is thus always present in this body of liquid causing the convection currents. It will therefore be noted that the body of liquid 30 is a heat absorbing medium which transmits visible radiations and cooperates with the cooling means 27 to effectively remove the heat generated by the lamp. In other words, this medium selectively absorbs infra-red radiation from the light source. It will be noted from the construction shown and described that in each case the tubular means 27 surrounds the inner envelope 13 and is within and spaced from the inner surface of the outer envelope 12. It will also be noted that the tubular means 27 is not in direct contact with the outer surface of the inner envelope 13 but is also slightly spaced therefrom to allow free passage of convection currents. This arrangement of the tubular means 27 in the space between the outer and inner envelopes permits the free circulation of the convection currents set up. The cooperation of the tubular means 27 with the body of liquid 30 is such that the lamp envelopes are kept comparatively cool, the major part of the spherical radiation of light being unobstructed. In one hemisphere the radiation of light is almost complete, this being the lower hemisphere when the device is used in a dependent position as illustrated.

The tubular means 27 is positioned in the upper part of the lamp structure, that is, adjacent to the base portion of the inner envelope 13. Such an arrangement is both desirable and necessary since the heat absorbed from the light source will cause by convection the portion of the body of liquid 30 near the top of the lamp structure to become very hot so that the cooling means 27 is most effective in this position. The cooling means 27 being in the upper part of the lamp structure is also out of the way of the light source and hence offers no obstruction to free and full passage of the light through the envelopes 12 and 13. Due to the fact that the

liquid 30 is confined in the space between the outer and inner envelopes and is not circulated but is cooled in the manner described, it will be noted that no light obstructing material such as dirt, which may be present in the liquid will be deposited in the outfit as would be the case if it were constantly circulated.

The construction shown and described is simple, rugged and compact. It permits the use of an envelope for the light source which is very much smaller than that which must ordinarily be used with a lamp of similar light intensity but which is not cooled as described. The construction likewise permits the use of a bank or series of such lamps in order to obtain the desired intensity of light without the attendant heat ordinarily generated by the use of such lamps.

The lamp structure of my invention finds a wide field of application. For example, it may be used in the motion picture industry, in the medical arts, and in fact wherever a cool, high intensity lamp is desirable or necessary.

It will be obvious to those skilled in the art to which this invention pertains that many modifications may be made in the construction shown and described which will still fall within the scope of the invention and the appended claims. For example, referring to Fig. 2 of the drawings, it will be obvious that if desired the light source 14 may be placed in the upper part of the inner envelope 13 when the tubular means 27, as there shown, does not entirely surround the outer surface of the inner envelope and that this modification would still fall within the scope of this invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A lamp structure comprising a light source, spaced outer and inner envelopes, said inner envelope containing the light source, a fixed liquid in the space between said outer and inner envelopes, said liquid being capable of effectively absorbing undesirable heat radiation while transmitting visible radiation, and means for cooling said liquid.

2. A lamp structure comprising a light source, spaced outer and inner envelopes, said inner envelope containing the light source, a body of liquid confined within the space between the outer and inner envelopes, and tubular means within said liquid and in part surrounding the inner envelope but spaced from said outer envelope, said tubular means having inlet and outlet openings for the circulation of a cooling fluid therethrough.

3. A high intensity lamp comprising a light source, an envelope therefor, an outer casing, a common support for said envelope and casing, a body of liquid selectively absorbing heat and transmitting light from said lamp confined within said casing, and means within said casing for cooling said liquid, said means surrounding a portion only of said envelope, and affording a passage for the circulation of a cooling fluid.

4. A lamp structure comprising a light source, spaced outer and inner envelopes, said inner envelope containing the light source, a body of liquid confined within the space between the outer and inner envelopes, and cooling means arranged therein spaced away from said envelopes to leave passages for the circulation of liquid convection currents.

5. A lamp structure comprising a light source, spaced outer and inner envelopes, said inner envelope containing the light source, a fixed body of liquid within the space between the outer and inner envelopes, and a cooling means arranged in said body of liquid, said cooling means being spaced from said light source and being arranged to present no obstruction to the major portion of radiation from said light source.

6. A lamp structure comprising a light source, spaced outer and inner envelopes, said inner envelope containing the light source, a body of liquid confined within the space between the outer and inner envelopes, and a cooling means positioned in the upper portion of said space between said outer and inner envelopes.

7. A lamp structure comprising a light source, spaced outer and inner envelopes, said inner envelope containing the light source, a body of liquid confined within the space between the outer and inner envelopes, a cooling means arranged in said body of liquid, said cooling means surrounding the inner envelope adjacent the base thereof.

8. A lamp structure comprising a light source, a support therefor, spaced outer end inner envelopes, said inner envelope containing the light source, said space between said outer and inner envelopes being adapted to receive a body of liquid therein, and a cooling means within said outer envelope and surrounding said inner envelope adjacent the support for said light source.

9. An illuminating device comprising an outer casing, an inner envelope supported in spaced relation to said casing, means for emitting light therein accompanied by heat radiation, a medium confined between said casing and envelope having the property of transmitting a high percentage of light and absorbing a high percentage of heat radiation, and means for cooling said medium arranged between said casing and envelope and surrounding an arcuate portion only of said envelope.

10. An illuminating device comprising an outer casing, a holder therefor detachably secured thereto, an inner envelope also detachably secured to said holder, an incandescent filament therein, a medium spaced between

said casing and envelope which is capable of absorbing a high percentage of heat radiation and transmitting a high percentage of visible radiation from said filament, and a cooling coil supported from said holder and surrounding an arcuate portion only of said inner envelope in a zone adjacent said holder.

11. A lamp structure comprising spaced outer and inner envelopes fixed to a common base, a light source within said inner envelope positioned remote from said base, a heat absorbing liquid confined in the space between said outer and inner envelopes, and cooling means within the said space surrounding in part at least the portion of said inner envelope which is intermediate said base and said light source.

In witness whereof, I have hereunto set my hand this 1st day of October, 1929.

NEWELL T. GORDON.