Dec. 7, 1937. F. C. WAPPLER 2,101,277

MINIATURE ELECTRIC LAMP

Filed Dec. 21, 1934

Fig. 1

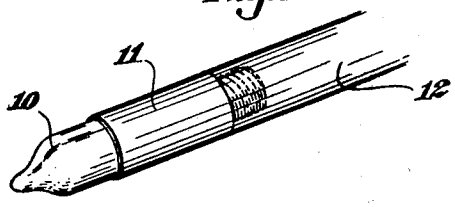


Fig. 2

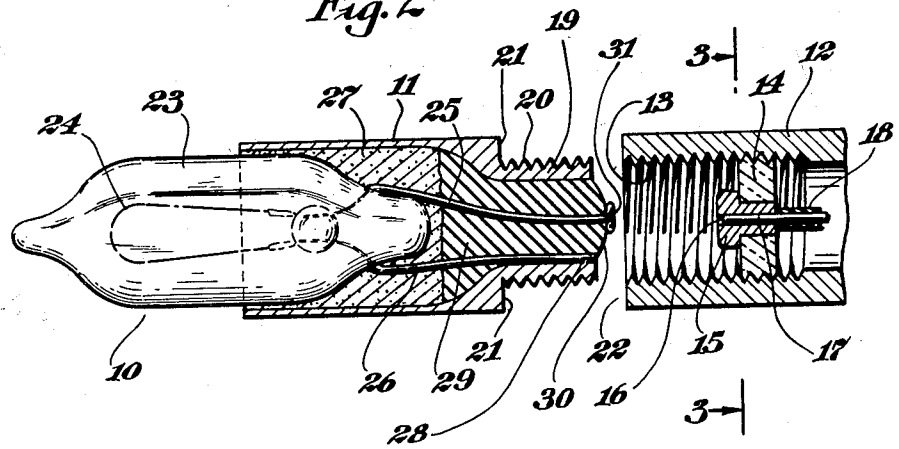


Fig. 3

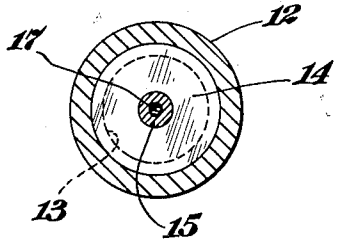


Fig. 4

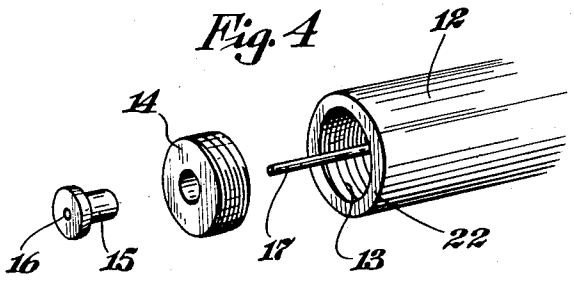
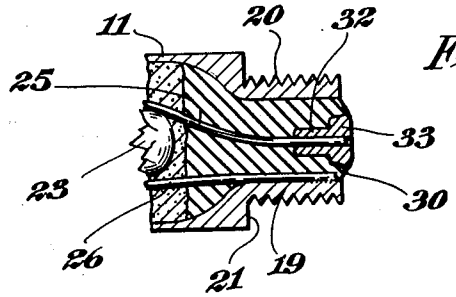


Fig. 5



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MINIATURE ELECTRIC LAMP

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Application December 21, 1934, Serial No. 758,561

6 Claims. (Cl. 176—32)

My present invention relates generally to electric lamps, and has particular reference to certain improvements in the structure of miniature lamps.

While I have herein illustrated and shall hereinafter describe my invention as it applies to a lamp of the extremely miniature type which is used in surgical instruments and surgical telescopes, nevertheless it will be understood that certain phases of my invention are not restricted to this particular use.

The type of lamp to which my invention has reference consists essentially of a bulb having a filament or the like therein, the bulb being mounted in a sleeve which provides exteriorly accessible contacts and which is adapted to permit insertion and removal thereof into a suitable socket. In the case of extremely miniature lamps, such as those which are used, for example, in a surgical telescope of the character illustrated and described in Patent Number 1,680,491, special structural difficulties are encountered because of the extreme smallness of the various parts. The lamp that is illustrated in the aforementioned patent, for example, has an external diameter of barely $\frac{3}{32}$nds of an inch, and it is, therefore, obvious that the features of construction conventionally employed in ordinary lamps are not applicable.

In the case of lamps which are used in surgical telescopes or the like, the problems are complicated further by the requirement that the lamp unit fit snugly and accurately into the socket that is provided for it.

It is a general object of my present invention to improve the structure of miniature lamps of the character mentioned. A feature of the invention lies in imparting a degree of resilience and yieldability to certain parts of the structure, hitherto unachieved. The advantages resulting from the present improvements will be readily appreciated by those skilled in the art and will be referred to in greater detail hereinafter.

I achieve the foregoing objects, and such other objects as may hereinafter appear or be pointed out, in the manner illustratively exemplified in the accompanying drawing, wherein—

Figure 1 is a perspective view of the forward end of a conventional type of surgical lamp tube, showing a lamp of the present character in association with a lamp socket;

Figure 2 is a greatly enlarged cross-sectional view through the lamp and socket of Figure 1, the lamp being shown withdrawn from the socket;

Figure 3 is a cross-sectional view taken substantially along the line 3—3 of Figure 2;

Figure 4 is an exploded view showing the elements of the socket; and

Figure 5 is a fragmentary view similar to Figure 2, illustrating a modification.

The bulb 10 of Figure 1 is mounted in a sleeve 11, this assembly constituting a unit which is adapted to be removably inserted into the forward end of a tube 12. In order that the features presently to be described may be more fully appreciated, it is pointed out that the tube 12 and the sleeve 11 of Figure 1 have an exterior diameter of approximately $\frac{3}{32}$nds of an inch.

In a preferred construction, the lamp is adapted to be screwed into association with the socket; and in Figure 2 it will be observed that the forward end of the tube 12 is interiorly threaded, as at 13. There are about one hundred threads to the inch. Because of the extreme smallness, the socket assembly is completed by inserting a disc 14 which is exteriorly threaded and which is preferably composed of bone or similar insulating material. Into a central opening in the disc 14 a conductive contact member 15 is inserted, the latter having a miniature bore 16 into which the forward end of a lead wire 17 is projected and secured, e. g., by means of solder. The wire 17 is insulated, as at 18, behind the disc 14, and this insulated wire extends rearwardly through the tube 12 to suitable connections at the rear end which form no part of the present invention.

The member 15 has an enlarged forward head which keeps it from slipping rearwardly through the disc 14. This head serves as a center contact, and the other terminal of the socket is constituted by the tube 12 itself.

The sleeve 11 of the lamp assembly is substantially tubular in character, and has a reduced rear portion 19 exteriorly threaded, as at 20. This reduction provides a rearwardly disposed shoulder 21. When the sleeve is screwed into the socket, the exterior surface of its forward portion is adapted to lie flush with the exterior surface of the tube 12, and the shoulder 21 must abut firmly and accurately against the forward edge 22 of the socket.

In accordance with my invention, the bulb 23 (which is provided with the filament 24 and the rearwardly projecting lead wires 25 and 26) is inserted into the forward end of the sleeve 11 in substantially the manner shown in Figure 2, and

is held in this position by means of an unyielding bonding material, such as the cement 27. The lead 26 is then secured, as at 28, to the interior of the sleeve 11, the other lead 25 extending rearwardly in a free and unattached manner, and substantially axially, through the sleeve 11.

The construction is completed by filling the rear end of the sleeve 11 with a mass of resilient, nonconductive sealing material 29 which yieldably embeds the wires 25 and 26 therein. In accordance with my invention, this material is preferably rubber latex, which has excellent insulating qualities, which is normally liquid or plastic to permit it to be inserted, and which has great resilience. The term "latex" as used herein and in the appended claims, is intended to refer to those products which are well known per se and are available on the market, consisting of the milky dispersion of colloidal rubber particles (which is the material emanating from the tree), compounded with materials which effect a curing and vulcanization in air, such compounds being available either with or without inert fillers and stabilizers. The rear surface of this mass of material is convexed, as at 30, so that the rear convex surface projects beyond the rear edge of the sleeve 11. The unattached lead wire 25 terminates in a center contact 31 which is adapted to contact with the member 15 when the lamp is screwed into the socket.

In the structures heretofore conventionally employed for lamps of this general type, an unyielding bonding material, such as cement or wax, has been employed, and the rear surface was carefully prevented from protruding in a convex manner. The difficulties encountered with such an unyielding construction are obvious. Great accuracy was required to bring about the required electrical contact, simultaneously with an accurate fit of the shoulder 21 against the edge 22. If the length of the threaded portion 20 was too short, or if the center contact 31 was not accurately positioned, the circuit would not be completed and the lamp would not function. Even where accuracy during initial manufacture was achieved, a slight loosening of the lamp in the socket would cause the contact to be broken and the lamp would go out. On the other hand, if the length of the threaded portion 20 was by a slight amount too great, or if the cement filler projected beyond the rear edge of the sleeve, the process of screwing the lamp tightly into position would often cause the cement to crack, resulting frequently in short-circuiting of the embedded wires 25 and 26.

In accordance with my present invention, these disadvantages have been effectively and successfully obviated. The rear surface 30 of the yieldable filler is purposely convexed; and because of the yieldable character of the material, such as latex, much less accuracy in manufacture is necessary; and when the lamp is screwed down a firm contact is established under all conditions, without any danger of injury to the delicate assembly, or of short-circuiting the embedded wires. Even if the center contact 31 is pressed inwardly to a degree sufficient to buckle the wire 25, no damage results because of the yieldable character of the material in which the wire is embedded. In this connection, it should be remembered that the distance between the embedded wires 25 and 26 may be as small as .02 of an inch, or even less. No matter how much the intervening layer of yieldable material is squeezed, due to buckling of the wires, it is impossible to bring about a rupture of this thin membrane and thereby to cause a short-circuit.

In Figure 5, I have illustrated a modified construction in which the rear end of the wire 25 has a contact member 32 mounted thereon, this member being similar in shape to the member 15 of the socket, and including a lateral flange 33. This construction is of advantage because of the flanged nature of the member 32, in that it permits the yieldable filling material to obtain a firm grip upon the contact member 32, and thereby prevents this member from being accidentally pushed into an unexposed position within the mass of the yieldable material.

The reason why it is preferable to employ the unyielding material 27 around the rear end of the bulb 23, instead of employing the yieldable filler throughout the extent of the sleeve 11, is to produce a firm and rigid association of bulb and sleeve. My present invention permits of this rigid assembly, at the bulb end of the sleeve, while at the same time providing for the highly desirable yieldability at the rear end of the device.

The lamp herein illustrated, for the purpose of explaining the nature of the invention, is approximately a .50 watt lamp. It will be understood that other minature lamps are of .75 watts, or even greater in wattage, and that the invention, while primarily directed to the extremely minute lamps, is nevertheless applicable to lamps of somewhat greater size and strength. In other words, while ordinary lamp structures, such as those employed in conventional lamps of over approximately 15 watts, are not applicable to miniature lamps of the present type, nevertheless many of the features of the present invention are applicable to lamps (e. g., Christmas tree lamps) of a size somewhat greater than the surgical size herein illustrated and described.

It will be obvious that changes in the details, herein described and illustrated for the purpose of explaining the nature of my invention, may be made by those skilled in the art without departing from the spirit and scope of the invention as expressed in the appended claims. It is, therefore, intended that these details be interpreted as illustrative, and not in a limiting sense.

Having thus described my invention, and illustrated its use, what I claim as new and desire to secure by Letters Patent is—

1. In a miniature electric lamp of the character described, a tubular metallic sleeve, a bulb with spaced lead wires projecting from its rear end, said bulb being snugly mounted in the forward end of said sleeve with its rear end within the sleeve and its forward end projecting therefrom, said wires extending rearwardly through said sleeve, an unyielding bonding material around the rear end of the bulb to secure the latter in rigid association with the sleeve, and a mass of resilient, nonconductive, sealing material filling the rear end of the sleeve and yieldably embedding said wires in spaced relation therein.

2. In a miniature electric lamp of the character described, a tubular metallic sleeve, a bulb with spaced lead wires projecting from its rear end, said bulb being snugly mounted in the forward end of said sleeve with its rear end within the sleeve and its forward end projecting therefrom, said wires extending rearwardly through said sleeve, an unyielding bonding material around the rear end of the bulb to secure the latter in rigid association with the sleeve, and a

mass of latex filling the rear end of the sleeve and yieldably embedding said wires in spaced relation therein.

3. In a miniature electric lamp of the character described, a tubular metallic sleeve, a sealed bulb with spaced lead wires projecting from its rear end, said bulb being snugly mounted in the forward end of said sleeve with its rear end within the sleeve and its forward end projecting therefrom, said wires extending rearwardly through said sleeve, and a mass of resilient, non-conductive, sealing material filling the rear end of the sleeve and yieldably embedding said wires in spaced relation therein, said sealing material having a convex rear surface projecting beyond the rear end of the sleeve, and at least one of the lead wires terminating in a contact on said surface.

4. In a miniature electric lamp of the character described, a tubular metallic sleeve, a sealed bulb with spaced lead wires projecting from its rear end, said bulb being snugly mounted in the forward end of said sleeve with its rear end within the sleeve and its forward end projecting therefrom, said wires extending rearwardly through said sleeve, and a mass of latex filling the rear end of the sleeve and yieldably embedding said wires in spaced relation therein, said mass of latex having a convex rear surface projecting beyond the rear end of the sleeve, and at least one of said lead wires terminating in a contact on said surface.

5. In a miniature electric lamp of the character described, a tubular metallic sleeve, a bulb with spaced lead wires projecting from the rear end thereof, said bulb being snugly mounted in the forward end of said sleeve with the rear end of the bulb within the sleeve and the forward end projecting therefrom, one lead wire being attached to said sleeve, the other lead wire projecting axially rearwardly through said sleeve, a flanged contact member on the end of the last-mentioned wire, and a mass of resilient, non-conductive, sealing material filling the rear end of the sleeve and yieldably embedding said wires and contact member therein with the wires in spaced relation, said sealing material having a convex rear surface projecting beyond the rear end of the sleeve, the outer end of the contact member being exposed at the center of said surface.

6. In a miniature electric lamp of the character described, a tubular metallic sleeve, a bulb with spaced lead wires projecting from the rear end thereof, said bulb being snugly mounted in the forward end of said sleeve with the rear end of the bulb within the sleeve and the forward end projecting therefrom, one lead wire being attached to said sleeve, the other lead wire projecting axially rearwardly through said sleeve, a flanged contact member on the end of the last-mentioned wire, and a mass of latex filling the rear end of the sleeve and yieldably embedding said wires and contact member therein with the wires in spaced relation, said latex having a convex rear surface projecting beyond the rear end of the sleeve, the outer end of the contact member being exposed at the center of said surface.

FREDERICK CHARLES WAPPLER.