April 18, 1944. W. M. JOHNSON 2,347,055

ELECTRIC LAMP

Filed Jan. 6, 1943

Fig. 1.

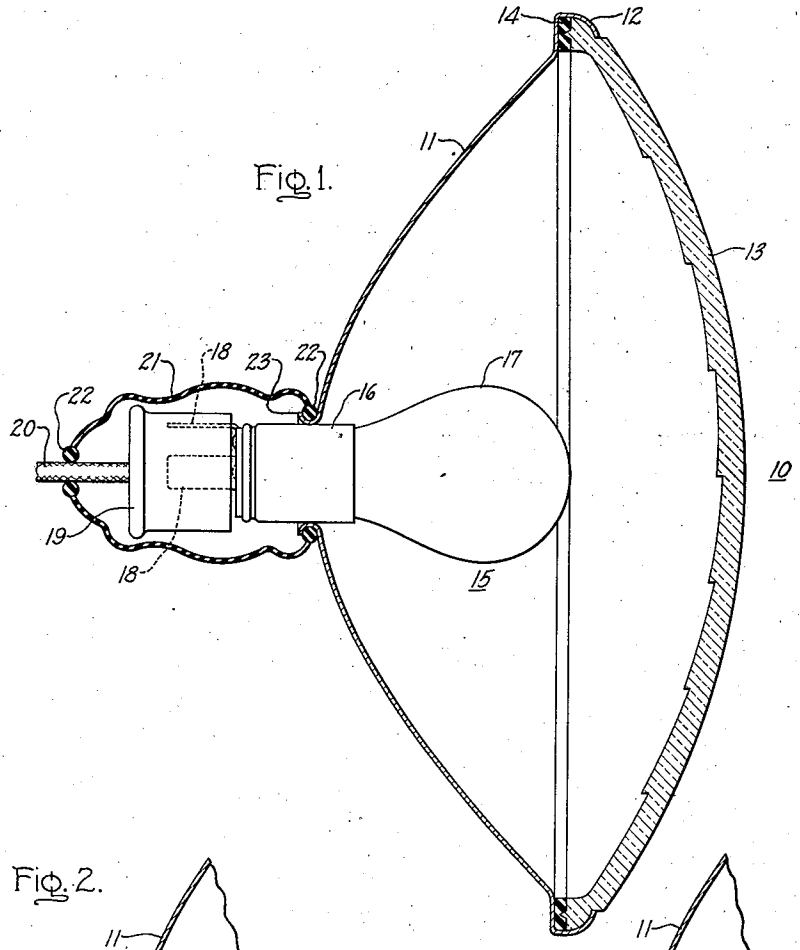


Fig. 2.

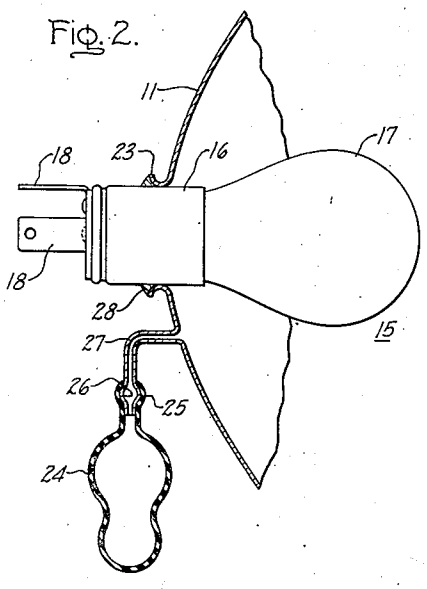
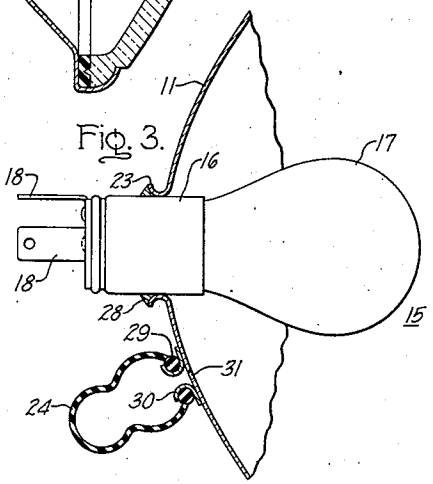


Fig. 3.



Inventor:
Wilber M. Johnson,
by John H. Anderson
His Attorney.

Patented Apr. 18, 1944 2,347,055

UNITED STATES PATENT OFFICE

2,347,055

ELECTRIC LAMP

Wilber M. Johnson, Cleveland Heights, Ohio, assignor to General Electric Company, a corporation of New York

Application January 6, 1943, Serial No. 471,467

3 Claims. (Cl. 240—41)

My invention relates to electric lamps of the type comprising an enclosure for a light source, which enclosure is filled with gas, such as air.

A type of lamp in conjunction with which my invention is useful is known as a "Sealed Beam" lamp and is now in extensive use in automobile headlights. One type of such lamp comprises a small electric incandescent lamp mounted within an enclosure having a reflector portion of paraboloidal or other suitable shape and a lens or cover portion secured at its periphery to the reflector portion to form an enclosure. The base of the incandescent lamp extends through the reflector portion and the enclosure is filled with air. Such lamps tend to breathe; that is, the air flows in and out of it, if the enclosure is not air-tight, since the enclosed air expands and contracts as the temperature of the lamp rises and falls. The air from the outside atmosphere entering the lamp enclosure under such conditions may be and usually is mixed with undesired and even harmful substances, such as water vapor which condenses on the inner surface of the enclosure and changes the pattern of the projected beam, or sulphur or other gaseous vapors which impair the surface of the reflector. In order to prevent such breathing action, it has heretofore been the practice to make the joint between the cover and the reflector and that between the reflector and the base of the lamp gas tight and of substantial mechanical strength to withstand the increased pressure of the air in the enclosure when the temperature is raised by operation of the lamp, by the heating action of the sun or by heat from other sources.

The principal object of my invention is to provide a lamp of the above type which may breathe without being contaminated by material from the outside atmosphere. Another object of my invention is to reduce the manufacturing cost of such lamps. Further objects and advantages of my invention will appear from the following description thereof.

It is well known that gas tight seals of large mechanical strength are more difficult and expensive to make than such seals of small mechanical strength. Further, in the fabrication of gas tight seals there is a certain amount of wastage or spoilage due to a portion of the seal being too weak mechanically to withstand the variations in gas pressure encountered under service conditions. According to my invention the hermetic seals of such lamps may be of small mechanical strength and in certain instances gas pervious, mechanical joints may be substituted for gas tight joints without harmful material from the outside atmosphere entering the lamp enclosure to the end that the cost of manufacture of such lamps is substantially reduced. Whereas prior efforts have been in the direction of increasing the mechanical strength of the lamp enclosure to withstand increasing gas pressure and thus resisting the tendency of the lamp enclosure to breathe, I proceed in the opposite direction to solve the common problem in a less expensive manner by permitting the lamp enclosure to breathe and thus avoid pressure changes with changes in temperature. Instead of keeping the volume of the enclosure constant, which causes the pressure to change directly with the temperature, I provide means whereby the volume of the enclosure may change as the gas expands and contracts with changing temperature. The gas in the enclosure is then at atmospheric pressure under temperature conditions encountered in service which eliminates mechanical stress from this source on the seals. In accordance with my invention, the joints may be made of lesser mechanical strength and thus with less expense by providing an easily collapsible and expansible pocket or chamber communicating with the interior of the reflector lamp. In one embodiment of my invention the joint between the reflector and the lamp base may be pervious to air, thus eliminating one of the expensive hermetic joints or seals used heretofore.

In the drawing accompanying and forming part of this specification species of my invention are shown in conjunction with a "Sealed Beam" lamp of a type well known in commerce. Fig. 1 of the drawing is a side elevational, partly sectional view of the lamp, an electrical supply terminal therefor and an easily collapsible and expansible sleeve communicating with the interior of the lamp; Fig. 2 is a fragmentary, partly sectional view of a similar lamp having an easily collapsible and expansible bag communicating with the interior thereof through a pipe or conduit, and Fig. 3 is a similar view of a bag similar to that shown in Fig. 2 communicating with the interior of the lamp through an orifice. Like numbers denote like parts in all the figures.

Referring to Fig. 1 of the drawing, the lamp 10 comprises a reflector member 11 of paraboloidal shape having a flange 12 rolled over onto the outer surface of the peripheral portion of a lens 13. A gasket 14 of flexible, air impervious material, such as rubber, is interposed between the reflector 11 and the lens 13 and is compressed therebetween to form an air-tight or

hermetic seal between the reflector 11 and the lens 13. In some types of commercial lamps the reflector 11, the lens 13 and the gasket 14 are held together by a clamping ring. A small incandescent lamp 15 is mounted in the space defined by the reflector 11 and the lens 13 and is supported therein by its metal base 16 which extends through an opening in the apex of the reflector 11 and which is soldered to the reflector 11. The incandescent lamp 15 may be of the type disclosed and claimed in the Severin Patent No. 2,227,324, issued December 31, 1940, and assigned to the assignee of this application and which comprises, in addition to the base 16, a glass bulb 17 having a neck portion extending into the base 16 and secured thereto by basing cement. The lamp 15 has a pair of filaments supported in the bulb 17 by current in-leads which pass through the stem of the bulb 17 and connect with spaced contacts 18 on the base 16 of the lamp 15. The filaments, the stem and the in-leads of the lamp 15 have been omitted from the drawing for purposes of simplicity of illustration. A connector member 19 fastened to the end of a current or power supply cable 20 engages with the terminals 18 of the lamp 15 in the usual manner.

The lamp 10 described above is well known in commerce and the above described structure constitutes no part of my invention.

As pointed out above, prior efforts have been in the direction of making the lamp 10 air-tight to prevent the ingress of contaminating, deleterious material into the lamp enclosure. Thus, the space between the base 16 and the reflector 11 has been filled with solder to make the joint therebetween air-tight or hermetic at pressures above and below atmospheric pressure and a special composition impervious to air has been used to seal the space between the base 16 and the bulb 17 for the same purpose, all as disclosed in copending application Serial No. 385,672, filed March 28, 1941, and assigned to the assignee of this application. Such precautions and special procedures add to the cost of manufacture of the lamps and are eliminated by my invention which comprises, in the embodiment thereof illustrated in Fig. 1, an easily collapsible and expansible sleeve 21 of material impervious to air, such as soft rubber, oiled silk, or the like, surrounding the member 19 and the portion of the lamp base 16 outside the reflector 11. The sleeve 21 is provided with two rings 22 of flexible material, such as soft rubber. The rings 22 are of such diameter that they are stretched and under tension when mounted on the cable 20 and on the flange 23 on the reflector 11. The flange 23 is integral with the reflector 11 and provides an annular groove for one of the rings 22. In mounting the sleeve 21, one of the rings 22 is stretched sufficiently to pass the member 19 into the sleeve 21. The opposite ring 22 is then stretched to permit the engagement of the member 19 with the contacts 18 and thereafter the ring 22 is placed in the groove formed by the flange 23. The rings 22 grip the cable 20 and the surface of the groove with sufficient force to prevent seepage of air from the ambient into the sleeve 21 under the conditions described below.

It is advantageous in the practice of my invention to provide a low resistance path for the flow of air between the interior of the lamp 10 and the interior of the sleeve 21. The building up of pressure in the lamp 10 and concomitant stress on the gasket 14 is thus avoided. Accordingly, instead of filling the annular space between reflector 11 and the base 16 of the lamp 15 with solder as has been the practice heretofore, in an effort to seal this space, only sufficient solder is used to support the lamp 15 in the reflector 11 without sealing the said space. I prefer to solder the base 16 to the reflector 11 at three spaced places around the base 16 so as to leave spaces between said base 16 and said reflector 11 for the free flow of air between the lamp 10 and the sleeve 21. Thus, when the lamp 10 is at the temperature of the ambient and the sleeve 21 is collapsed, air flows freely from the lamp 10 into the sleeve 21 as the temperature of the lamp 10 increases and the air therein expands when the lamp 15 is energized. The sleeve 21 expands as the air from the lamp 10 enters it. When the lamp 15 is deenergized and the reflector lamp 10 cools, the air therein contracts. The uncontaminated air from the sleeve 21 then flows back into the lamp 10 through the mechanical joint between the reflector 11 and the base 16 and the sleeve 21 collapses. The above cycle is repeated each time the temperature of the lamp 10 rises above and then falls to the temperature of its surroundings.

It is apparent from the foregoing that the difference in the air pressure inside and outside the lamp 10 is inappreciable at all times, that the expensive air-tight seal between the lamp base 16 and the reflector 11 as well as that between the lamp bulb 17 and the base 16 have been eliminated and that the mechanical stress on the seal between the reflector 11 and the cover 13 has been minimized while the ingress of contamination from the ambient into the lamp 10 is prevented by my structure. Further, the sleeve 21 is easily detachable from the lamp 10 and attached to a new lamp when lamp replacement is necessary.

The embodiment of my invention illustrated in Fig. 2 of the drawing comprises an easily collapsible and expansible bag 24 which is impervious to air and which has a neck portion 25 which grips the enlarged end portion 26 of a tubular extension 27 on the reflector 11. The bag 24 may consist of soft rubber, oiled silk, or similar material, and the neck portion 25 thereof may consist of soft rubber or other material capable of gripping the end portion 26 of the extension 27. This embodiment of my invention is particularly useful in conjunction with lamps made in the conventional manner, that is, with the space between the base 16 and the reflector 11 sealed with solder as shown at 28. While a special sealing composition may be used to make the space between the base 16 and the bulb 17 air-tight in accordance with the application referred to above, I prefer to omit such composition and thus save its cost when using this embodiment of my invention. This may be done without risk of contamination from the ambient entering the lamp 10 because the usual basing cement offers appreciable resistance to the flow of air between the base 16 and the bulb 17 whereas the resistance to the flow of air through extension 27 between the lamp 10 and the bag 24 is inappreciable. Thus, as the air in lamp 10 expands with increasing temperature, it flows from lamp 10 into the bag 24. The same uncontaminated air flows back into lamp 10 when the air contracts when the lamp temperature falls. In this embodiment as in the embodiment illustrated in Fig. 1, the building up of pressure in the lamp 10 with its accompanying stress on the seals is avoided without permitting contamination to enter lamp 10

from the ambient by providing space for the gas to increase in volume rather than pressure as it expands with increasing temperature. The seals may then be weaker mechanically than those used heretofore which dispenses with the elaborate, expensive tests and inspections necessary for seals capable of withstanding appreciable pressures.

The embodiment of the invention illustrated in Fig. 3 is the same as that illustrated in Fig. 2 except that the bag **24** is provided with a ring **29** which is similar to rings **22** illustrated in Fig. 1 and which clamps about an annular groove formed by a circular, outwardly flaring flange **30** on the reflector **11** and about the opening **31** in said reflector **11**. This is a more compact arrangement than that shown in Fig. 2 and may be preferred where mounting space for lamp **10** is small.

In the species of my invention illustrated in Figs. 2 and 3 of the drawing, the easily collapsible and expansible member is mounted only on the replaceable lamp **10** per se and not on the permanent parts of the installation or vehicle. When the lamps are to be placed in stock for a time before being used, these embodiments may be preferred since the bag **24** may be placed thereon to serve the same purposes as it does when the lamp **10** is in use.

In order to eliminate moisture or water vapor in the lamp **10** it may be flushed with dry air and a getter, such as calcium chloride, may be disposed in the sleeve **21**, the bag **24**, the conduit **27**, or on the member **19**. Under certain service conditions it may be desirable to use both the sleeve **21** and the bag **24** on a single lamp for attaining the objects and advantages of my invention.

While I have illustrated and described my invention in conjunction with headlamps of a commercial type for vehicles, I contemplate that it may be used with other types of lamps and with lamps used for other purposes. Further, electrical conductors in the form of metal wires or rods may be used for passing energy into the lamp instead of a lamp base.

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

1. A lighting unit comprising an enclosure including a reflector, and an electric lamp in said enclosure, said enclosure containing a gaseous atmosphere and being normally air-tight but subject to leakage through a portion thereof upon expansion and contraction of the internal atmosphere when the lamp is turned on and off, and an air-tight easily collapsible and expansible bag-like member connected with the interior of said enclosure, said bag-like member having sufficient volume to accommodate the internal atmosphere which is expanded when the lamp is lighted and to prevent a rise in pressure sufficient to cause the internal atmosphere to leak out of the enclosure to the exterior atmosphere, the internal atmosphere in said member being returned to the enclosure when the unit cools.

2. A lighting unit comprising an enclosure including a concave reflector and a cover glass sealed together at their peripheries, and an electric lamp mounted in an opening in said reflector, said enclosure containing a gaseous atmosphere and being normally air-tight but subject to leakage through said opening upon expansion and contraction of the internal atmosphere when the lamp is turned on and off, a detachable current supply connector at the exterior of said enclosure engaging terminals on said lamp, and an air-tight easily collapsible and expansible bag-like member engaging the reflector around the said opening therein and enclosing the said connector, said bag-like member having sufficient volume to accommodate the internal atmosphere which is expanded when the lamp is lighted and returning the atmosphere pocketed therein to the enclosure when the unit cools.

3. A lighting unit comprising an enclosure including a concave reflector and a cover glass sealed together at their peripheries, and an electric lamp in said enclosure comprising a bulb and a base, said lamp base being mounted in an opening in said reflector and hermetically sealed to the margin of said opening, said enclosure containing a gaseous atmosphere and being normally air-tight but subject to leakage through the interior of the said lamp base, and an air-tight easily collapsible and expansible bag-like member connected with the enclosure through an opening in said reflector, said bag-like member having sufficient volume to accommodate the internal atmosphere which is expanded when the lamp is lighted and to prevent a rise in pressure sufficient to cause the internal atmosphere to leak through the lamp base to the exterior atmosphere, the internal atmosphere in said member being returned to the enclosure when the unit cools.

WILBER M. JOHNSON.