Sept. 8, 1964 C. W. PEARSON 3,148,305

ELECTRIC INCANDESCENT LAMP WITH A RECTIFYING DIODE MOUNTED WITHIN THE LAMP BASE

Filed March 28, 1960

Fig. 1.

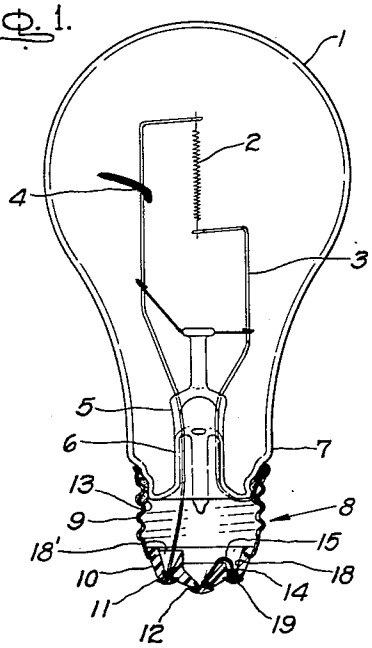


Fig. 2.

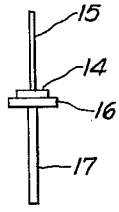


Fig. 3.

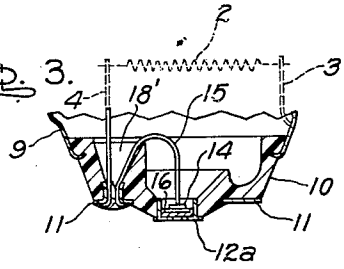


Fig. 4.

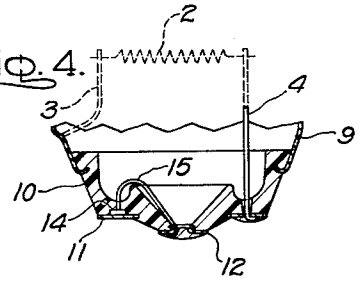
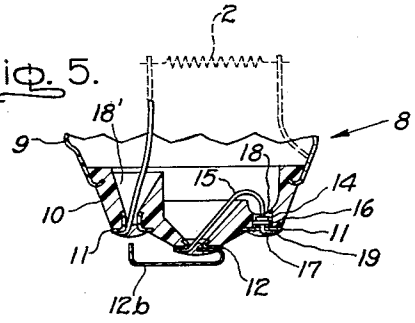


Fig. 5.



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ELECTRIC INCANDESCENT LAMP WITH A RECTIFYING DIODE MOUNTED WITHIN THE LAMP BASE

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9 Claims. (Cl. 315—51)

This invention relates generally to electric incandescent lamps, and more particularly to lamps adapted to operate at different levels of illumination. Still more particularly, the invention relates to lamps provided with a single filament and with means whereby the filament may be caused at will to emit different degrees of light.

The conventional means heretofore employed for obtaining different levels of illumination from an incandescent lamp was to provide the lamp with two or more filaments. Such an arrangement involves complications in the structure and manufacture of the lamp. According to the present invention, the filament may be operated at different levels of illumination by a simple arrangement of a rectifier in the base of the lamp, the filament being connected to the alternating current supply circuit either directly or through the rectifier.

Further features and advantages of the invention will appear from the following detailed description of species thereof and from the drawing wherein:

FIG. 1 is an elevation, with the base in section, of a lamp comprising the invention;

FIG. 2 is an elevation, on an enlarged scale, of a form of semiconductor rectifier assembly located in the base of the lamp; and

FIGS. 3, 4 and 5 are fragmentary elevations, on an enlarged scale, showing alternative arrangements of the rectifier in the lamp base.

Referring to FIG. 1 of the drawing, the lamp illustrated therein comprises a sealed glass bulb 1 containing a filament 2, preferably of tungsten, which is mounted on and electrically connected to the inner ends of lead wires 3 and 4 which extend through the press or seal portion 5 of a stem tube 6 extending inwardly from the neck portion 7 of the bulb 1.

Whereas the base of a single filament lamp ordinarily has two contacts or terminals, in the present case the base 8 is provided with three contacts or terminals. As illustrated herein, the base is of a screw threaded type ordinarily employed with multiple filament lamps. To that end, the base 8 comprises a screw threaded metal shell 9 which serves as one of the contact terminals and has at its end an insulating web 10 to which is secured an intermediate, concentrically arranged, annular metal contact terminal 11 and a centrally arranged end contact terminal or eyelet 12. The contacts 11 and 12 are spaced progressively greater distances from the end of the shell 9. The base 8 may be secured to the bulb in any suitable manner, as by the conventional cement 13, and the insulating web portion 10 thereof may consist of glass or organic plastic as well known in the art.

One end of the filament 2 is connected to one of the other contacts 11 or 12 by lead wire 4; as shown in FIG. 1, the lead wire 4 is connected to the intermediate or ring contact 11 through a funnel shaped opening 18' in the insulation 10.

In accordance with the invention, the contacts 11 and 12 are interconnected through a rectifier located in the base 8. As shown in FIG. 2, the rectifier is of the semiconductor type, preferably a silicon rectifier comprising a small wafer 14 of silicon employing the junction of an aluminum wire 15 alloyed into the silicon wafer. As shown herein the silicon wafer 14 is soldered to a metallic base disc 16 to which is attached a lead wire 17. The

disc 16 should have a thermal expansion similar to that of the wafer 14. The silicon rectifier is preferred over germanium because of its ability to withstand higher temperatures.

As shown in FIG. 1, the rectifier is located in an opening 18 in the insulating web 10 with its base disc 16 against the inner surface of the intermediate contact 11 and with its lead wire 17 extending through a hole in the contact 11 to the outer surface thereof where it is attached, for example by solder 19. The free end of the aluminum wire lead 15 is connected to the end contact or eyelet 12, as by soldering it thereto.

Although the rectifier is enclosed within the base 8, when desired it may further be protected from atmospheric elements, including moisture, by employing suitable encapsulation about the rectifier, such as an epoxy resin.

The lamp may be used with a multiple contact switch socket of the type wherein the lamp base shell 9 is connected to one terminal of an alternating current supply, the other terminal of which is alternatively connected to the intermediate contact 11 or the end contact 12. When the current source is connected to the intermediate contact 11 and shell 9, the filament 2 is connected directly across the power supply to emit a normal high level of illumination. When the current source is connected to the end contact 12 and shell 9, the filament 2 is connected in series with the rectifier 14–15 through contact 11 whereby the reduced pulsating direct current flow causes the filament to emit a materially lower level of illumination amounting to about one-third of the high level.

The lamp may be operated in existing sockets of the so-called 3-way or 3-lite type wherein one side of the current supply line is connected to the shell 9 and the other side is connected alternatively, by switching, to the intermediate contact 11, the end contact 12, both contacts 11 and 12, and off. In that case, the lamp will be sequentially lighted to illumination levels of high, low, high, off. Although it is not necessary, it is preferred that the sequence be such, as in the example just stated, that the full alternating current be supplied first to the filament before the connection is made through the rectifier; this avoids sending through the rectifier the current surge which normally flows when a cold filament is connected into the circuit.

For lamps of up to about 150 watts, the silicon rectifier may be one having a rating of about 500 to 600 milliamperes at a temperature of about 100° C. A lamp having a filament 2 of coiled coil tungsten rated at 100 watts and drawing .833 ampere at 120 volts, when operated in series with the silicon rectifier draws about .42 ampere and emits about one-third the amount of light emitted at its normal rating.

In the modification shown in FIG. 3, where like parts are numbered the same as in FIG. 1, the wafer 14 of the rectifier may be secured, preferably by soldering, to the end contact 12*a* either with or without the presence of the backing disc 16. For this purpose the end contact, instead of being an eyelet 12 partially embedded in the insulation 10 as in FIG. 1, may be a cap-like member 12*a* making a friction fit with an aperture in the insulation. The free end of the aluminum lead wire 15 extends into the opening 18' in the insulation 10 and is connected, as by soldering, to the intermediate contact 11. The filament 2 (indicated diagrammatically) is connected by one of the lead wires 3 to the shell 9, and by the other lead wire 4 to the intermediate contact 11.

In the modification shown in FIG. 4, the wafer 14 of the rectifier is embedded in the insulation 10 which may be an organic plastic such as a thermosetting phenol formaldehyde resin, such as is well known in the art. In that case the silicon wafer 14 may be soldered, either

directly or through the backing disc **16** (FIG. 2), to the intermediate contact **11** prior to molding the insulating web **10**. The lead wire **3** is connected to the shell **9**, and the lead wire **4** may be connected to the intermediate contact **11** as shown, or it may be connected to the end contact eyelet **12** along with the free end of the aluminum lead wire **15** of the rectifier.

When desired, the switching arrangement may be incorporated in the lamp base. One such arrangement is illustrated, by way of example, in FIG. 5. In the illustrated example, the construction is like that shown in FIG. 1 except that the end contact is made in the form of a leaf spring member **12***b* which may be soldered to the eyelet **12** and which overlies the intermediate contact **11** but is normally spaced therefrom. The lamp may then be used in a conventional two contact socket. By screwing the base **8** into the socket sufficiently far so that the spring contact **12***b* engages the center contact of the socket, a circuit is established through the filament **2** and rectifier **14–15** in series to provide a low level of illumination, and by screwing the base further into the socket to bring the spring contact **12***b* into engagement with the intermediate contatct **11**, the rectifier is bypassed or short circuited, and the full alternating current flows through the filament.

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

1. An electric incandescent lamp comprising a bulb, a single filament in said bulb, a base on said bulb comprising a metallic shell contact attached to said bulb and having an insulating web at its outer end, a pair of contacts spaced apart in said web, means connecting one end of said filament to said shell contact, means connecting the other end of said filament to one of said pair of contacts, a semiconductor rectifier in said base, and means connecting said rectifier across said pair of contacts, whereby to supply different levels of illumination upon connecting a current supply source across said shell contact and said one of said pair of contacts and, alternatively, across said shell contact and the other of said pair of contacts.

2. An electric incandescent lamp comprising a bulb, a single filament in said bulb, a base in said bulb comprising a screw threaded metallic shell contact attached to said bulb and having an insulating web at its outer end carrying an intermediate, concentrically arranged, annular contact and a centrally arranged end contact spaced progressively greater distances from the end of said shell contact, a semiconductor rectifier in said base, means connecting one end of said filament to said shell contact, means connecting the other end of said filament to said intermediate contact, and means connecting said rectifier across said intermediate and end contacts whereby to supply different levels of illumination upon connecting a current supply source across said shell and intermediate contacts and, alternatively, across said shell and end contacts.

3. An electric lamp base comprising a metal shell contact having an insulating web at one end and a pair of contact terminals spaced apart in said web, and a semiconductor rectifier mounted in said base and electrically connected across said pair of contact terminals.

4. An electric lamp base comprising a metal shell contact having an insulating web of organic plastic at one end and a pair of contact terminals spaced apart in said web, and a semiconductor rectifier embedded in said insulating web and electrically connected across said pair of contact terminals.

5. An electric incandescent lamp comprising a bulb, a single filament in said bulb, a base on said bulb having three contact terminals, connections from the ends of said filament to two of said terminals, a rectifier in said base, means connecting said rectifier between one of said two terminals and the third terminal, and switch means mounted in said base to selectively complete a shunt circuit across said one of said two terminals and said third terminal to thereby short circuit said rectifier.

6. An electric incandescent lamp comprising a bulb, a single filament in said bulb, a base on said bulb comprising a metallic shell contact attached to said bulb and having an insulating web at its outer end, a pair of contacts spaced apart in said web, means connecting one end of said filament to said shell contact, means connecting the other end of said filament to one of said pair of contacts, a semiconductor rectifier in said base, means connecting said rectifier across said pair of contacts, and switch means mounted in said base to selectively complete a shunt circuit across said pair of contacts to thereby short circuit said rectifier.

7. An electric incandescent lamp comprising a bulb, a single filament in said bulb, a base on said bulb having first, second and third external contact terminals for engagement with corresponding socket terminals, a rectifier in said base, means connecting said filament directly across said first and second contact terminals, and means connecting said rectifier across said second and third contact terminals, whereby to supply different levels of illumination upon connecting a current supply source across said first and second contact terminals and, alternatively, across said first and third contact terminals.

8. A lamp as set forth in claim 7 wherein the said rectifier is a semiconductor rectifier.

9. A lamp as set forth in claim 7 wherein the said rectifier is a silicon rectifier.

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