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LIGHT DIMMING ADAPTOR FOR THREE-WAY LAMPS

Filed May 18, 1960

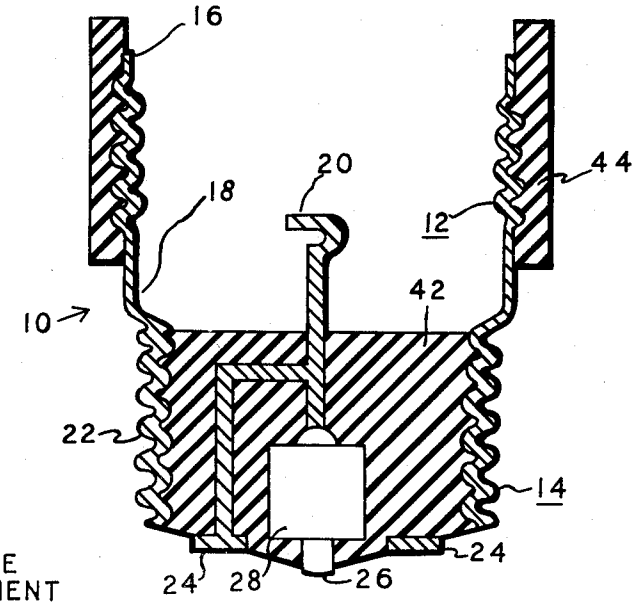

FIG. 1

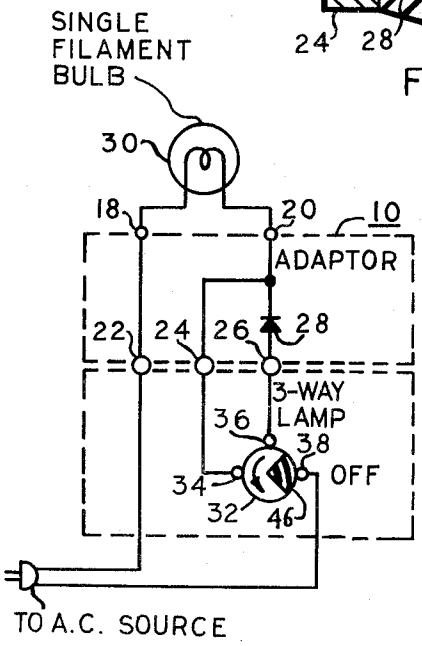

FIG. 2a

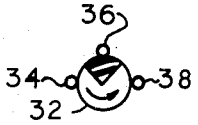

FIG. 2b

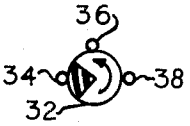

FIG. 2c

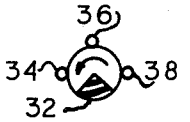

FIG. 2d

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LIGHT DIMMING ADAPTOR FOR THREE-WAY LAMPS

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This invention relates to the light dimming art, and in particular to an improved apparatus for converting a three-way floor or table lamp (that ordinarily accommodates a two-filament incandescent bulb to provide different illumination levels) to accommodate a common, single-filament incandescent bulb and still provide for different illumination levels from the bulb.

A three-way bulb socket, of the kind usable in residential table or floor lamps, normally requires the use of a two-filament incandescent bulb especially made for the purpose; the illumination level of the bulb is controlled by the selection of the filaments to be energized. Since the consumer cost of such a bulb is usually of the order of twice that of the conventional single-filament bulb, the purchase of a three-way floor or table lamp has heretofore committed the consumer to the continued purchase of the relatively costly two-filament bulbs.

Accordingly, one of the objects of this invention is to provide an improved means for enabling the owner of a three-way lamp to use single-filament bulbs in the lamp and still be able to secure different illumination levels from the lamp.

The foregoing and related objects are realized by the use of the improved adaptor apparatus of the invention. In one embodiment of the invention the adaptor apparatus takes the form of an elongated screw-in device. One end of the device is threaded to receive a common, single-filament bulb; the other end of the device is threaded for insertion into the bulb receiving socket of the three-way lamp to be converted. The bulb receiving or female end of the device has the usual two bulb-receiving terminals; the other end, the male end of the device, is provided with an array of three terminals corresponding in location to the three terminals of the conventional three-way bulb. A first terminal of the female end is connected to a first terminal of the male end; the second terminal of the female end is connected to a second terminal of the male end, and; the third terminal of the male end is electrically connected to a half-wave rectifier, the rectifier in turn being connected to the second terminal of the female end. In operation of the device, when a single filament bulb is screwed into the device and the device is in turn screwed into a three-way lamp socket, the bulb glows at its full illumination level when current passes from the socket directly through the adaptor and to the bulb, the bulb glows at an appreciably reduced illumination level when the path of the electric current is switched by the socket first through the rectifier in the adaptor and then to the bulb, and the bulb is turned off when the electrical connection to the bulb is broken.

In the accompanying single sheet of drawings, wherein like reference characters refer to like or corresponding parts:

FIGURE 1 is a sectional view of an adaptor according to the invention;

FIGURE 2*a* is a schematic representation of a circuit wherein a three-way lamp is adapted to accommodate a single-filament bulb by means of the adaptor depicted in FIGURE 1; and

FIGURES 2*b*, 2*c*, and 2*d* are schematic representations of respectively, successive positions of a switch arrangement illustrated in FIG. 2*a*.

This invention is predicated upon the use of half-wave rectification for reducing the illumination level of an incandescent bulb to an appreciably lower or dimmer level, and makes use of this principle to provide an arrangement for easily, inexpensively, and effectively modifying three-way lamps (which normally accommodate two-filament bulbs) to accommodate single-filament bulbs and still provide different illumination levels. A discussion of half-wave rectifier incandescent bulb control, and the advantages of such control over the use of resistive, inductive, and capacitive arrangements, is provided in U.S. Patent 2,896,125 assigned to the same assignee as the present invention.

There are many occasions where it is desirable to reduce the illumination level of a residential environment to appreciably less than a normal or high intensity level. In the use of floor or table lamps this is usually accomplished by the use of three-way lamps, lamps that are constructed to accommodate a special incandescent bulb having two filaments. In this special two-filament bulb one of the two filaments provides an appreciably higher illumination level than the other filament. Thus, a selection of the filament to be energized effects a selection of the illumination level provided by the bulb. (This selection of illumination level is usually accomplished by a rotary type switch built into the lamp socket that accommodates the bulb.) While two appreciably different illumination levels are all that are ordinarily required in residential environments, the presence of two filaments in a single bulb has made possible the simultaneous energization of both filaments to provide a third illumination level. Hence, such two-filament bulbs are usually referred to as three-way bulbs. One typical bulb, for example, has a 50 watt filament to provide a low illumination level and a 200 watt filament to provide a high illumination level; the simultaneous energization of both filaments provides a 250 watt illumination level that is almost imperceptively brighter than the 200 watt illumination level. In the use of the adaptor of the invention, by way of comparison, a single filament, 200 watt bulb can be energized to provide an effective 200 watt illumination level, and can also be energized at a second position to provide an illumination level corresponding to of the order of about 75 watts.

Referring to FIG. 1, the elongated adaptor **10** is made up of a male base member **14**, a female bulb-receiving member **12**, and uni-directional current passage device or rectifier **28**. The male member **14** is threaded for insertion into the bulb-receiving socket (not shown) of the three-way lamp (not shown) to be adapted. To this end the male member **14** is provided with an array of three coaxial parts or terminals: an outermost terminal **22**, an intermediate terminal **24**, and an innermost terminal **26**. These terminals correspond in location to the three terminals of the conventional three-way bulb whose place is to be taken by the adaptor **10**.

The female or bulb-receiving member **12** is threaded to receive a common, single-filament bulb (indicated schematically in FIG. 2*a* by the numeral **30**). To this end the female member **12** has two coaxial parts or terminals, an inner terminal **20** and an outer terminal **16**.

The outermost terminals **16** and **22** of the male and female members are electrically connected to each other and, as indicated in FIG. 1, are integral with each other. In the device of FIG. 1 the inner terminal **20** of the female member **12** is electrically connected to the intermediate terminal **24** of the male member **14**. The rectifier **28**, which may for example take the form of a silicon diode, is electrically connected in series between the inner terminal **20** of the female member and the innermost terminal **26** of the male member **14**.

At least a portion of the region within the outermost

terminal 22 of the male member, and containing the rectifier 28, is preferably filled with an insulating material 42 in order to fix the rectifier and the male member terminals against movement, and at the same time to impart a greater rigidity to the overall adaptor structure.

A band of insulating material 44 is fixed around the outer terminal 16 of the female member 12 in order to assure that no metallic portions of the adaptor 10 will be normally contacted during insertion of the adaptor into a lamp.

In order that the adaptor 10 of the invention be able to better accommodate the bulb socket of the three-way lamp to be adapted, the elongated dimension of the adaptor 10 is preferably made as small as possible. Accordingly, the distance between the entrance portion of the female member (the portion indicated by numeral 16) and the closed portion of the female member (the portion indicated by numeral 18) is made relatively small, as is the distance between the closed portion 18 of the female member and the base portion of the male member (the portion adjacent to the inner terminal 20). Similarly, the distance between the base portion of the male member and its terminal portion (the portion of the male member adjacent to the innermost terminal 26) is also made relatively small. For example, it has been found that an overall length of about 1½ inches is sufficient to enable the adaptor 10 to provide both the desired physical support for the bulb accommodated by the adaptor and the desired electrical connections, and at the same time allow the adaptor 10 to be screwed into a three-way lamp socket to an extent sufficient to enable the socket both to physically support the adaptor and to make the desired electrical contact with the adaptor.

While the rectifier 28 is illustrated as being connected between the inner terminal 20 of the female member 12 and the innermost terminal 26 of the male member 14, it will be appreciated that the rectifier may instead be connected between different combinations of male and female member terminals. Thus, for example, the rectifier 28 may instead be positioned and electrically connected between the intermediate terminal 24 of the male member and the inner terminal 20 of the female member, with this inner terminal 20 and the male member innermost terminal 26 directly connected to each other.

FIGS. 2*a*, 2*b*, 2*c*, and 2*d* will now be referred to in connection with a description of the operation of the adaptor of the invention. FIG. 2*a* schematically depicts the adaptor 10 described above, the single-filament bulb 30 whose illumination level is to be controlled, and the three-way lamp to be converted for reception of single-filament bulbs. The three-way lamp to be converted normally includes a rotary switch having a rotor 32 and three rotor terminals 34, 36, and 38. Alternating current is received by the lamp by means of a conventional two-wire cord. One current supply wire is connected to directly energize the device mounted in the lamp (the wire terminating at the terminal 22). The other current supply wire is connected to one terminal 38 of the rotary switch.

The rotor 32 of the rotary switch has a circumferential extant that is integral and electrically conductive along approximately 270° of its circumference, and that is insulating along approximately 90° of its circumference (the portion of the rotor indicated at numeral 46). The angular position of the rotor 32 determines whether current will be passed from terminal 38 to terminal 36, from terminal 38 to terminal 34, or whether no current shall flow through the lamp. In the position of the rotor 32 illustrated in FIG. 2*a*, the insulating portion 46 of the rotor is adjacent to terminal 38; hence, no current flows through the lamp. In a successive position of the rotor, depicted in FIG. 2*b*, the insulating portion of the rotor 32 insulates terminal 36, but directly connects terminals 38 and 34; hence current passes from terminal 38, through terminal 34, and to the other terminal 24 of the device connected to the lamp. In a successive position of the rotor, depicted in FIG. 2*c*, the insulating portion of the rotor 32 is positioned adjacent to terminal 34, and terminals 38 and 36 are electrically connected to each other through the rotor; thus, current passes from terminal 38 to terminal 36, and to a third terminal 26 of the device connected to the lamp. In a further successive position of the switch, illustrated in FIG. 2*d*, the terminal 38 is electrically connected to both terminals 34 and 36; current thus passes from terminal 38 to both of the device terminals 24 and 26.

From the foregoing it is seen that one terminal 22 of the adaptor 10 (FIGS. 1 and 2*a*) is always connected to the alternating current source, while the other terminals 24 and 26 of the adaptor are selectively energized under the control of the rotor 32 of the lamp.

During successive switching operations the adaptor 10 will control the illumination level of the single-filament bulb 30 to off, bright, dim, and bright as the lamp switch takes the positions represented in, respectively, FIGS. 2*a* through 2*d*. These successive positions represent, respectively, a condition where no current flows through the bulb 30, a condition where the full source alternating current is passed to the bulb to effect its illumination at a full brilliancy level, a condition where pulsating direct current is passed to the bulb by virtue of the connection of the rectifier 28 in series with the bulb (whereupon the bulb is illuminated at an appreciably lower than a full brilliance level), and another condition where the full source alternating current is passed to the bulb to again effect its illumination at a full brilliancy level.

In the illustration of FIG. 1 it should be noted that the rectifier 28 is physically located so that the innermost male member terminal 26 is in immediate adjacency to the rectifier. This preferred arrangement is desired for the reason that any heat generated in the rectifier 28 will be quickly conducted to the innermost terminal 26, and then to the lamp portion with which this terminal is in contact. The high thermal conductivity of the arrangement allows the rectifier to be operated at a higher current rating than would be the case if the rectifier were thermally insulated from any of the adaptor terminals 22, 24, or 26 that mate with the lamp.

Indeed, in the arrangement depicted in FIG. 1, the innermost terminal 26 may itself comprise one of the rectifier terminals.

As is explained in greater detail in co-pending application Serial No. 29,880, filed simultaneously with this application, and entitled Incandescent Lamp Light Switch Arrangement, invented by Robert C. Morton, and assigned to the same assignee as the present invention, the arrangement of FIG. 1 has yet another advantage. An incandescent bulb filament has appreciably less resistance when it is cold than when it is hot; the momentary current flow through a cold bulb filament is of the order of 25 times that of the normal flow through a hot filament. The subjection of a rectifier, especially a silicon crystal diode, to the cold flow current leads to a shortening of the life of the rectifier by virtue of the overload presented to the rectifier each time that it controls current flow to a cold bulb. In the arrangement depicted in the drawings, the bulb is always subjected to full brilliancy energization prior to a subjection to low level illumination. Hence, the bulb is always heated to its normal, hot operating level prior to the subjection of the rectifier to bulb intercepting current flow. Consequently, this arrangement obviates the need for heavy duty rectifiers in the arrangement of the invention.

From the foregoing it is seen that the arrangement of the invention provides an improved means for enabling the owner of a three-way lamp to use single-filament bulbs in the lamp and still be able to secure appreciably different illumination levels from the lamp.

What is claimed is:

1. In combination: a female member having an en-

trance portion and a closed portion; a male member having a terminal portion and a base portion; with said male member mounted on said female member such that said base portion of said male member is adjacent to closed portion of said female member; said terminal portion of said male member having two inner parts and one outer part, and said closed portion of said female member having inner and outer parts; said outer part of said female member being connected to said outer part of said male member, and said inner part of said female member being connected to one of the inner parts of said male member; and a uni-directional passage device connected between said inner part of said female member and the other one of said inner parts of said male member.

2. The combination claimed in claim 1, wherein said parts of said male and female members are coaxial, and wherein said uni-directional passage device comprises a diode having a terminal integral with said other one of said inner parts of said male member, thereby to provide a high thermally conductive path between said device and said terminal portion of said male member.

3. In combination: a three-way electric lamp having a three terminal female socket of the kind normally used for the receipt of a male portion of a two filament, three-way incandescent bulb; and an adaptor unit mateable with said three terminal lamp socket for enabling said socket to receive single-filament incandescent bulbs and controlling the illumination level of such single-filament bulbs to uniquely different illuminations levels.

4. In combination: a three-way electric lamp having a threaded three terminal female socket of the kind normally used for the receipt of a male portion of a threaded two filament, three-way incandescent bulb; and an adaptor unit mateable with said three terminal lamp socket for enabling said socket to receive single-filament incandescent bulbs and controlling the illumination level of such single-filament bulbs to uniquely different levels.

5. An adaptor arrangement for converting a three-way incandescent bulb socket for the receipt of a single-filament bulb, while enabling the single-filament bulb to provide two uniquely different levels of illumination during normal operation of the socket, comprising: a male member; a female member fixed to said male member; and a unilateral conduction device electrically connected between said members; said male member having three mutually insulated electrical terminals with said terminals being arranged to mate with corresponding terminals in a normal three-way lamp socket during insertion of said male member into said socket; said female member having two mutually insulated terminals arranged to mate with corresponding terminals of a normal single-filament bulb; a first of said male terminals being connected to a first of said female terminals, a second of said male terminals being connected to the second of said female terminals, and said unilateral conduction device electrically connected between the third of said male terminals and said second of said female terminals.

6. An adaptor arrangement for converting a switch controlled three-way incandescent bulb socket for the receipt of a single-filament bulb, while enabling the single-filament bulb to provide two uniquely different levels of illumination during normal operation of the switch, comprising: a male member; a female member fixed to said male member; and a diode electrically connected between said members; said male member having three mutually insulated electrical terminals with said terminals being arranged to mate with corresponding terminals in a normal three-way lamp socket, said female member having

two mutually insulated terminals arranged to mate with corresponding terminals of a normal, single-filament bulb; a first of said male terminals being threaded, a first of said female terminals being threaded, with said first terminals being fixed to each other; a second of said terminals being connected to the second of said female terminals, and said diode being electrically connected between the third of said male terminals and said second of said female terminals.

7. In combination: a three-way electric lamp having a three terminal female socket of the kind normally used for the reception of a male portion of a two-filament, three-way incandescent bulb; and an adaptor unit mateable with said three-way lamp socket for enabling said socket to receive single-filament incandescent bulbs and controlling the illumination level of such single-filament bulbs to uniquely different illumination levels; said adaptor comprising two members, one of said members including an array of three electric terminals corresponding in position to the three electric terminals of the three-way bulb normally insertable into said lamp socket, and a second member having two terminals arranged in an array to receive the normal, single-filament to be converted for use in said lamp; and rectifier means electrically connected between one of the three terminals of said first member and a second of said three terminals of said first member.

8. The combination claimed in claim 7, wherein said three terminals of said first member are arranged in a co-axial array, with one terminal lying on the axis of said array; and integral with said rectifier means for providing a high thermal conductivity path between said rectifier means and said last-named terminal, thereby to enable said last-named terminal to mate with said lamp socket to provide a heat sink for said rectifier means.

9. An adaptor arrangement for manually converting a three-way incandescent bulb socket for the receipt of a single-filament bulb, during continued energization of said socket from a source of electricity to enable the single-filament bulb to provide two uniquely different levels of illumination during normal operation of the socket, comprising: a male member; a female member fixed to said male member; and a diode electrically connected between said members; said male member having three, mutually insulated electrical terminals with said terminals being arranged to mate with corresponding terminals in a normal three-way lamp socket during insertion of said male member into said socket; said female member having two mutually insulated terminals arranged to mate with corresponding terminals of a normal, single-filament bulb; a first of said male terminals being connected to a first of said female terminals, a second of said male terminals being connected to the second of said female terminals, said diode electrically connected between the third of said male terminals and said second of said female terminals; one of said female terminals defining a generally cylindrical metallic element adapted to support the single-filament bulb therein; and a generally cylindrical insulating element disposed around and fixed to said metallic element to provide a means for manually grasping said adaptor arrangement during insertion into said electrically energized socket without electrical shock hazard.

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