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H. FASOLA

3,372,302

ADAPTOR MECHANISM FOR LIGHT CIRCUITS

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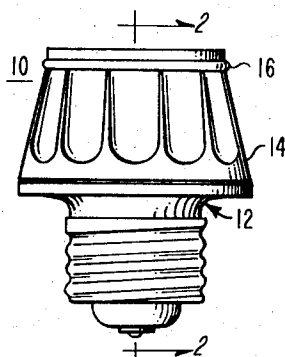


FIG.-1

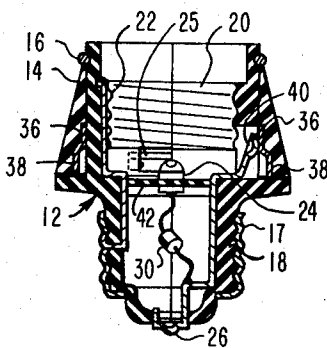


FIG.-2

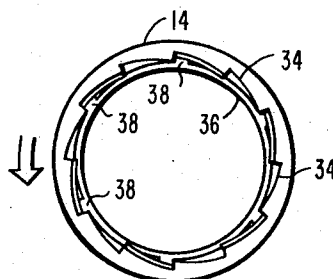


FIG.-3

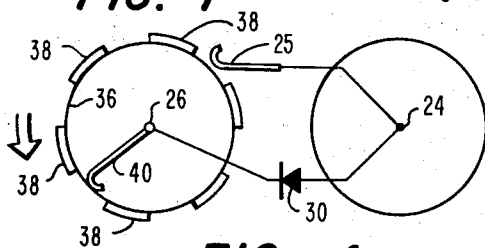


FIG.-4

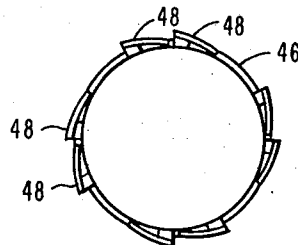


FIG.-5

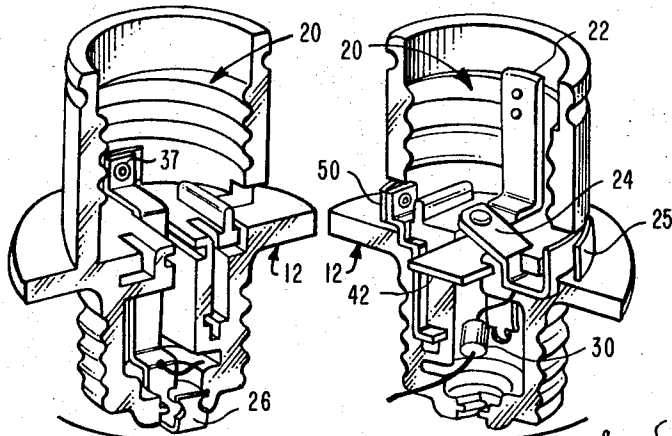


FIG.-7

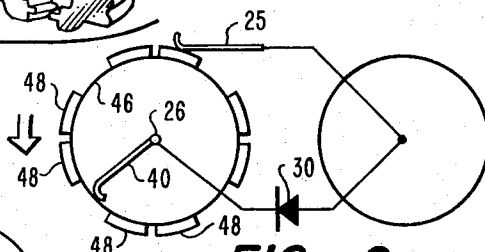


FIG.-6

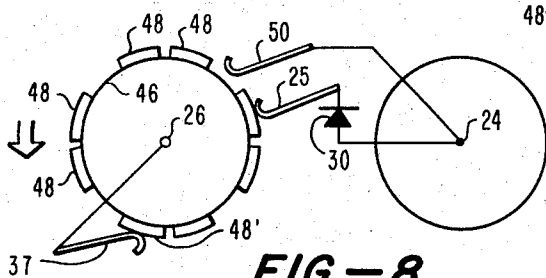


FIG.-8

INVENTOR
HENRY FASOLA, JR.

BY *Fraser and Bogucki*
Albert Rosen
ATTORNEYS

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ADAPTOR MECHANISM FOR LIGHT CIRCUITS
Henry Fasola, Los Angeles, Calif., assignor to California
Computer Products, Inc., Anaheim, Calif., a corpora-
tion of California

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This invention relates to mechanisms for receiving and controlling light bulbs, and more particularly to adaptors for permitting a different type of operation of a light bulb, than the primary purpose for which the light bulb is designed.

It has become common in domestic and in industrial lighting applications to use a dimming effect for purposes of economy or more pleasant lighting. There are two principal ways in which these results are accomplished, these being typified by the "three-way" bulb and the light dimmer switch.

To use the three-way bulb construction, the light socket is specially designed with two or more concentric contact rings which are arranged to complete circuits with complementary contacts on the light bulb. Two different filaments are contained within the bulb and are connected in such fashion that one filament may be used for one lighting intensity, the other may be used for a higher lighting intensity, and both together may be used for a maximum lighting intensity. These changes are effected by selection of the desired one of three different switch positions which control the circuits in the socket.

Light dimmer mechanisms have been designed for installation in wall switches. The circuits of such mechanisms include one or more rectifying elements, which may exhibit a continuously variable impedance characteristic over a limited range, and which therefore may be inserted in circuit with the power line to block either half or a selected different part of the alternating current wave. Thus, in this example, the power supplied in the circuit to a controlled light bulb is diminished to achieve the dimming effect.

In addition, light dimming adaptor mechanisms have been developed for adapting a single filament bulb for use in a three-way socket with a dual level of illumination under the control of the switch associated with the three-way socket. Particular examples of such mechanisms may be found in U.S. Patent 3,028,523 of Eugene Seid entitled "Light Dimming Adaptor for Three-Way Lamps" and in U.S. Patent 3,028,525 of Robert C. Morton entitled "Incandescent Lamp Light Switch Arrangement." In such mechanisms, an adaptor is described as provided with a diode completing a circuit path between one of the extra contact rings of the three-way socket and the central terminal of the adaptor making contact with the light bulb, thereby reducing the power transmitted to the light bulb filament when that particular contact ring of the socket is energized.

Although the above-mentioned adaptor mechanisms permit the use of lower cost, single filament bulbs in a three-way socket, they are of no use in conjunction with the conventional on-off socket insofar as effectuating a light dimming or dual level of illumination for such sockets is concerned. With switch-mounted light dimmer mechanisms, on the other hand, a problem arises from the fact that it is not often desirable to have light level control for a lamp at a wall switch. Even if it is not inconvenient to operate the wall switch to adjust the light level of a lamp, as in the case where a lamp is plugged into a wall outlet which is controlled by the wall switch, all other light sources which are coupled into the wall switch circuit are necessarily modulated in intensity in

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the same manner, which effect may be the opposite of that which is intended.

It is therefore an object of the present invention to provide an improved light dimmer adaptor mechanism.

It is another object of the present invention to provide an improved device for the individual control of the intensity of on-off light bulbs.

A further object of the present invention is to provide improved means for achieving step control of a normally single-intensity light source.

A more specific object of the present invention is to provide an adaptor for use with single filament bulbs in on-off sockets to establish a multi-level control of illumination from such bulbs.

In brief, particular arrangements in accordance with the present invention provide a light socket adaptor containing its own dimming mechanism and circuit which may be mounted in a simple on-off socket and is arranged to receive a single filament or on-off bulb which may be modulated to an intermediate light intensity in accordance with a switch control. In such arrangements, the adaptor mechanism body includes an external switch control element which may control the circuit to the light bulb separately, or in conjunction with the regular on-off switch of the lamp socket mechanism. In one particular arrangement in accordance with an aspect of the invention, the adaptor in one position diverts current through a diode rectifier contained therein to provide an intermediate level of illumination; and in another position the adaptor supplies current directly to the associated light bulb to provide a maximum level of illumination, with the off position of the lamp being controlled by the switch which is normally provided to control the lamp socket. In another particular arrangement in accordance with an aspect of the invention, a conventional three-way adaptor structure is employed with a diode rectifier being added in circuit between two of the terminals of the structure in order to provide a desired dimming effect for one position of the adaptor switch. In this particular arrangement, a position of bright intensity and a position of intermediate intensity are provided, with the off position being controlled by the on-off switch controlling the lamp. In still another particular arrangement of the invention, an adaptor mechanism incorporates a diode rectifier connected in the circuit thereof in a manner which provides a sequence of off, bright and dim positions of the adaptor control switch itself, in order to provide further protection of the diode rectifier and so that particular diode rectifiers having lower maximum current capabilities and therefore lower cost may be utilized.

A better understanding of the invention may be had from the following detailed description, taken in conjunction with the accompanying drawing, wherein:

FIG. 1 is a view of one particular structural arrangement of an adaptor mechanism in accordance with the invention;

FIG. 2 is a sectional view of the arrangement of FIG. 1 taken along the lines 2-2, and showing the position of a diode rectifier connected therein;

FIG. 3 is a view of a particular element of the arrangements shown in FIGS. 1 and 2;

FIG. 4 is a schematic representation of a portion of the circuit of the arrangement of FIGS. 1 and 2 corresponding to the element of FIG. 3;

FIG. 5 represents an alternative element of the arrangements of FIGS. 1 and 2 which may be substituted for the element depicted in FIG. 3;

FIG. 6 is a schematic representation of a portion of the circuit of the adaptor mechanism of the invention as shown in FIGS. 1 and 2 corresponding to the element shown in FIG. 5;

FIG. 7 is a perspective view of one particular arrange-

ment in accordance with the invention showing two halves of an adaptor mechanism together with the associated elements incorporated therewith; and

FIG. 8 is a schematic representation of a portion of the circuit of the adaptor mechanism in accordance with the invention shown in FIG. 7.

FIGS. 1 and 2 depict a particular structure which may be employed to embody the invention, FIG. 2 being a structural view taken along line 2—2 of FIG. 1. As therein shown, an adaptor device 10 comprises a main body structure 12 encircled by a collar 14 which is freely rotatable about the body structure 12 but is retained in position thereon by a retaining ring 16. The body structure 12 has at the lower end thereof a protruding, externally threaded base portion 18 which is adapted to be screwed into a conventional on-off type light socket and make electrical contact with the terminals thereof. The base portion 18 is substantially covered by a conducting sleeve 17 having matching threads which is affixed about the threaded section of the base portion 18 and also has a central terminal 26 at its lowermost point. The upper end of the body structure 12 contains a female socket portion 20 having internal threads adapted to receive the base of an ordinary single filament, on-off type light bulb and make electrical contact with the light bulb terminals. A thin metallic strip 22 is recessed along the threads of the female socket portion 20 in a position to make electrical contact with the threaded portion of the base of a light bulb which may be screwed into the socket portion 20. The strip 22 is electrically connected to the sleeve 17 at the base portion 18.

A spring terminal 24 extends to a central position within the female socket portion 20 for the purpose of maintaining electrical contact with the central base terminal of the conventional single-filament light bulb. A diode rectifier 30 is shown connected between the central spring terminal 24 and the central terminal 26 of the base portion 18. An insulator strip 42 is shown in position beneath the terminal 24.

As may be better seen in FIG. 3, which is a bottom view of the collar 14 of FIGS. 1 and 2, the collar 14 may comprise a plurality of regularly spaced, sloping recesses arranged about its inner bore at the base thereof. A conducting ring 36 having a plurality of protruding segments, or ears 38, is positioned within the collar 14 with the ears 38 engaging corresponding recesses 34 thereof. As shown in FIG. 3, the ears 38 are spaced about the ring 36 to correspond to alternate recesses 34. In the assembled position as shown in FIG. 2, the ring 36 bears against a wiper arm 40 which is an extension of the central base terminal 26 of the base portion 18. An additional wiper arm 25 is mounted at the outer end of the spring terminal 24 in a position to engage the recesses 34 and the ears 38 which are alternately positioned therein. Thus it may be seen that as the collar 14 is rotated about the body structure 12, the ring 36 is energized at the potential applied to the central base terminal 26 by means of the wiper arm 40 which maintains continuous contact with the ring 36. In this particular arrangement, however, the ears 38 are positioned only in alternate recesses 34 of the collar 14. Accordingly the wiper 25 alternately makes and breaks contact with successive ears 38 of the ring 36, thus alternately completing and breaking a circuit from the base terminal 26 directly to the spring terminal 24.

The electrical circuit of this structure may be better understood by referring to FIG. 4, which is a schematic diagram for an adaptor mechanism 10 employing the switch ring and wiper arrangement of FIGS. 2 and 3. As seen in FIG. 4, the wiper 40 which is connected to the central base terminal 26 maintains continuous contact with the ring 36 to which the ears 38 are connected as regularly spaced segments. The wiper 25 which is connected to the central socket terminal 24 alternately makes and breaks connections with the ears 38, depending upon

whether at any given setting of the switch collar 14 the wiper 25 is opposite an ear 38 or opposite a gap between adjacent ears 38. When the wiper 25 is in contact with an ear 38, an electrical path is provided from the terminal 26 directly to the terminal 24 via the wiper 40, the ring 36, an ear 38 and the wiper 25. Such a path completely bypasses the diode rectifier 30 so that an associated light bulb is operated at full brilliance. However, when the wiper 25 is opposite a gap between adjacent ears 38, the direct path is interrupted and the only path remaining between the terminals 24 and 26 is through the diode rectifier 30. In this case, the diode rectifier 30 blocks current from the associated light bulb filament for approximately half of the applied alternating current cycle so that the light bulb is operated at a reduced or intermediate level of brilliance. Thus by means of the arrangement depicted schematically in FIG. 4, an associated light bulb may be operated at full brilliance or reduced brilliance by rotating the switch collar 14 to select one or the other of these two conditions. With such an arrangement, it is intended that the light bulb may be switched off by operation of a switch (not shown) controlling the socket into which the adaptor mechanism 10 is inserted.

Similar control of the level of brilliance of the light bulb may be achieved by the use of a slightly different configuration for the ring section 36 of FIG. 3 in the adaptor mechanism 10 of FIGS. 1 and 2. Such a ring configuration is shown in FIG. 5 wherein a switch ring 46 is provided having a plurality of ears 48 spaced about its periphery and arranged to protrude in the fashion of the ears 38 of FIG. 3. The ears 48 are disposed by pairs so that two ears 48 are arranged adjacent one another followed by a gap and then another pair of ears 48. The corresponding circuit is shown schematically in FIG. 6. The operation of this configuration is similar to that described with respect to FIG. 4 except that the level of illumination for a light bulb so controlled follows the pattern of bright-bright-dim rather than the alternating bright-dim pattern of FIG. 4. It will be noted that the shape of the recesses 34 and the wipers such as 25 produce a ratchet effect which limits rotation of the switch collar 14 to one direction only.

Another particular embodiment in accordance with the invention is shown in FIG. 7 and represented schematically in FIG. 8 wherein an adaptor mechanism is arranged to permit turning off an associated light bulb as well as controlling the illumination level thereof and further to provide for the operation in a particular control sequence in a manner which serves to limit the current which is supplied through the associated diode rectifier, thus serving to protect the rectifier from unwanted current surges and advantageously permitting the use of particular rectifiers having lower current ratings. In FIG. 7, the main body structure 12 is shown in perspective view in two separate halves, together with the associated elements mounted therein. Principal differences between this arrangement and that shown in FIG. 2 lie in the substitution of a different type of wiper element 37 for the wiper 36 of FIG. 2 and in the different connection for the diode 30. Also, an additional wiper element 50 is provided to which one terminal of the diode rectifier 30 is connected. The other terminal of the diode rectifier 30 is connected to the spring terminal 24 as previously. A collar 14 having a ring member 46 like that shown in FIG. 5 is employed with the structure shown in FIG. 7 to provide an adaptor mechanism as shown in FIG. 1. All of the wipers 25, 37 and 50 are alike, and are arranged to make contact with the ears 48 of the ring 46 of FIG. 5 at appropriate positions thereof.

The operation of this arrangement may best be understood by reference to FIG. 8 which is a schematic representation of the corresponding wiper circuit. It will be seen that each of the wipers 25, 37 and 50 makes contact with a pair of ears 48 in succession followed by a gap

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during which contact is broken, and that the position of the wipers 25, 37 and 50 with respect to each other is such that, for the counterclockwise direction of rotation as indicated, the sequence of operation for an associated light bulb is off-bright-dim. In the position of the ring 46 as shown in FIG. 8, the wiper 37 makes contact with the particular ear 48', thus energizing the entire ring 46 from the central base terminal 26. Current is carried around the ring 46 to the wiper 25 and applied to the spring terminal 24 via the diode rectifier 30. For the position indicated, the light bulb will thereby develop an intermediate level of illumination. Rotation of the ring 46 to the next position places the wiper 37 opposite a gap between the ears 48 so that the ring 46 is not energized and no current is supplied to the terminal 24; thus the associated light bulb is turned off. In the next position, the wiper 37 is opposite an ear 38 and thus energizes the ring 46. Although the wiper 25 is opposite an ear 48, the wiper 50 which serves to bypass the path containing the diode rectifier 30 is also in contact with an ear 48 so that the associated light bulb is operated at full intensity following the off condition. As the ring 46 is rotated to the next position, a condition equivalent to that which is depicted occurs wherein the wiper 50 is again out of the circuit and current is applied through the diode rectifier 30. Rotation is permitted in only the direction indicated so that the off-bright-dim sequence is established.

Operation of the arrangement of FIGS. 7 and 8 in this manner advantageously insures that the associated light bulb is first heated to full intensity following the off condition and before the diode rectifier 30 is caused to conduct current. In order to further insure this particular operating sequence, the wiper 25 may be provided with a slightly extended portion so that it cannot possibly drop into a recess 34 of the collar 40 before the wiper 50 has made contact with the particular ear 48. By always insuring that the intermediate level of illumination follows the condition of full intensity, this arrangement of the invention provides that the surge of high current which is experienced when a light bulb filament is first energized is never permitted to pass through the diode rectifier 30. Consequently, lower cost rectifiers having lower current capabilities may be employed in this arrangement in accordance with the invention and the rectifiers are protected from the surge currents.

The various embodiments of the invention described above may be employed to provide desired dual levels of illumination from a single filament light bulb in a socket and switch mechanism which is designed for simple on-off control. Arrangements in accordance with the invention thereby advantageously attain multiple level illumination in low cost lamp structures which otherwise would not have such a capability. In addition, particular arrangements in accordance with the invention provide for on-off as well as multi-level illumination control of a single filament light bulb, and perform this control function in a particular sequence which automatically protects certain of the elements employed from undesirably high current surges.

Although there have been described above specific arrangements of adaptor mechanisms for light circuits in accordance with the invention for the purpose of illustrating the manner in which the invention may be used to advantage, it will be appreciated that the invention is not limited thereto. Accordingly, any and all modifications, variations or equivalent arrangements falling within the scope of the annexed claims should be considered to be a part of the invention.

What is claimed is:

1. An adaptor mechanism for light circuits, comprising: a body structure having a base portion including a threaded member for engagement in mating relation with a conventional on-off type light socket and having a pair of electrical terminals arranged to make contact with corresponding terminals of the socket; a body structure

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socket portion adjacent to said base portion, including a threaded member for engagement in mating relation with a base of a single-filament light bulb having two terminals at the bulb base, said socket portion having a pair of terminals for contacting the light bulb base terminals; a diode rectifier connected to one of said terminals of said socket portion for blocking part of the applied alternating current energizing the light bulb; and said body structure including switch means for alternately opening and closing a circuit path bypassing the diode rectifier for establishing dual levels of illumination in the associated light bulb.

2. An adaptor mechanism for light circuits comprising: a body structure having a base portion including a threaded member for engagement in mating relation with a conventional on-off type light socket and having a pair of electrical terminals arranged to make contact with corresponding terminals of the socket, the body structure including a socket portion including a threaded member for engagement in mating relation with a base of an ordinary single-filament light bulb and having a strip terminal and a central terminal positioned to contact corresponding terminals at the base of the light bulb, a diode rectifier connected to said central terminal for conducting only unidirectional current in a first circuit path to said central terminal, and the body structure including switch means for selectively opening and closing a second circuit path bypassing the diode rectifier for establishing dual levels of illumination in the associated light bulb.

3. A light circuit adaptor mechanism for providing dual levels of illumination for a single-filament light bulb operated from an on-off type of socket, comprising a body structure having a base portion and a socket portion, the base portion having a pair of terminals for making contact with corresponding terminals in an on-off type socket, the socket portion having a pair of terminals for making contact with corresponding terminals of the light bulb, means for establishing a first circuit path between two corresponding terminals of the socket and base portions of the body structure, a diode rectifier coupled to the remaining terminal of the socket portion, and means contained within the socket for selectively establishing a circuit path through said diode rectifier from the remaining terminal of the base portion and alternatively establishing a circuit path which bypasses said diode rectifier.

4. A light circuit adaptor mechanism for providing dual levels of illumination for a single-filament light bulb operated from an on-off type of socket comprising a body structure having a base portion and a socket portion, the base portion having a pair of terminals for making contact with corresponding terminals in an on-off type socket, the socket portion having a pair of terminals for making contact with corresponding terminals of the light bulb, means for electrically connecting two corresponding terminals of the socket and base portions of the structure, a diode rectifier coupled to the remaining terminal of the socket portion, and means for selectively establishing a first circuit path through said diode rectifier from the remaining terminal of the base portion and alternatively establishing a second circuit path which bypasses said diode rectifier, said circuit path establishing means also including means for opening said first and second circuit paths to turn off the light bulb.

5. A light circuit adaptor mechanism for providing dual levels of illumination for a single-filament light bulb operated from an on-off type of socket comprising a body structure having a base portion and a socket portion, the base portion having a pair of terminals for making contact with corresponding terminals in an on-off type socket, the socket portion having a pair of terminals for making contact with corresponding terminals of the light bulb, means for electrically connecting two corresponding terminals of the socket and base portions of the structure, a diode rectifier coupled to the remaining terminal

of the socket portion, switching means for selectively establishing a first circuit path through said diode rectifier from the remaining terminal of the base portion and alternatively establishing a second circuit path which bypasses said diode rectifier, said switching means also including means for opening said first and second circuit paths to turn off the light bulb, and means for causing the switching means to establish said circuit paths in a particular sequence providing an off-bright-dim control sequence for the light bulb.

6. A light circuit adaptor mechanism for providing a plurality of illumination levels in a single filament light bulb from an on-off type socket comprising a body structure including a generally cylindrical form having a generally central axis, said structure including a base portion for insertion in said socket and a socket portion for receiving the base of a single-filament light bulb, each of said base and socket portions having a pair of terminals, means interconnecting a corresponding pair of terminals of the base and socket portions, a diode rectifier connected between the remaining terminals of said base and socket portions, a first wiper arm connected to said remaining terminal of the base portion, a second wiper arm connected to said remaining terminal of the socket portion, and rotatable switch means mounted within said body structure for effecting switching operation by rotational motion of a portion thereof in a plane normal to the axis of said body structure for selectively providing a circuit path between said wiper arms in order to bypass current from said diode rectifier.

7. A light circuit adaptor mechanism comprising a body structure having a base portion and a socket por-

tion, each portion having a threaded section and a central terminal, the base portion being adapted for insertion in an on-off type socket, the socket portion being adapted to receive the base of a single-filament light bulb; a diode rectifier connected to the central terminal of the socket portion; a rotatable switch ring having a plurality of conducting segments separated by spaces; first, second and third wiper elements selectively positioned to make contact with said segments in a particular sequence as the switch ring is rotated, the first wiper element being connected to the diode rectifier on the side remote from said central terminal of the socket portion, the second wiper element being connected directly to the central terminal of the socket portion, and the third wiper element being connected directly to the central terminal of the base portion; and means for permitting rotation of said switch ring only in a selected direction to establish an off-bright-dim sequence of illumination for a light bulb inserted in the adaptor mechanism.

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JOHN W. HUCKERT, *Primary Examiner*.

D. O. KRAFT, J. SHEWMAKER,

Assistant Examiners.