Sept. 19, 1961 R. C. WOOFTER ET AL 3,001,165

LAMP SOCKET AND TERMINAL MEANS FOR PRINTED CIRCUITS

Filed Feb. 24, 1958

2 Sheets-Sheet 1

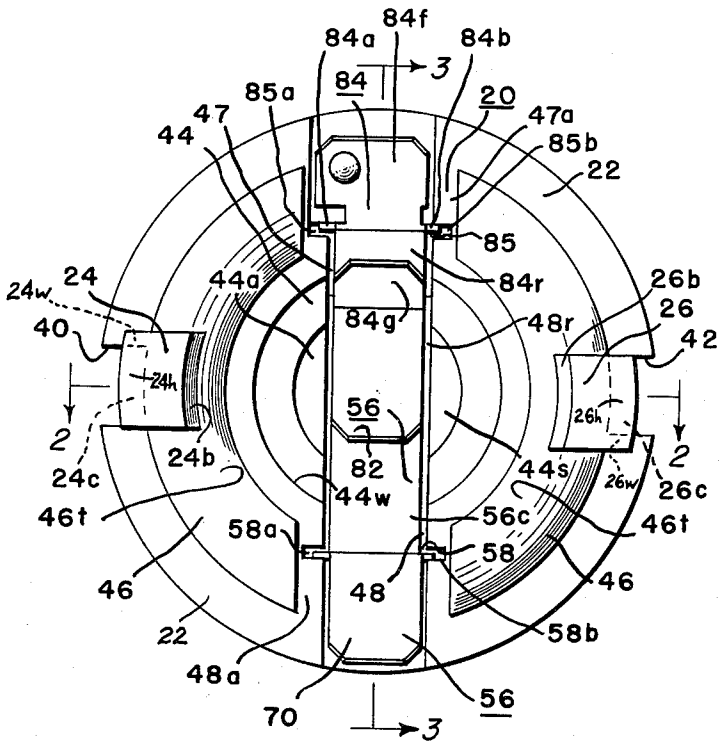


Fig. 1

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2 Sheets-Sheet 2

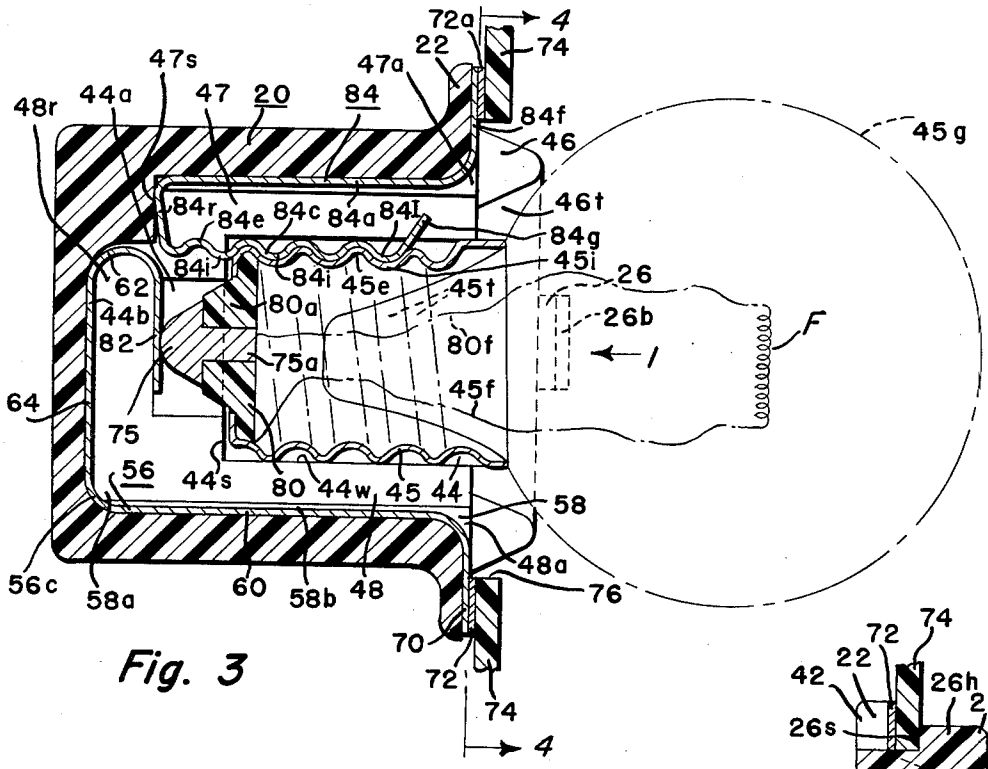


Fig. 3

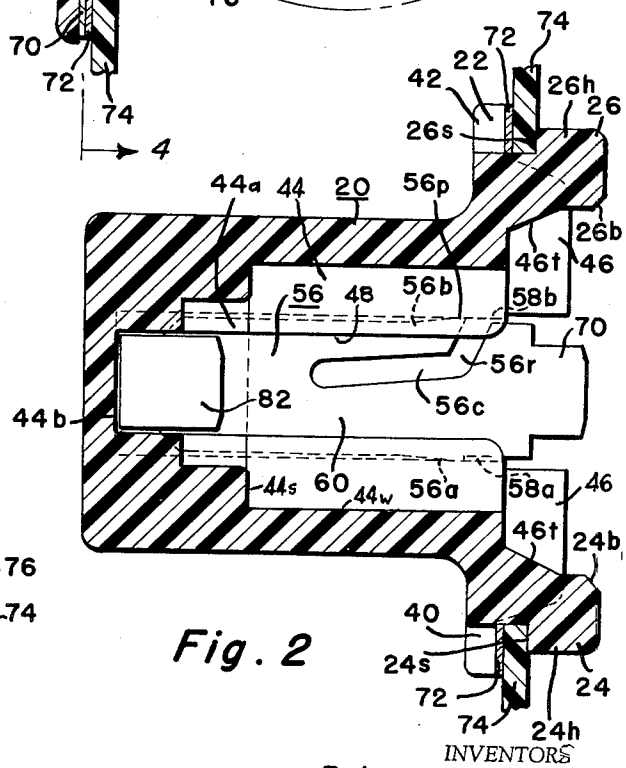


Fig. 2

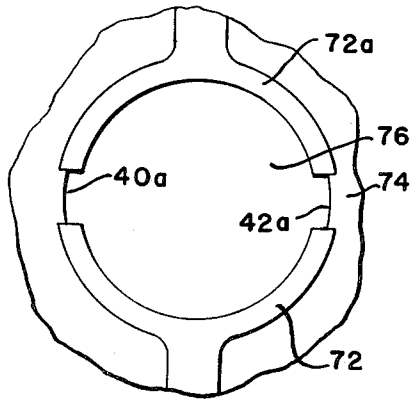


Fig. 4

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3,001,165
LAMP SOCKET AND TERMINAL MEANS FOR PRINTED CIRCUITS

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This invention relates to a lamp socket and terminal means thereof for printed circuits, and, particularly, to a lamp socket and terminal means for connecting a screw-base-type lamp bulb with a printed circuit on an insulating board.

An object of this invention is to provide new and improved lamp socket and terminal means for connecting a screw-base-type lamp bulb with a printed-circuit-type conducting means supported on an insulating board mounting therefor.

Another object of this invention is to provide a lamp socket adapted to receive screw-base-type-lamp-supporting terminal means including a grounding terminal to provide electrical contact between a printed circuit-type conductor on an insulating board and screw threads on a conducting-metal base of a lamp bulb.

Another object of this invention is to provide a lamp socket having an insulating body adapted to have bayonet-type fastening lugs cooperable with slots extending radially outwardly from a hole through an insulating board carrying printed-circuit-type conducting material engaged by ends of terminal means provided to be complementary to a tip and screw-threads of a base of a lamp bulb electrically connectible with the printed-circuit-type conducting material.

Another object of this invention is to provide a terminal adapted to be carried longitudinally relative to an insulating body portion of a lamp socket and having one end portion provided to contact a printed-circuit-type conducting material secured to an insulating board and having an opposite end portion bent complementary to screw-threads of a metal base portion of a lamp bulb to be supported and electrically connected through the terminal to the printed-circuit-type conducting material.

Another object of this invention is to provide terminal means adapted to be carried longitudinally relative to an insulating body portion of a lamp socket and having one end portion provided to contact a printed-circuit-type conducting material secured to an insulated mounting means and having a portion bent complementary to screw-threads of a metal base portion of a lamp bulb to be supported and electrically connected through the terminal means to the printed-circuit-type conducting material for use in combination with each other.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIG. 1 is a plan view looking into an open end of an insulating body of a lamp socket provided with terminal means in accordance with the present invention.

FIG. 2 is a cross-sectional view taken along line 2—2 of FIG. 1 and including a fragment of an insulating material mounting board having a printed-circuit-type conducting material secured thereto.

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 1 and including a phantom of a screw-base-type lamp bulb and a fragment of an insulating material mounting board having a printed-circuit-type conducting material secured thereto.

FIG. 4 is a plan view taken in the direction of arrows 4 in FIG. 3 to show an insulating-material mounting board having a printed-circuit-type conducting material secured thereto about peripheral portions adjacent to a hole through the board for supporting the lamp socket and terminal means thereof in accordance with the present invention.

The objects are accomplished according to the present invention by the provision of the lamp socket formed of nylon, Tefion, Bakelite, or some other suitable hard plastic which is, itself, supported directly relative to an insulating board having a printed circuit material on one side thereof. The socket, as shown in FIG. 1, includes a body portion 20 from which a flange or radial shoulder 22 integral therewith projects radially outwardly to be engageable with an insulating board or panel as will be described later. Also integral with the body portion 20 and extending axially from the body portion on one side of the flange 22 are a pair of locking projection arms or lugs 24 and 26. These lugs are formed to cooperate with slots used in a bayonet type fastening relative to the printed circuit panel as will be described.

FIG. 1 also shows a pair of diametrically opposite cut-out portions 40 and 42 extending radially inwardly relative to the flange 22 and used to provide bayonet slots adjacent to the projection arms 24 and 26. These cut-outs 40 and 42 are adapted to permit resilient engagement of the body portion 20 and flange 22 thereof relative to a mounting panel when the arms cooperate with slots provided in the printed circuit panel as will be described.

FIG. 2 is a cross sectional elevational view taken on line 2—2 of FIG. 1 and shows a central chamber 44 formed inside the body portion 20 of the socket adapted to receive a base 45 of a lamp bulb visible in the cross sectional view of FIG. 3 taken along line 3—3 of FIG. 1. The drawings show an axially extending pair of semi-circular walls 46 having a tapered outer periphery formed integral with the locking projection arms 24 and 26 to provide a spacing means for insulating and separating the base 45 of the lamp bulb from possible contact with conducting portions of the printed circuit panel into which the socket is fitted when assembled as explained below. The chamber 44 is of substantially the same diameter throughout except for outwardly projecting recess portions 47 and 48 adapted to accommodate and receive terminal means in accordance with the present invention. The recesses 47 and 48 extend longitudinally and axially of the chamber 44 and also have lateral cutout portions 47*a* and 48*a* provided between the semi-circular walls 46 having the tapered outer periphery. The purpose of the lateral cutout portions 47*a* and 48*a* is to provide a gap through which a lateral portion of the terminal means can be projected for contacting the printed circuit panel as will be more fully described below.

In FIGURES 1, 2, and 3 there is shown a terminal or contact generally indicated by numeral 56. The recess portion 48 of the chamber 44 is provided with a radially out-

wardly located groove portion 58 adapted to provide space in which an axially-extending or longitudinal body portion 60 of the terminal 56 is positioned. A U-shaped or curved portion 62 of the terminal 56 extends into a bottom portion 44*a* of the chamber 44 and is resiliently connected relative to the longitudinal body portion by a lateral portion 64 bent transversely relative to the body portion and engaging a bottom 44*b* of the chamber portion 44*a*. There are two laterally extending recess portions or slots 58*a* and 58*b* formed to extend to opposite sides of the radially outwardly located groove 58 of recess portion 48 and side wings 56*a* and 56*b* provided extending laterally on opposite sides of the body portion 60 are slidable longitudinally therein. The body portion 60 has an L-shaped cutout portion including a radial gap 56*r* and longitudinally cutout gap 56*c*. Adjacent to the open end of the L-shaped cutout portion there is a barb or tang point 56*p* which is adapted to bite into a side of slot 58*b* for locking terminal means 56 in the insulating body 20.

A bent over portion or contact tongue 70 of the terminal 56 extends radially outwardly away from one end of body portion 60 and into cutout portion 58*a* extending laterally outwardly from the chamber 44. Tongue 70 is adapted to be engageable with a conducting material 72 of a printed circuit on an insulating board or panel 74 as shown in FIGURES 2 and 3. The panel of which only fragments are shown in FIGURES 2 and 3 is shown in a plan view in FIG. 4. The plan view of FIG. 4 shows an aperture 76 provided in the panel 74 and the printed circuit material 72 and 72*a* is provided having a semi-circular structure partially surrounding a peripheral portion of the aperture 76. The printed circuit material 72 and 72*a* is separated from connection relative to each other because cutout portions 40*a* and 42*a* are provided extending radially outwardly at diametrically opposite sides of aperture 76. The cutout portions 40*a* and 42*a* are adapted to be complementary to and to permit passage of the lugs 24 and 26, respectively, located adjacent to cutout portions 40 and 42 formed with the flange 22 of the body or insulating housing of the socket. The lugs are visible both in FIGURES 1 and 2 and are adapted to be insertable through the cutout portions 40*a* and 42*a* of the panel 74. The lugs 24 and 26 serve as part of a bayonet-type fastening and as guides or aligning means for properly positioning the terminal means of the lamp socket relative to the conducting portions 72 and 72*a* of the printed circuit material on insulating panel 74.

The lugs 24 and 26 each have a head portion 24*h* and 26*h*, respectively, underneath which there is provided a cutout portion 24*c* and 26*c* for interlocking the insulating housing of the lamp socket with the panel 74. The cutouts 24*c* and 26*c* are spaced longitudinally of the cutout portions 40 and 42 respectively as shown in FIG. 1. As shown in FIG. 2 a pair of shoulder portions 24*s* and 26*s* are formed at one side of the head portions 24*h* and 26*h* so that the panel 74 and printed circuit material 72 and 72*a* are sandwiched or wedged firmly between flange 22 and shoulders 24*s* and 26*s* when the insulating housing is inserted in aperture 76 and lugs 24 and 26 with body 20 are rotated a short annular distance corresponding to cutouts 24*c* and 26*c* under lugs 24 and 26 projected into the cutout portions 40*a* and 42*a* respectively of the panel. Webs 24*w* and 26*w* interconnect the flange 22 and one end of head portions 24*h* and 26*h* as indicated in FIG. 1. These webs serve as stops to limit rotation of the body 20 relative to the cutout portions 40*a* and 42*a*. Thus in effect the insulating housing or body 20 is secured to the panel 74 by a bayonet type fastening provided by the lugs 24 and 26 engageable through cutout portions relative to the printed circuit panel. The lugs 24 and 26 each have a beveled portion 24*b* and 26*b* adapted to cooperate with a glass envelope portion 45*g* secured to the base 45 of a lamp bulb adapted for use in the lamp socket of the present invention. The wall 46 as well as the beveled portions 24*b* and 26*b* of the lugs help to align the socket insulating housing relative to the panel and also serve to separate conducting material such as 72 and 72*a* from possible engagement with the cylindrical base 45 of the lamp bulb.

The base 45 of the lamp bulb is a substantially cylindrical structure formed of metal such as brass and constitutes one contact of the bulb. A second contact or central tip member 75 is provided and separated from the base by insulating material 80. This relationship of the base 45 and contact 75 is illustrated in FIG. 3 where there is also shown a longitudinal portion 75*a* of contact 75 extending through a central portion 80*a* of the insulating material 80. One end 80*f* of a filament F provided inside the glass envelope portion 45*g* of the lamp bulb is connected to the longitudinal portion 75*a* of the contact 75. An opposite end 45*f* of the filament is connected by soldering or by wedging of an end of the filament 45*f* to the inner periphery of the base 45 adjacent to the outer periphery of the insulating material 80. The contact 75 is engageable with a resilient free end 82 of the terminal 56 to provide electrical connection through the flag or tongue portion 70 against printed circuit conducting material 72 as indicated in FIG. 3.

As best illustrated in FIG. 3, the insulating housing or body 20 also is adapted to receive a second or ground terminal generally indicated by numeral 84. This ground terminal 84 is inserted in a radially outwardly located groove portion 85 provided at a laterally outward portion of recess 47. Both the terminals 56 and 84 are locked firmly into engagement with the insulating body 20 relative to the grooves 58 and 85 respectively through lateral portions such as 56*a* and 56*b* including tang points such as 56*p* which are slidable and engageable with slots on opposite sides of the grooves 58 and 85. The specific lateral locking structure of the terminals relative to these grooves is not part of the present invention but is illustrated for clarity only in FIG. 2. In FIG. 2 the terminal 56 is shown having lateral portions 56*a* and 56*b* inserted in undercuts or slots 58*a* and 58*b* of the groove 58 provided adjacent to the lateral recess 48. The lateral portions 56*a* and 56*b* are slidable longitudinally relative to these undercuts 56*a* and 56*b* and a positive engagement of the terminal 56 relative to the body 20 is assured by the sharp tang or point 56*p* which can be formed to bite into the insulating material at a location adjacent to the L-shaped cutout having the longitudinal cutout portion 56*c* and radial cutout portion 56*r* in the terminal 56 as shown in FIG. 2. It is to be understood that a similar locking structure such as provided by the lateral portions 56*a*, 56*b*, and tang 56*p* of terminal 56 should be provided for the terminal 84. This is evidenced by the view in FIG. 1 where there is shown an end view of the terminal 84 including a showing of lateral portions 84*a* and 84*b* inserted in undercuts 85*a* and 85*b* of groove portion 85 of recess 47.

In accordance with the present invention, the terminal means 84 is provided with a corrugated portion 84*c* at an end of the terminal 84 opposite to a flag portion 84*f* adapted to contact printed circuit conducting material 72*a*. As visible in FIG. 3, the terminal 84 has a longitudinal body portion 84*a* which extends axially of the recess 44 and connects the printed circuit material 72*a* through flag portion 84*f* through a radial portion 84*r* to the corrugated portion 84*c*. The radial portion 84*r* is fitted against a shoulder 47*s* of insulating body 20 and this shoulder serves as a stop for limiting insertion of the axial portion 84*a* of terminal 84 relative to the insulating body. There is considerable resilience in the terminal means 84 between corrugated portion 84*c* and the axial portion 84*a* due to the lateral length of the radial portion 84*r*. The corrugated portion 84*c* is formed having radially outwardly bent segments 84*e* and radially inwardly bent segments 84*i* provided in a structure complementary to the lamp bulb base 45 having

radially outwardly extending threaded segments 45*e* and inwardly extending threaded segments 45*i*. As seen most clearly in the view of FIG. 3, the threads of the lamp bulb base 45 are engageable with the resilient corrugated portion 84*c* having the complementary segments just mentioned.

As a guide for inserting the lamp bulb base 45 into the chamber 44, the terminal means 84 has a guide portion 84*g* extending radially outwardly from the first segment 84I of the terminal means 84. This guide portion or tank 84*g* extends laterally and angular toward the flag portion 84*f*. Thus when the lamp bulb is inserted into the socket, the lamp bulb base 45 is guided by a tapered surface 46*t* of the wall portion 46 toward the recess 44 and upon and after entering recess 44 the lamp bulb base 45 strikes against the guide portion 84*g* of the terminal 84 and is guided for facilitating threading of the bulb into engagement with the corrugated portion 84*c* of the terminal 84. The threads 45*t* of the lamp bulb base are indicated in the view of FIG. 3. The corrugated portion 84*c* of the terminal 84 extends radially inwardly from the groove portion 85 of recess 47 into the space or chamber 44. The corrugated portion 84*c* due to the resilient connection through radial portion 84*r* acts as a resilient means urging the lamp bulb base 45 laterally of the chamber 44 into engagement with a wall portion 44*w* of the chamber located substantially opposite to the corrugated portion 84*c* of the terminal 84. This wall portion is visible in FIG. 1 adjacent to the recess 48 opening into the space or chamber 44.

Thus the lamp bulb can be screwed or turned into engagement with the terminal 84 and wall 44*w* by progressive rotation of the bulb resulting in movement of the lamp bulb base 45 against the resilience of the corrugated portion 84*c* of the terminal means 84 until the contact 75 engages the resilient free end 82 of the terminal 56. There is a limit to the insertion of the lamp bulb by this threading the base into engagement with the complementary threading of the corrugated portion 84*c* of terminal 84 due to the beveled portions 24*b* and 26*b* of the lugs which engage the glass envelope 45*g*. This relationship is indicated in the phantom showing of the glass envelope relative to the lug 26 having the beveled portion 26*b* in FIG. 3. Also provided for limiting the insertion of the bulb base 45 is a shoulder 44*s* provided in the insulating body 20 at the bottom of the chamber 44 between wall portion 44*w* and the auxiliary recess 44*a* extending axially of the chamber 44 and permitting connection of the contact 75 with the free end 82 of the terminal 56. The recess 44*a* has substantially annular lateral portions and the base portion 44*b* engageable by the bottom portion 64 of terminal 56 is provided as a continuation of recess 48 into a lateral or radial recess portion 48*r* as seen in FIGURES 1 and 3.

Thus the lamp socket or insulating body 20 is adapted to receive screwbase-type-lamp-supporting terminal means including the grounding terminal 84 that provides electrical contact between a printed circuit type conductor 72*a* on an insulating board 74. There are screw threads 45*t* on a conducting metal base 45 of a lamp bulb resiliently engageable with a corrugated portion 84*c* of the terminal means 84. The bayonet-type fastening lugs 24 and 26 are cooperable with slots 40*a* and 42*a* extending radially outwardly from the hole or aperture 76 of the insulating board 74 carrying printed circuit type conducting material engaged by ends 84*f* and 70 of terminal means 84 and 56, respectively. The free end 82 of the terminal means 56 is adapted to be engageable relative to the contact 75 at a tip or end of the lamp bulb while the threaded portion 45*t* of the lamp bulb base 45 is provided to be complementary to the corrugated portion 84*c* of terminal means 84. The lamp bulb is resiliently supported in the insulating body 20 due to resilient engagement of the corrugated portion 84*c* of terminal means 84 and longitudinal resilient urging of free end 82 of terminal 56 against contact 75. The longitudinal resilient urging enhances positive contact of corrugated portion 84*c* relative to the screw threads of the lamp bulb base. The lamp bulb is resiliently supported in the insulating body 20 due to resilient engagement of the corrugated portion 84*c* complementary to the threads 45*t* of the bulb base 45 urging the lamp bulb base laterally in chamber 44 toward the wall portion 44*w* of the chamber substantially opposite to the corrugated portion 84*c* of the terminal means 84. Since the chamber 44 is located substantially centrally within the insulating body 20, the lamp bulb base as resiliently engaged by the corrugated portion 84*c* of the terminal means relative to the wall portion 44*w* is retained in a substantially central location relative to the aperture 76 of the panel 74. The corrugated portion 84*c* is substantially parallel to the body portion 84*a* of terminal 84. The bayonet fastening of the lugs 24 and 26 relative to the panel 74 results in positive engagement of the ends 70 and 84*f* of the terminal means relative to the printed circuit portions 72 and 72*a*, respectively.

It is to be understood that the printed circuit panel 74 illustrated in the drawings can be used to provide necessary circuit winding in an instrument cluster of a motor vehicle, for an appliance lighting panel or for any other lighting installation where space limitations make it advisable to use printed circuit type connections. The socket and terminal means of the present invention permit use of screw-base-type lamp bulb with printed circuit connections as described above. The lamp bulb can be axially threaded into and out of engagement with the terminal means and socket of the present invention and due to the stops provided by the beveled portions 24*b*, 26*b*, and shoulder 44s, the lamp bulb can be inserted relative to the terminal means only to a predetermined position as described above.

While the embodiments of the present invention as herein disclosed constitute a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination, a printed-circuit-type conducting means carried on an insulating board mounting and screw-base-type-lamp-bulb socket and terminal means, including an insulating body providing a smooth cylindrical inner surface defining an outer periphery of a main axially extending chamber, a closed end of said body having a smaller-diameter auxiliary chamber axially adjacent to said main chamber, a shoulder extending radially inwardly at a location intermediate said main and auxiliary chambers and adapted to be engaged by the lamp bulb base as a limit for insertion of the bulb relative to said body, first terminal means carried by said body and extending longitudinally therein, one end of said first terminal means being adapted to engage said printed-circuit-type conducting means and another end thereof being adapted to be fitted into said auxiliary chamber so as to engage axially and to be urged resiliently against a contact tip of the screw-type lamp bulb base, and second terminal means carried by said body and having a longitudinally extending body portion fitted into a longitudinally-extending undercut groove in said smooth cylindrical inner surface, a secondary shoulder portion being formed in said body at one end of the groove, a flag portion extending laterally outwardly and substantially transversely to one side of said body portion and adapted to engage part of said printed-circuit-type conducting means, a corrugated contact portion extending substantially parallel and spaced radially inwardly relative to said body portion of said terminal, and a resilient substantially radially extending lateral arm segment adapted to connect said longitudinal body portion and corrugated contact portion as well as to abut against said secondary shoulder portion of said body for limiting insertion of said terminal relative to said body, said corrugated contact portion being adapted to hold said screw-base-type lamp bulb relative to said body and

in electrical connection relative to said printed-circuit-type conducting means.

2. The combination of claim 1 wherein said corrugated contact portion of said second terminal means urges the screw-type lamp bulb base laterally relative to an opposing cylindrically smooth surface of said insulating body while simultaneously said first terminal means urges the lamp bulb longitudinally of the main chamber to enhance contacting engagement of the screw-type lamp bulb base against said corrugated contact portion of said second terminal means.

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