

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN ELECTRIC LAMP SOCKETS SUITABLE FOR USE IN A DECORATIVE STRING SET

(71) We, GENERAL ELECTRIC COMPANY, a corporation organised and existing under the laws of the State of New York, United States of America, of 1 River Road, Schenectady, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to electric lamp sockets for use in decorative lighting such as Christmas tree string sets. More particularly, the present invention relates to the socket construction.

Decorative lamp and socket combinations presently in use consist of a lamp, a separate base, and a socket. In one form, an incandescent lamp with extended lead wires is secured to a base having two legs with openings through which the lamp's lead wires pass. The respective extended portions of the lead wires are bent around the base legs before insertion into a socket. This construction and method of assembly is more fully described in U.S. Patent No. 3,233,207.

One of the difficulties of a lamp-base-socket combination is the reduced electrical reliability due to the increased number of connections, i.e., lamp-to-base, base-to-socket. Furthermore, the lamp-base-socket combination is inherently more expensive because of the added material costs of a separate base and the additional labour cost of assembling the base to the lamp.

Attempts to alleviate the above difficulties have not been fully satisfactory. A baseless lamp socket combination, as described in U.S. Patent No. 3,286,088, consists of a lamp with a grooved stem press and rigid socket contacts with ribs to fit the grooves thereby making electrical contact with the bent-around lead wires in each groove. One of the disadvantages of this combination is the fixed position of the rigid contacts which do not always touch the lead wires because of variations in the dimensions of the component

parts. Baseless lamps of this type are also susceptible to falling out of the socket when jarred or vibrated. Since typical dimensions of this type of decorative lamp socket combination are .250 inch for the lamp's stem press and .015 inch for the groove, a variation as small as .005 inch can give rise to the above problem.

The present invention seeks to provide a reliable, economical lamp socket by minimizing the number of parts and assembly operations. The lamp socket is capable of giving a highly reliable electrical connection between lamp lead wires and the socket contacts, and the problem of dimensional variations of component parts and of lamps is minimized by having resilient contacts which constantly hold the lamp in compression regardless of the dimensional variations.

According to the present invention there is provided a socket comprising a husk or body with a cavity adapted to receive the stem press of a lamp, two bores for power leads extending through the wall of said husk to said cavity, said husk having two pairs of slots opening into said cavity, a pair of contacts located in the cavity and adapted to be connected to the power leads, each of said contacts having two fingers and each finger being bent re-entrantly out of the general plane of the contact to provide a resilient projection adapted to engage the stem press of the lamp, each of said contacts also having two notches fitting one into a respective slot of a corresponding said pair of slots to engage the wall of said husk to prevent removal therefrom, the slots of each pair being tapered in depth so that there is a greater distance between the roots of the slots at the open end of the cavity than at the bottom of the cavity.

One embodiment of the invention will now be described by way of example, with references to the accompanying drawings, in which:

Fig. 1 is an elevation of a lamp suitable for use with a socket of the invention;

Fig. 2 is a fragmentary perspective view of the lamp's stem press;

Fig. 3 is an exploded elevation view of a socket embodying the invention comprising contacts and husk; and

Fig. 4 is an elevation view and partial section of the assembled lamp and socket taken along section line 4—4 in Figs. 1 and 3.

Fig. 1 of the drawings illustrates an incandescent lamp 11 having an envelope 12 with a stem press 13. Filament 14 is connected to lead wires 15 and 16 which are held in position by glass bead 17. Lamps as illustrated are generally used as Christmas tree lamps which are electrically connected in series in a string set. In order to maintain a closed circuit in the event of filament failure, oxidized cut-out wire 18 is wrapped around the leads just above the glass bead 17. This wire will electrically connect the two lead wires below the filament if the filament fails. Lead wires 15 and 16 are hermetically sealed in stem press 13 and extend beyond the stem press's outer edge 19.

As shown in Fig. 2, stem press 13 has parallel faces 20, 21 and sides 22, 23. Face 20 contains groove 24 which is separated from indentation 25 by end wall 26. Slot 27, which is longitudinally aligned with groove 24 extends from the upper wall of indentation 25 toward envelope 12. Indentation 25 extends from side 23 to approximately the centre of the face 20 of the stem press.

Parallel face 21 is constructed similar to face 20. Groove 28, indentation 29 extending from side 22, and slot 30 of face 21, shown by dotted lines, correspond to groove 24, indentation 25 and slot 26 respectively of face 20. The extended portion of lead wire 15 is bent around outer edge 19 and positioned or guided by groove 24 so that part of the extended lead wire passes over end wall 26 down into indentation 25. The end of lead wire 15 is positioned in slot 27 which is aligned with groove 24. The positioning of the end of the lead wire in slot 27 gives an improved lead alignment. Although slot 27 is not essential to all embodiments of the invention, it is recommended for optimum results inasmuch as it serves to locate the end of the lead wire in fixed position. Lead wire 16 is bent around outer edge 19 in the opposite direction to wire 15 so as to overlie indentation 29 of parallel face 21. After the bending and positioning of the lead wires, the lamp is ready for insertion into socket 31, the component parts of which are shown in an exploded view in Fig. 3.

Socket 31 is comprised of two contacts 32, 33 adapted for connection to power leads 34, 35, and a husk or body 36. Contacts 32 and 33 each have two fingers 37, 37', 38, 38', and each finger is bent re-entrantly out of the general plane of the contact to provide a

resilient projection for engaging the lamp's lead wires and stem press.

Electrical contact between power leads 34, 35 and contacts 32, 33 is made by crimping the respective insulation-bared ends 39, 40 of the power leads into sleeves 41, 42 formed on contacts 32 and 33, respectively. Projections 43, 44 are then clamped around the insulated portion of the power leads to give additional strength to the connection. This type of connection eliminates the need for soldering the power leads to the contacts.

After the husk is slipped over the power leads, and the power leads are attached to the contacts, as described, the contacts are pulled down into a central cavity in the husk so that notched sides 47 of the contacts 32, 33 are inserted into slots 45, 46 of the socket 31. Each contact 32 or 33 has two notched sides 47 fitting one into each of a corresponding pair of slots 45 or 46. The slots of each pair 45 or 46 are tapered in depth from top to bottom such that the depth of the slots into the husk wall is greater at the top of husk 36 than at the bottom. The distance at the top is selected such that it is slightly greater than the distance between the tips of notches 47. As the contacts are inserted into the husk, the distance between the roots of the slots of each pair 45 or 46 changes and the fit between the contacts and the husk becomes an interference fit. The tapering of the slots serves two purposes. First, the clearance fit at the top facilitates assembly of the contact and husk, while the interference fit at the bottom prevents contact removal.

As the contacts are pushed to the bottom of the slots, the power leads are drawn through bores 48 shown in Fig. 4. The lamp of Fig. 1 can then be inserted in the socket.

Contacts 32, 33 are spaced within the husk 36 so that there is an interference fit between stem press 13 and both contacts. This interference fit along with the resiliency of the spring-like material of the contacts generates a constant compressive force on the lamp's stem press to hold the lamp and maintain a reliable connection.

Indentation 29 and the lead wire diameter are sized such that the top of the lead wire is approximately flush with the surface of the stem press. After lamp 11 has been inserted in socket 31, finger 37' of contact 32 presses bent-around lead wire 16 against the glass surface of the indentation 29, as shown in Fig. 4. Simultaneously, finger 38' of contact 33 exerts a force opposite that of the force exerted by finger 37'. Adjacent fingers 37 and 38, not shown in Fig. 4, exert a similar force on the other side of stem press 13. Once the lamp 11 is positioned between the contacts, it cannot be removed by jarring or vibrating because lead wires extending over end walls 26 of indentations 29 and 25 act as stops.

By constructing each contact 32 and 33 with two separate fingers, one of which grips a lamp lead wire and the other the face of the lamp stem press, a considerable latitude is developed by relative movement between the fingers to compensate for manufacturing tolerances and small variations in the dimensions of the stem press and lead wires. This insures good electrical contact with the lamp, and firm seating of the lamp in the husk, in spite of the above-mentioned variations and tolerances which sometimes appear in manufacture of the ultra-minature lamp of this invention. Because the lamp lead wires are positioned in grooves in the stem press they are always in position for gripping by a socket finger and cannot become bent or displaced such as to prevent a good electrical connection between the lamp and the socket.

Reference is made to co-pending patent application No. 44633/72, (Serial No. 1384739) of which the present patent application is a divisional, and which describes and claims an electric lamp comprising a sealed vitreous envelope with lead-in conductors hermetically sealed in and extending from a stem press of said envelope, said stem press having two opposite substantially parallel faces and two sides, one of said faces connected with an indentation extending from one of said sides to substantially the centre of said one face of the stem press, a groove extending from the outer edge of the said stem press inwardly along said one face toward said envelope and terminating in an end wall before reaching said indentation, the other face of said stem press being similarly constructed such that such indentations extend one from each of the sides of said stem press, an extended end portion of one of said

lead-in conductors being bent around the outer edge of said stem press and positioned in the groove of said one face, said one lead-in conductor being out of the groove over the end wall and overlying the indentation of the said one face, an extended end portion of said other lead-in conductor being bent around the outer edge of the stem press and positioned in the groove and over the end wall and overlying the indentation of the opposite face.

WHAT WE CLAIM IS:—

1. A socket comprising a husk or body with a cavity adapted to receive the stem press of a lamp, two bores for power leads extending through the wall of said husk to said cavity, said husk having two pairs of slots opening into said cavity, a pair of contacts located in the cavity and adapted to be connected to the power leads, each of said contacts having two fingers and each finger being bent re-entrantly out of the general plane of the contact to provide a resilient projection adapted to engage the stem press of the lamp, each of said contacts also having two notches fitting one into a respective slot of a corresponding said pair of slots to engage the wall of said husk to prevent removal therefrom, the slots of each pair being tapered in depth so that there is a greater distance between the roots of the slots at the open end of the cavity than at the bottom of the cavity.
2. A socket substantially as hereinbefore described with reference to and as shown in Figs. 3 and 4 of the accompanying drawings.

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