July 22, 1952

F. C. DE REAMER

2,604,505

LAMP SOCKET FOR ELONGATED TUBULAR FLUORESCENT DISCHARGE LAMPS

Original Filed Nov. 2, 1945

Fig. 1.

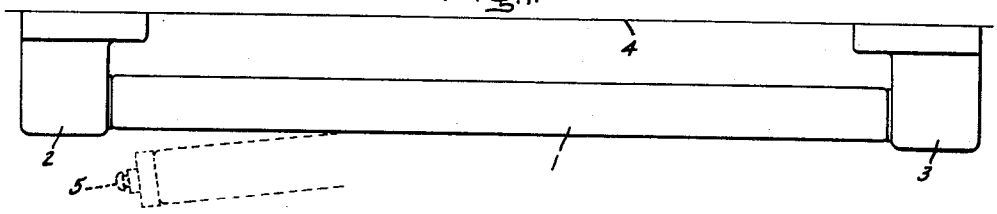


Fig. 2.

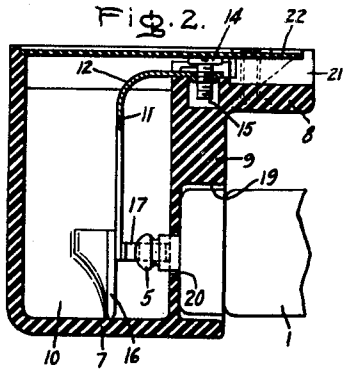


Fig. 3.

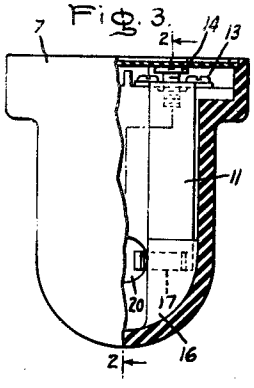


Fig. 4.

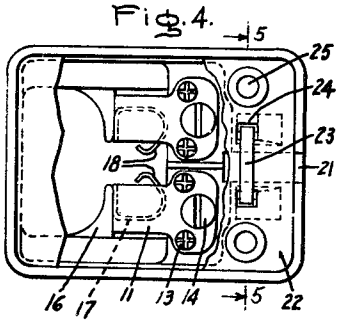


Fig. 5.

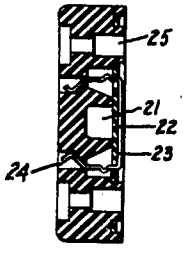


Fig. 6.

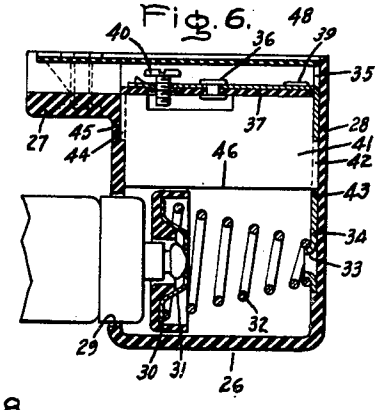


Fig. 7.

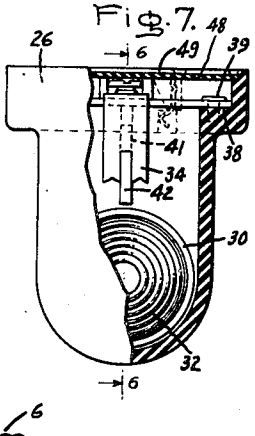


Fig. 8.

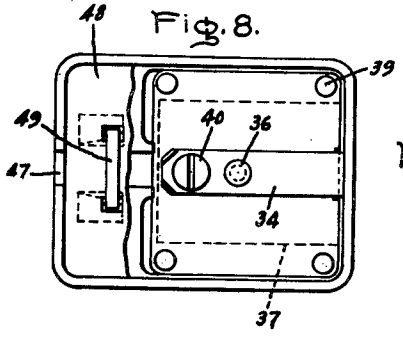
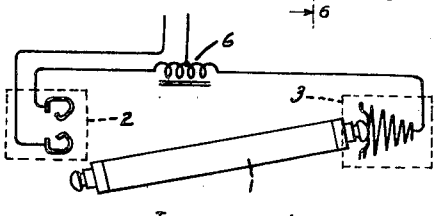


Fig. 9.



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by
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UNITED STATES PATENT OFFICE

2,604,505

LAMP SOCKET FOR ELONGATED TUBULAR FLUORESCENT DISCHARGE LAMPS

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Original application November 2, 1945, Serial No. 626,346. Divided and this application June 16, 1951, Serial No. 231,917

2 Claims. (Cl. 173—328)

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This is a division of my copending application Serial No. 626,346, filed November 2, 1945, for Lamp Sockets which has matured into United States Patent No. 2,584,677, issued February 5, 1952.

My invention relates to lamp sockets and more particularly to lamp sockets for fluorescent discharge lamps of the type which operate at relatively high voltages.

Certain types of fluorescent discharge lamps now in use, particularly those applicable to commercial installations, operate at relatively high voltages on the order of 600 to 1000 volts. Such voltages are usually obtained from an autotransformer which also acts as a ballast in the lamp operating circuit. Connections from the transformer to the lamp are made through lamp sockets which support opposite ends of the lamp. In such installations, there is danger of shock to a person if the person inadvertently touches the live contacts of the socket unless precautions are taken in designing such sockets to prevent shock hazards. According to my invention, the lamp sockets are so designed and connected into a lamp circuit as to make it impossible for a person to receive a shock from the sockets when the lamp is removed.

Therefore it is an object of my invention to provide a new and improved lamp socket for supporting one end of a discharge lamp in an operating circuit, the socket being constructed and arranged to open the circuit to the primary of the ballast transformer when the lamp is removed in order to prevent shock hazard.

It is another object of my invention to provide a new and improved lamp socket for supporting the other end of the lamp, the two sockets being so arranged that the lamp can be mounted in the sockets in only one way. The arrangement protects a person from shock if the contact at one end of the lamp is grasped when inserting the other end in either of the sockets.

It is a further object of my invention to provide sockets for a tubular lamp which are of simple construction, easily manufactured at low cost. The sockets are so designed as to hold the lamp securely in position at all times.

In the accompanying drawing, Fig. 1 illustrates a tubular discharge lamp supported at each end in lamp sockets constructed in accordance with my invention; Fig. 2 is a sectional view through the lamp socket mounting the left hand end of the lamp, the view being taken along line 2—2 of Fig. 3; Fig. 3 is an end view, partly in section, of the socket of Fig. 2; Fig. 4 is a view looking

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at the base of the socket with part of the cover plate broken away; Fig. 5 is a sectional view through the socket taken along the line 5—5 of Fig. 4; Fig. 6 is a sectional view through the socket supporting the right hand end of the lamp, the view being taken along the line 6—6 of Fig. 7; Fig. 7 is an end view of the socket of Fig. 6 with part of the housing cut away; Fig. 8 is a view of the base of the socket with part of the cover plate broken away, and Fig. 9 is a schematic view showing the sockets connected into a lamp operating circuit.

Referring to the drawing, Fig. 1 shows a tubular discharge lamp 1, such as a cold cathode fluorescent lamp, supported at opposite ends in lamp sockets 2 and 3 constructed in accordance with my invention. The sockets in turn are supported from a reflecting surface 4 forming part of a lighting fixture, or the like. As shown in dotted lines in Fig. 1, cold cathode discharge lamps of the type used with the sockets are provided with a single contact pin 5 at each end thereof connected to an electrode. The lamps are adapted to start at voltages ranging from 600 to 1000 volts without preheating of the lamp electrodes.

Referring to Fig. 9, I have shown the lamp socket in schematic form connected into a suitable operating circuit for the lamp. The lamp socket 3 is provided with a single contact for engaging one end of the lamp. On the other hand, the lamp socket 2 is provided with two spaced contacts which are bridged or short-circuited by the contact pin on the other end of the lamp when the lamp is inserted in the socket. To supply the proper voltage for starting and operating the lamp, an autotransformer 6 is connected into the operating circuit. It also acts as a ballast. When the lamp is inserted in the socket 2, a circuit is closed from the 110 volt A.-C. supply to the primary of the ballast transformer. Inasmuch as the ballast acts as an autotransformer, a high voltage will appear across the secondary which is applied across the lamp electrodes to start the lamp and maintain it in operation. With a 110 volt A.-C. supply, the voltage applied by the transformer to the lamp may reach 600 volts or more. When the lamp is removed from the sockets, the circuit to the primary of the autotransformer is opened at the socket 2 because the circuit is formed in part by the contact pin on the end of the lamp. Thus when the lamp is removed from the sockets, the primary of the transformer is deenergized and consequently there is no danger of secondary high voltage being applied to the socket 3. This ar-

rangement eliminates danger of shock if the lamp contacts are inadvertently touched.

Turning now to the construction of the sockets and referring to Figs. 2, 3, and 4, socket 2 comprises a housing 7 of any suitable molded insulating material. Preferably, the housing is molded in a single piece. It is formed with a base portion 8 for mounting the socket on a support and an extension 9 for supporting the lamp. During the molding operation, the extension is formed with a recess 10 to accommodate spaced conducting bars 11. The conducting bars 11 are formed of relatively heavy sheet metal, such as brass. As shown in Fig. 2, they are bent with a curve 12 of large radius to form an angle. One end of each of the conducting bars is fastened to the base 8 in any suitable manner, as by two drive pins 13. The same ends of the conducting bars are tapped and screw-threaded to carry a terminal screw 14 for making an electrical connection therewith. The screws extend downwardly into openings 15 molded in the base. At the other end, the bars extend downwardly into the recess 10 and rest against abutments 16 extending outwardly from the side walls of the recess. The spring action acquired by means of the bend 12 in the bar holds it firmly in engagement with the abutment 16.

Each bar 11 carries a flexible spring contact member 17 fastened thereto in any suitable manner as by spot welding. As shown in Fig. 4, the spring contact members are formed with curved portions extending toward each other to provide contact surfaces 18 for engaging the contact pin 5 on the end of the lamp. The contact surfaces are normally spaced from each other maintaining the circuit open, unless the lamp is inserted in the socket so that the lamp contact pin engages and bridges the contact surfaces.

In order to guide the lamp contact pin into engagement with the contact members, the front part of the extension 9 is provided with a recess 19 to accommodate the end of the lamp. The wall at the bottom of the recess is provided with an opening 20 through which the contact pin of the lamp extends into engagement with the contact surfaces 18. Thus the recess 19 serves as a guide when inserting the lamp in the socket. It also serves to support one end of the lamp to prevent the lamp from falling out of the socket.

When connecting the socket into the lamp operating circuit shown by Fig. 9, the lead wires are inserted in a groove 21 formed in the base 8 and are bound around the terminal screws 14. A cover plate 22, formed of sheet insulating material, is then placed over the base 8 and protects the electrical connections. It is held in position by a U-shaped spring clip 23, the ends of which frictionally engage the walls of openings 24 in the base 8. In order to mount the socket on a support, the base is provided with spaced openings 25 for receiving fastening screws.

Turning now to the construction of the right hand socket and referring particularly to Figs. 6, 7, and 8, the socket 3 comprises a housing 26 of any suitable insulating material molded in a single piece. It is formed with a base portion 27 for securing the socket to a support and an extension 28 for supporting the lamp. As shown in Fig. 6, the extension is provided with a recess having an opening 29 in one side wall thereof for receiving the end of the lamp when the lamp is mounted in the socket. The contact pin on the end of the lamp is adapted to rest in an opening in an insulating disk 30 which carries a contact

disk 31 for making an electrical connection with the lamp contact pin. A spring 32 biases the contact disk into engagement with the lamp contact pin. One end of the spring rests against the flared edge of an opening 33 in a conductor bar 34, the flared edge serving to engage one of the convolutions of the spring to hold the spring in position. The other end of the spring bears against the contact disk 31. In this way an electrical connection is obtained between the contact disk and the conductor bar. It will be apparent that the insulating disk 30 has a considerable amount of movement within the socket housing since the coiled spring 32 may be compressed to a considerable degree when inserting the lamp. The purpose of this will be more fully described later.

The conductor bar 34 comprises a strip of sheet metal such as brass. It is bent to form an angle. One arm of the angle containing the opening 33 extends along the opposite side wall of the housing where it rests in a recess 35. The other arm extends inwardly in a direction parallel to the axis of a lamp when the lamp is inserted in the socket and is secured in any suitable manner, as by a rivet 36, to a base plate 37 which closes the recess in the extension 28. The base plate 37 rests on a ledge 38 formed around the wall of the base and is held in position by drive pins 39. A terminal screw 40 is mounted in the conductor bar 34 for making an electrical connection with the socket.

In order to provide a guide for the insulating disk 30 and to maintain it and the spring 32 in position, a guide plate 41 is mounted on edge within the extension. One edge of the guide plate is provided with an abutment 42 which rests in an opening 43 in the conductor bar 34. The opposite edge is provided with a similar abutment 44 which rests in a groove 45 formed in the wall of the housing 26. Preferably the guide plate is formed of any suitable insulating material such as sheet fiber.

In assembling the socket the coiled spring 32, the insulating disk 30 and the contact disk 31 are first inserted in the recess in the housing extension 28. The guide plate 41 is then assembled in an upright position on the base plate 37 with the abutment 42 inserted in the opening 43 in the conductor bar 34. This assembly is then fitted down into the housing with the conductor bar 34 resting in the groove 35 on one wall of the housing and the abutment 44 of the guide plate resting in the groove 45 on the opposite wall of the housing. The base plate 37 is then fastened to the housing by the drive pins 39 in the manner already mentioned. As shown in Fig. 6, when in assembled position, guide plate 41 forms a guide and support so that the insulating disk 30 may slide back and forth along its inner edge 46.

When making an electrical connection with the socket, the insulated conductor is laid in a groove 47 formed in the base and the bared end is bent around the terminal screw 40. A cover plate 48 of sheet insulating material is then placed on the base to enclose the socket and provide protection for the electrical connection. It is held in position by means of a U-shaped spring clip 49 which cooperates with openings in the base in the same manner as the spring clip 23 of socket 2.

Referring to Fig. 9 in which the sockets 2 and 3 are shown in diagrammatic form, it will be seen that the circuit to the primary of the transformer is open at all times unless the lamp is

mounted in position in the socket 2 so that the lamp contact pin short-circuits the normally open contacts of the socket. As long as the lamp is removed from the socket, there is no possibility of high voltages being applied to the single contact of socket 3. Thus if the contact disk 31 of socket 3 is touched inadvertently, no shock can be obtained from it. Similarly, if the lamp itself is inserted in socket 3 and the other end of the lamp gripped in the hand, a shock cannot be obtained through the lamp itself because the socket 3 is dead. If, on the other hand, the user accidentally touches the live contacts in socket 2, no appreciable harm will result because this socket is connected to the low voltage side of the ballast transformer at 110 volts A.-C. In some instances, the contacts may be short-circuited by inserting one end of the lamp in socket 2 and grasping the other end in the hand. Still a shock cannot be obtained through the lamp in such a situation because the socket 2 is connected into the low voltage side of the circuit.

With further reference to Figs. 2, 6, and 9, it will be seen that the sockets 2 and 3 are constructed and mounted so that the lamp can be inserted in one way only. The arrangement is such that the lamp must first be inserted in the high voltage or secondary socket 3 and then inserted in the low voltage socket 2. If one end of the lamp is first inserted in the socket 2, the other end cannot be inserted in socket 3 because the end of the lamp will rest against the fixed bottom wall of the recess 29. The spacing of the edges of the sockets is less than the length of the lamp so that it will be impossible to insert the other end of the lamp in socket 3. However, when one end of the lamp is first inserted in socket 3, this end of the lamp may be inserted a considerable distance into the socket due to the large amount of movement provided by the coiled spring 32. This means that the lamp may be inserted a distance sufficient so that the other end of the lamp clears the edge of the socket 2 into which it is snapped by the pressure of the spring 32 in the socket 3. Thus the circuit to the primary of the transformer is completed to energize the lamp operating circuit only after the lamp is fully mounted on the lamp fixture first by inserting it in socket 3 and then mounting it in socket 2.

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

1. In a lamp socket, a housing of insulating material having walls therein forming a recess having one open end, one of said walls being provided with an opening having a diameter suitable for receiving an axially inserted lamp contact pin, spaced abutments within said housing extending from said walls adjacent said opening, spaced conducting members, one end of each resting against a corresponding abutment, and conducting member being fastened to said housing, the other end extending into said recess and resting against a corresponding abutment, and spaced apart flexible contact fingers carried one by each of said conducting members to be disposed behind said opening for making an electrical connection with a lamp pin.

2. In a lamp socket, a housing of insulating material having walls forming therein a recess having one open end, one of said walls being provided with an opening having a diameter suitable for receiving an axially inserted lamp contact pin, spaced abutments extending from said walls adjacent said opening, spaced apart contact strips carried by said housing, one end of each strip being fastened to said housing and being provided with terminal means, the other end of each strip being disposed at an angle and extending into said recess to rest against a corresponding abutment, and a flexible spring contact finger carried by each of said said contact strips and being disposed behind said opening for making an electrical connection with a lamp pin.

FRANK C. DE REAMER.

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