June 14, 1938. J. B. SEEVER 2,120,630

ELECTRICAL SOCKET AND METHOD OF MAKING SAME

Filed March 14, 1935 2 Sheets-Sheet 1

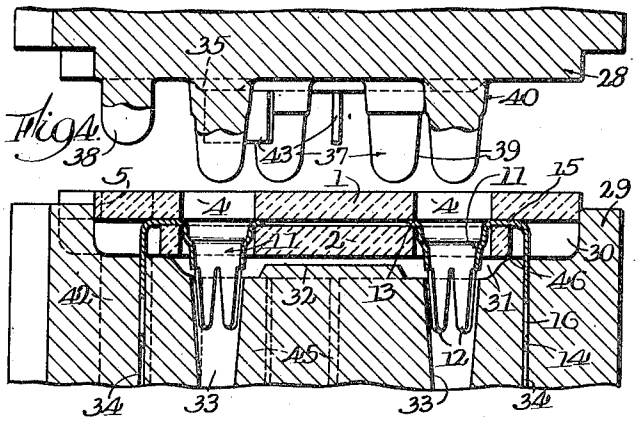


Fig. 4.

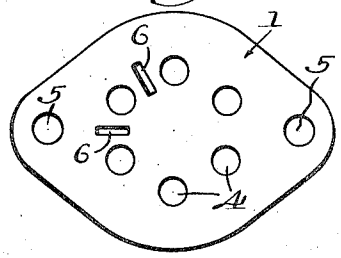


Fig. 1.

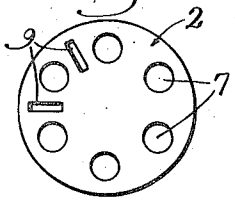


Fig. 2.

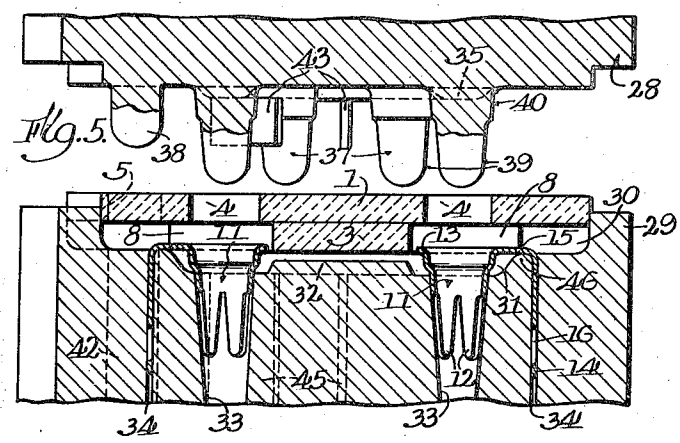


Fig. 5.

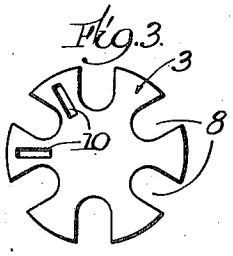


Fig. 3.

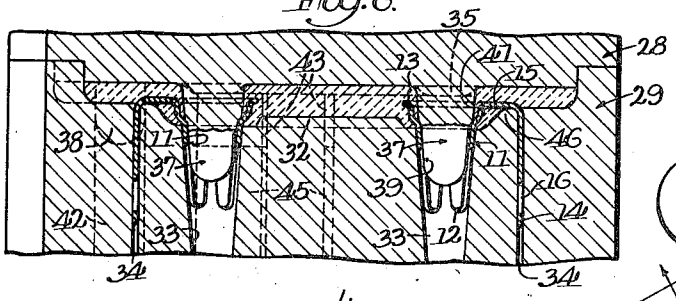


Fig. 6.

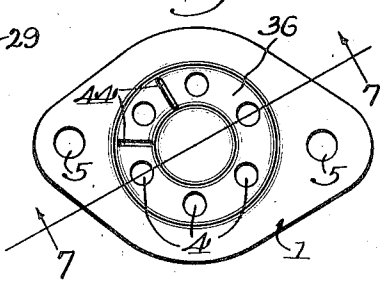


Fig. 8.

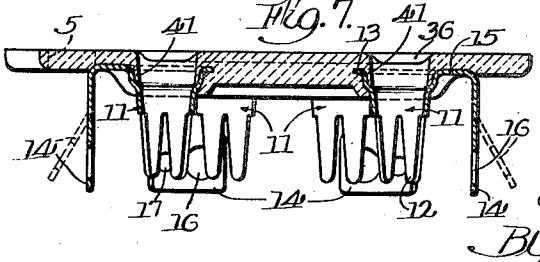


Fig. 7.

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ELECTRICAL SOCKET AND METHOD OF MAKING SAME

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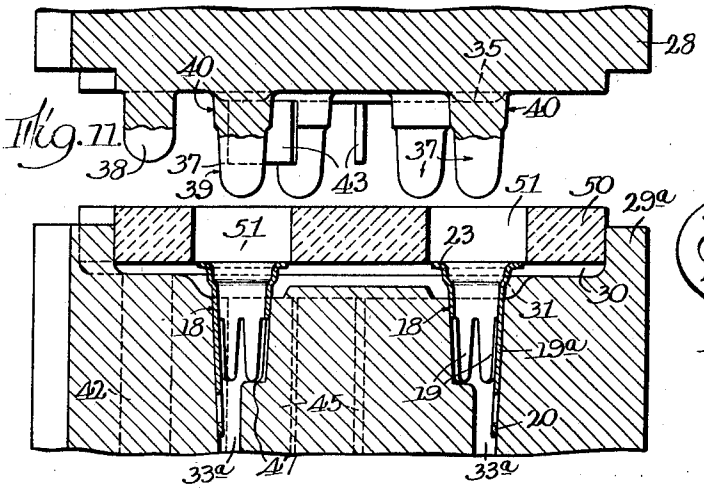


Fig. 11.

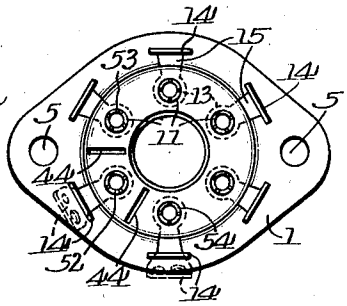


Fig. 9.

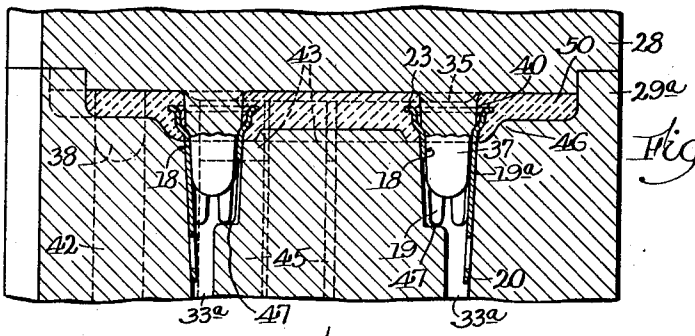


Fig. 12.

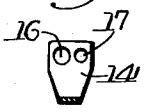


Fig. 10.

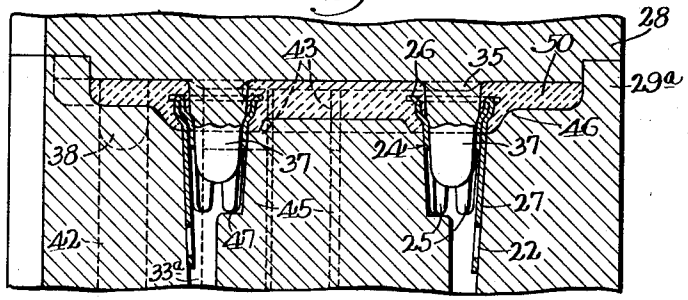


Fig. 13.

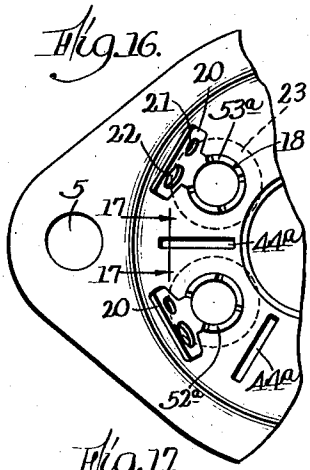


Fig. 16.

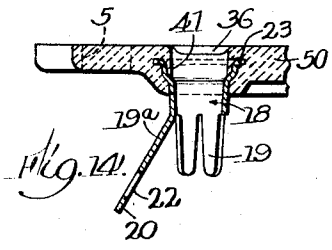


Fig. 14.

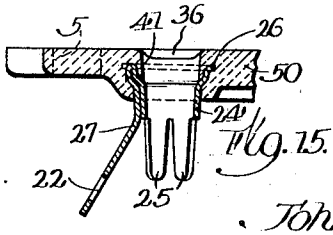


Fig. 15.

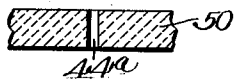


Fig. 17.

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UNITED STATES PATENT OFFICE

2,120,630

ELECTRICAL SOCKET AND METHOD OF MAKING SAME

John B. Seever, Chicago, Ill.

Application March 14, 1935, Serial No. 11,174

1 Claim. (Cl. 173—328)

The present invention relates to electrical sockets and the method of making the same, and more particularly to radio tube sockets.

Among the objects of the invention is to provide a novel electrical socket or the like with a body member composed of insulating material which may be fused or displaced into the form of a single unitary substantially homogeneous mass and having contact clips a portion of which is embedded and firmly held in the unitary mass of the insulating material.

Another object of the invention is to provide a novel process of making electrical sockets by the juxtaposing of contact clips and one or more pieces of insulating material of a resinous base, and applying thereto or subjecting the same to heat and pressure sufficient to cause a fusing and displacing of the insulating material to given form and for embedding a portion of the contact clips in the insulating material, and for effecting the material into a single unitary substantially homogeneous mass of given form and with a portion of the clips embedded in the unitary mass.

A further object of the invention is to provide a novel electrical socket having means for eliminating short-circuiting between the contacts of the socket, preferably by so increasing the resistance between the contacts as to practically prevent short-circuiting for all differentials of potential in use with the socket. In a specific illustrative embodiment of the invention this is accomplished by the provision of air gaps in the insulating material between the contacts.

Another object of the invention is to provide a novel contact clip in an electrical socket.

Other objects, advantages, capabilities, features, process steps and the like are comprehended by the invention as will later appear and as are inherently possessed by the invention.

Referring to the drawings:

Fig. 1 is a plan view of a piece of pre-shaped insulating material that may be used in accordance with the present invention;

Fig. 2 is a plan view of another piece which may be used with the piece shown in Fig. 1;

Fig. 3 is a plan view of a piece similar to that shown in Fig. 2 but of alternate form;

Fig. 4 is a sectional view through a die, pieces of insulating material, and contact clips assembled for uniting together;

Fig. 5 is a view similar to Fig. 4 but showing another assembly;

Fig. 6 is a view similar to Figs. 4 and 5 but showing the application of pressure and heat and the forming of the article;

Fig. 7 is a sectional view of a finished article taken in a plane represented by line 7—7 in Fig. 8;

Fig. 8 is a top plan view of the same;

Fig. 9 is a bottom plan view of the same before the lugs are bent;

Fig. 10 is a sectional view of a clip showing the lug part in elevation.

Fig. 11 is a view similar to Figs. 4 and 5 but showing the use of but one piece of insulating material and the employment of a new type of contact clip;

Fig. 12 is a similar view but showing the application of pressure and heat and the forming of the article;

Fig. 13 is a view similar to Fig. 12 but showing the use of an alternate form of new contact clip;

Figs. 14 and 15 are fragmentary sectional views of the article formed as shown in Figs. 12 and 13;

Fig. 16 is a fragmentary bottom plan view of the article formed in either Fig. 12 or 13 or both; and,

Fig. 17 is a fragmentary sectional view taken in a plane represented by line 17—17 in Fig. 16 of the drawings.

Referring more in detail to the drawings, among the embodiments selected to illustrate the invention, and first more particularly to Figs. 1, 2 and 3, the invention comprises pieces 1 and 2 or 1 and 3 of insulating material of a resinous base capable under pressure and heat to be fused and displaced to assume any desired form or shape as may be controlled or determined by the contoured parts of dies and also to unite into a single unitary substantially homogeneous mass. The piece is preferably of quadrangular shape as shown and is provided with a series of holes 4 through which the prongs or pins of a radio tube may pass when engaged with the contact clips of the socket, holes 5 at the ends of the piece for the passage of suitable securing elements for holding the socket in place in a radio set, and slots or slits 6 to form insulating air gaps in the insulating material between the holes 4 which receive the radio tube pins (not shown).

The pieces 2 and 3 shown in Figs. 2 and 3 are preferably disc shaped and are provided with a series of holes 7 or slots 8 so located as to register with the holes 4 of the piece 1 when the pieces 1 and 2 or 1 and 3 are united into a single unit. They also have slits or slots 9 or 10 to register with the slots 6 in the piece 1 when the pieces 1 and 2 or 1 and 3 are united into a single unit.

Each of the contact clips shown in Figs. 4–7

and 9 and 10 comprises a tapered contact part or body 11 having spring tongues 12, a flange 13, and a soldering lug 14, the latter being connected to the part 11 by a connecting or spanning part 15. The lug 14 has holes 16 and 17 for reception of the ends of different size wire or similar conductor when to be soldered to the lug. In other words, the clip is generally U-shaped with parts 11—12 and 14 forming the legs and the part 15 forming the bend of the U.

Each of the contact clips shown in Figs. 11, 12 and 14 comprises a tapered contact part or body 18 having spring fingers 19 and 19a of which finger 19a has an extension 20 serving as the soldering lug for the clips, this lug having openings 21 and 22 (Fig. 16) for the reception of ends of different size wire or similar conductor when to be soldered to the lug. The body 18 also has a flange 23 which is embedded in the finished article as later described. In the completed article the lug 20 may be bent as shown in Fig. 14 for facilitating the connection of the conductor or wire thereto.

Each of the contact clips shown in Figs. 13 and 15 comprises a tapered contact part or body 24 having spring fingers 25 and a flange 26 which is embedded in the finished article as later described. Integral with the upper or flanged part of the body 24 is a bent or folded back lug 27 having holes 21 and 22 (Fig. 16) for the reception of ends of different size wire or similar conductor when to be soldered to the lug. In the completed article the lug 27 may be bent as shown in Fig. 15 for facilitating the connection of the conductor or wire thereto.

Referring to Figs. 4, 5 and 6 the dies comprise die parts 28 and 29 of which the die part 29 is provided with a trough 30 of generally quadrangular shape for determining the shape of the top part or portion of the socket body. The die part 29 also has an annular trough 31 with a central island 32 for determining the shape of the lower part or portion of the socket body. Moreover, the die part 29 also has passages 33 and 34 for the entry of the clip parts 11—12 and 14 respectively, the passages 33 being tapered to conform with the taper of the clip parts 11—12.

The die part 28 has an annular dike 35 for providing an annular channel 36 (Fig. 8) in the top face of the top portion of the socket body. The die part 28 also has lugs 37 and 38, the lugs 37 being for entry into the holes 4 of the part 1, holes or slots 7 or 8 of part 2 or 3, and into the sockets of the clip parts 11—12, while lugs 38 are for passing through the holes 5 of the part 1, and extending into recesses 42 provided in the die part 28.

Each lug 37 has a tapered part 39 to fit into the tapered tongue portion of the clip socket 11—12, and a shouldered part 40 so located that the holes 5 will be sufficiently large to freely receive the prongs or pins of the radio tube. The body portion of the lug is preferably spaced from the upper part of the lug socket 11—12 so as to provide for the forming of an annular insulating part 41 in the lug socket above the spring fingers. The insulating part 41 is provided to prevent short circuiting in the set should the tube be wrongly located wherein the ends of the pins of the tube might enter the wrong holes 5 just enough to contact the upper metal part of the lug socket 11, even though the pin is not in proper position to enter between the tongues 12. By providing an insulating coating in the upper part of the lug socket 11—12, the above mentioned disadvantage is avoided or eliminated.

The die part 28 also has flat lugs 43 for forming air gaps 44 (Fig. 8) between contact clips, the lugs passing through the slits or slots 6 and 9 or 6 and 10, and extending into recesses 45 in the die part 29.

In the means shown in Fig. 4, the parts are assembled by first placing the disc 2 upon the shoulder 46 between the troughs 30 and 31 and with the holes 7 thereof in registry with the passages 33 of the die part 29. Then the clips are so placed on the disc 2 as to have the lug sockets 11—12 projecting through the holes 7 and into the passages 33 and with the soldering lugs 14 extending into the passages 34 in the die part 29. Then the piece 1 is located in the trough 30 with the holes 4 thereof in registry with the holes 7 of the disc 3, and with the air gap slots 6 thereof in registry with the slots 9 in the disc 2. The shape of the part 1 being that of the trough 30, the side walls of the latter determine the correct position of the part 1.

The die parts are heated in any suitable manner to a suitable temperature, such as for example about 300 to 350° F., and are then forced together under considerable pressure, as for example, about 2000 lbs. per square inch. The heat and pressure so applied causes the insulating material of the parts 1 and 2 to fuse or soften and become displaced so as to fill in the spaces of the troughs 30 and 31 and about the upper end of the clips, such as the flanges 13 and the connecting parts 15 so that these parts become embedded in the strained material. At the same time the island 32 and the dike 35 form depressions in the faces of the parts 2 and 1. The heat and pressure also cause a uniting of the material of the parts 1 and 2 so that a single unitary integral substantially homogeneous mass will result with the parts 11, 13 and 15 of the clips embedded in this unitary mass. (Figs. 6 and 7.) As the two die parts are forced together the lugs 37 enter the holes 4, and lug sockets 11—12 of the contact clip so as to hold them firmly in place and to prevent the extruding of the insulating material therein. Likewise, the pins 38 enter the holes 5 and extend in the recesses 42. The flat lugs 43 pass through the slots 6 and 9 and extend into the recesses 45. The dike 35 forms an annular groove or channel 36 (Fig. 8) for acting as a guiding groove or race for the prongs or pins of the radio tube when seeking to insert them into the holes 4 of the socket. The island 32 forms a central depression in the under side of the socket body for providing reinforcing ribs or ridges adjacent thereto (Fig. 7).

In the means shown in Fig. 5, the parts are assembled by first placing the contact clips on the die part 29 with the clip part 11—12 extending in the passages 33, the solder lugs 14 in the passages 34, and the connecting parts 15 resting upon the shoulder 46. The disc 3 is then put into place so that the upper ends of the contact clips, that is, the flanges 13 and the parts 15, will fit into the slots 8. The piece 1 is then placed upon the piece 3 with the holes 4 in registry with the slots 8 and the air gap slots 6 in registry with the slots 10 of the disc 3. The shape of the part 1 being that of the trough 30, the side walls of the latter determine the correct position of the part 1.

As above described, the heated die parts 28 and 29 are forced together to cause a fusing or softening and a displacing of the insulating material

of the parts 1 and 3 so as to fill in the spaces of the troughs 30 and 31 and about the upper end of the contact clips, such as the flanges 13 and the connecting parts 15 so that these parts become embedded in the strained material. At the same time the island 32 and the dike 35 form depressions in the faces of the parts 3 and 1. The heat and pressure also causes a uniting of the parts 1 and 3 so that a single unitary integral substantially homogeneous mass will result with the parts 11, 13 and 15 of the clips embedded in this unitary mass (Figs. 6 and 7). The lugs 37, 38 and 43 extend as previously described to maintain the parts in proper place and the holes of proper size.

The complete unit is shown in Figs. 7, 8 and 9. The lugs 14 thereof may be bent outwardly to the desired angle for soldering of wire ends thereto, as shown for example in dotted lines in Figs. 7 and 9.

Instead of separate pieces 1 and 2 or 1 and 3, a single integral piece may be placed over the previously inserted clips in the die and fused or displaced to form an integral homogeneous unit with the clips partly embedded therein. Referring to Figs. 11–16, there is shown a die having a die part 28 for shaping the upper part of the socket body, and a die part 29a having a trough 30 of quadrangular form, an annular trough 31 and a central or circular island 32 for shaping the lower part of the socket body. The die part 29a has tapered passages 33a for receiving the lower end of the contact clip body 18 or 24 as the case may be, there being shoulders 47 in passages 33a for the resting thereon of the lower ends of the tongues 19 or 25 and for holding the flanged parts 23 or 26 of the clip sockets 18 or 24 in such position as they will be in a medial plane of the socket body when in finished form as shown in Figs. 12, 13, 14 and 15. The insulating member 50 is of quadrangular shape and fits into the quadrangular trough 30 of the die part 29a. It has a series of holes 51 of such a size as to receive the flanges 23 or 26 of the clip sockets 18 or 24 (Fig. 11).

As the heated die parts are forced together, the material of the member 50 so fuses or softens and is displaced as to fill in the trough spaces and around the flanged part of the clip sockets 18 or 24 and around the pegs 37, 38 and 43 to form a unitary homogeneous mass with the upper or flanged ends of the clip sockets embedded in the mass, as clearly shown in Figs. 12, 13, 14 and 15. After removal of the article from the dies the solder lugs may be bent as shown in Figs. 14 and 15.

The insulating material or composition used in my invention is preferably of a synthetic resinous base and more specifically known as a rag base preformed board having a partly cured fusible material. Such a substance when treated in accordance with the present invention is practically indestructible and highly resistant to heat and electricity as well as chemicals.

It will be noted that by the interposition of the lugs 43 so as to provide slots or slits 44 (Fig. 8) or 44a (Figs. 16 and 17) there are provided, as desired, any number of air gaps in the material between any two contact clips in the socket. As for example, a contact such as contact 52 (Fig. 9) or 52a (Fig. 16) may be at such a different potential from that at contacts 53 or 54 (Fig. 9) or 53a etc. (Fig. 16) as to ordinarily permit leakage or short circuiting across the surface of the insulating material between the contact clips, especially when there is presence of moisture. By providing air gaps 44 or 44a in the normal path of leakage the resistance to short circuiting is so increased as to prevent or eliminate such leakage or short circuiting.

While I have herein disclosed a few embodiments of the invention and a few methods of producing the same, it is to be understood that the invention is not limited thereto but may comprehend other constructions, details, arrangements of parts, features, process steps and the like without departing from the spirit thereof.

Having thus disclosed the invention, I claim:

A socket comprising an insulating body composed of fused material of a resinous base formed in a single unitary substantially homogeneous mass, contact clips having a portion embedded in said mass, and an air gap provided in said body between any two of said clips for eliminating short circuiting between said clips.

JOHN B. SEEVER.