July 30, 1940. W. J. LARKIN, JR 2,209,734

ELECTRICAL APPARATUS

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Fig. 1

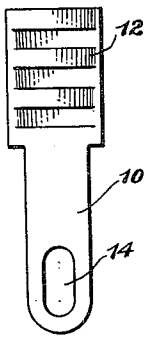


Fig. 2

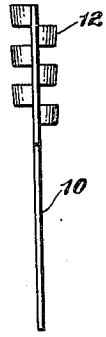


Fig. 4

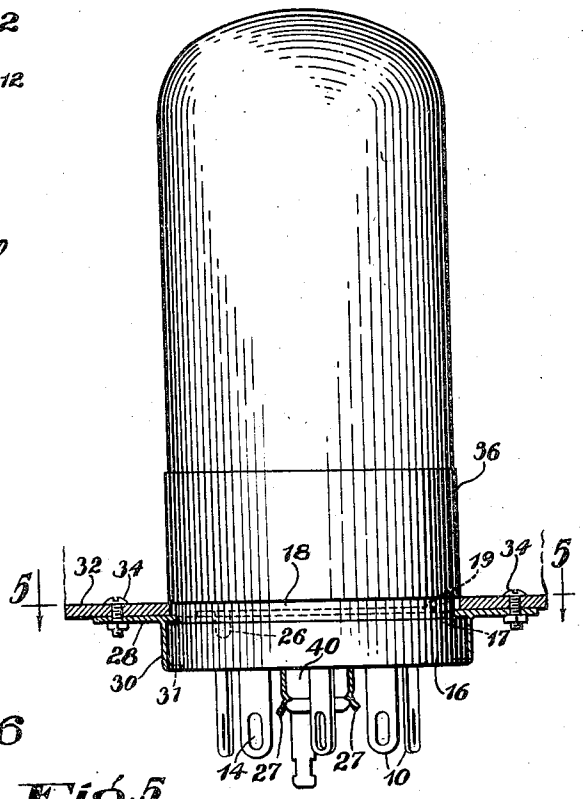


Fig. 3



Fig. 6

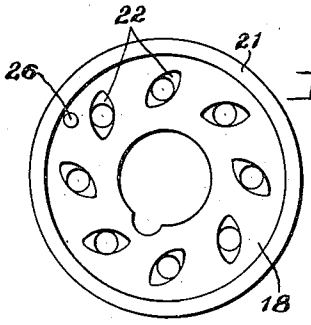


Fig. 5

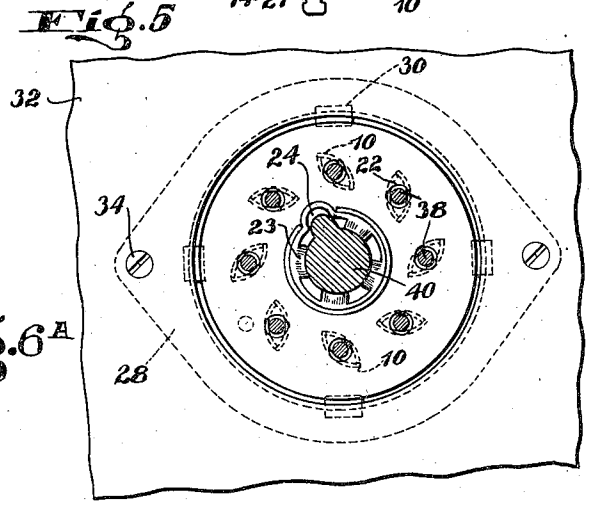


Fig. 6A

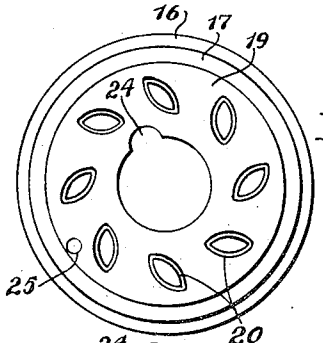


Fig. 6B

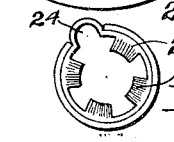
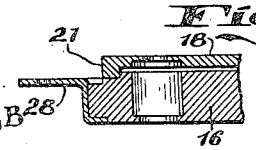


Fig. 7



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Fig. 8.

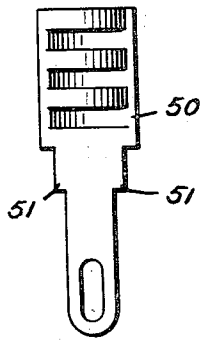


Fig. 9.

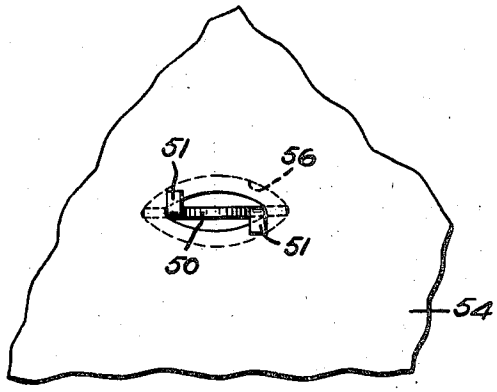


Fig. 11.

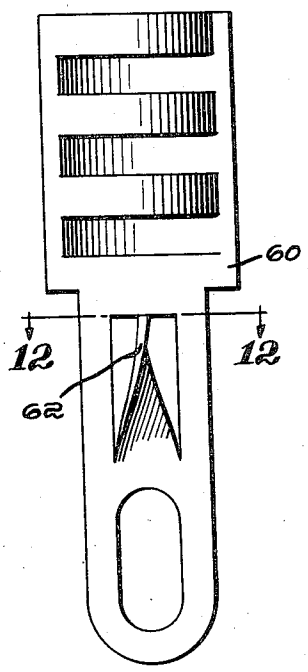


Fig. 10.

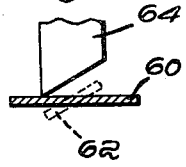


Fig. 12.



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UNITED STATES PATENT OFFICE

2,209,734

ELECTRICAL APPARATUS

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Application September 28, 1939, Serial No. 296,942

5 Claims. (Cl. 173—328)

This invention relates to electrical apparatus and consists in a novel tube socket which includes in its structure an improved type of contact spring.

An important object of my invention is to provide a tube socket wherein the electrical connection between the prongs of a tube in the socket and the contact springs leading to the wires of the circuit is perfect and remains so, even when the set in which the tube is contained is subjected to the sudden movement and shocks which are unavoidably encountered in installations in aircraft and automobiles.

Another object of the invention is to simplify the manufacture of tube sockets and reduce the cost thereof.

One important feature of my invention resides in a barbed construction of the prong-engaged portion of the contact springs which permits a tube to be easily inserted in the socket but renders its removal more difficult, thus preventing the tube from working its way out of the socket and opening the circuit.

These and other objects and features of my invention will be more easily understood and appreciated from the following detailed description of a preferred embodiment thereof selected for purposes of illustration and shown in the accompanying drawings, in which:

Fig. 1 is a view in front elevation of a spring contact member constructed according to my invention,

Fig. 2 is a view of the same in side elevation,

Fig. 3 is a plan view,

Fig. 4 is a view in elevation showing the socket of my invention as assembled with a tube in a radio set,

Fig. 5 is a view in cross-section taken along the line 5—5 of Fig. 4,

Figs. 6, 6A, and 6B are plan views of the cap, base and sleeve respectively elements of the socket, open and ready for the reception of the spring contact members,

Fig. 7 is a fragmentary sectional view of the same elements,

Fig. 8 is a view in front elevation of a modified form of contact spring,

Fig. 9 is a bottom plan of a contact spring inserted in a socket,

Fig. 10 is a view in cross-section of another modification of the invention,

Fig. 11 is a view in front elevation of the modification shown in Fig. 10, and

Fig. 12 is a view in cross-section along the line 12—12 of Fig. 11.

As shown by way of illustration in the drawings, a preferred embodiment of my invention comprises a plurality of spring contact members 10 adapted to be secured in position in a socket consisting of a base 16 and a cap 18.

Each spring contact 10 is stamped from resilient sheet metal and consists in a reduced shank provided with an aperture 14 and an enlarged head in which several transverse slits are cut to form bridge members 12 which are bowed outwardly from the plane of the shank as clearly shown in Fig. 2. Adjacent bridges 12 are bowed in opposite directions to form an uninterrupted axial passage in the head of the contact 10. It should be observed that the bridges 12 are converging downwardly and inwardly, this in effect providing a series of barbs. It will be apparent that if a metal contact pin is pushed into the passage formed by the bridges 12 in the head of the contact 10 its ingress will be easy, but the lower edges of the bridges 12 will tend to bite into the pin and hinder its removal.

Any suitable resilient metal may be employed for the contact members 10, such as sheet bronze, beryllium copper, or the like. The sheet stock may be cut, the bridges formed and the complete member died out from the stock by the usual step of working sheet metal. It will be noted that the passage formed by the alternate displacement of the bridges 12 is symmetrically disposed in line with the shank of the member.

The socket includes a circular base 16 of porcelain, steatite, or other insulating material. The base 16 is provided on its upper surface with two concentric raised portions 17 and 19 of circular outline, an internal aperture provided with a keyway 24, and a small dowel hole 25 near the edge of the raised portion 19. Molded in the base 16 are a number of elliptical holes 20 which are large enough at the top to receive the heads of the contact members 10 and just large enough at the bottom to receive the shanks of the contacts 10. Thus the contact members 10 can be inserted in the base 16 from the top only. The shanks of the contacts 10 fit tightly in the bottoms of the apertures and prevent solder from entering the socket when connections are being made.

As shown in Fig. 6 the socket also includes a circular cap 18 of insulating material recessed to fit over the raised portion 19 on the base 16 and having a peripheral flange 21 coinciding in external diameter with the raised portion 17 on the base 16. The cap 18 is provided on its lower surface with a dowel 26 fitting in the hole 25 in

the base 16. The large internal aperture with the keyway 24 is continued in the cap 18. The cap 18 is also provided with apertures 22 which are elliptical at their inner ends to coincide with the top of the apertures or pockets 20 in the base 16. The upper portions of the apertures 22 are circular and considerably smaller in area than the lower portions thereof. An elongated metal split sleeve 23 extends through the central aperture in the base 16 and is headed over at the top of the cap 18, thus holding the cap and the base together. The sleeve 23 is provided with spring prongs 27 at its lower end, which are crimped inwardly near the tip.

In assembling a socket, the contacts 10 are first pushed into the apertures 20 of the base 16, the sleeve 23 is positioned, and the cap 18 is placed on the base and fastened to it by the dowel 26 passing into the hole 25 and by heading over the upper end of the sleeve 23. A sheet metal fastener in the form of a flat ring 28 provided with perforated ears is slipped over the cap 18 and rests on the margin of the base 16 outside the raiseed portion 17. The ring 28 is provided with a number of lugs 30 which are bent over the bottom of the base 16, fitting into short, radial recesses 31 cut into the bottom of the base.

In Fig. 4 a socket is shown assembled on the chassis 32 of a radio set, or other device employing electron discharge tubes. The ring 28 is secured to the chassis by a pair of small bolts 34 passing through the perforated ears, although rivets or other fasteners may also be used effectively. A tube 36 is shown as provided with eight pins or prongs 38 which, as shown in Fig. 5, enter the small holes 22 and are gripped by the spring contacts 10. The tube shown in the drawings is of the "Locktal" type and is provided with a heavy central prong 40 having a key fitting the keyway 24 and the eight smaller pins 38. However, my invention may be adapted for sockets for tubes having any number of pins or prongs and is not limited to use with "Locktal" tubes.

It will be observed that the spring contacts 10 are held in the socket and cannot loosen or fall out and that the cap 18 and the cap 16 are held together by the sleeve 23. The lower edges of the bridges 12 tightly grip the pins 38 at a plurality of spaced points establishing perfect electrical contact and preventing the tube 36 from slipping out of or being easily withdrawn from the socket. The circuit connections are, of course, made by soldering wires into the apertures 14 in the lower portions of the contacts 10 which protrude below the base 16. The central prong 40 is provided near its end with an annular recess into which the bent portions of the prongs 27 are snapped when the tube 36 is pushed home in the socket. One of the prongs 27 is elongated to form means for connecting the rung 23 and thus the prong 40 to a wire forming part of the circuit (not shown). The lower edges of the bridge members 12 also serve to scrape the pins 38 and clean off any film of oxide which may have formed therein. This action obviously improves the electrical connection, since a film of oxide is not a good conductor.

The contact spring of my invention may, in a slightly modified form, be used in combination with a one piece socket. As shown in Fig. 8 I may construct a contact member 50 with an opposed pair of shoulders 51 cut into the reduced shank, in other respects the contact 50 is identical with the contact 10 shown in Fig. 1. The socket 54 with contact members of the type shown in Fig. 8 is similar to the base 16. The socket 54 is provided with a series of elliptical holes 56 partially closed at the bottom as shown in Fig. 9. A contact spring 50 is inserted from the top of the socket 54, the shank portion protruding through the bottom. Then, by means of a punch or other suitable tool, the shoulders 51 are flattened in opposite directions on the bottom of the socket 54, thus preventing the contact 50 from being withdrawn.

Another form of the invention is shown in Figs. 10–12. A contact spring 60 is blanked out similarly to the contact 10 of Fig. 1 with one exception. In the shank of the contact 60 an ear or transom 62 is punched out and twisted on a longitudinal axis lying in the plane of the shank. A bevelled punch 64 may be used as suggested in Fig. 10. The upper end of the ear 62 is perpendicular to the plane of the shank as shown in Fig. 12 and extends out equally and symmetrically on either side thereof. When the contact 60 is inserted into a socket, the ear 62 is forced back into the plane of the shank until the whole length of the ear 62 is exposed below the base; then the ear snaps back into its initial position, bears against the bottom of the socket, and prevents withdrawal of the contact 60 from the socket. The ear 62 forms in effect a transverse wall which abuts against the bottom of the socket, and any upward pull on the contact 60 will be resisted by the wall. Since the thrust is longitudinal of the ear 62, there is no tendency to bend it out or snap it off.

The sockets thus described are easy to manufacture and assemble. The novel contact springs, however, may be used in sockets of various types in addition to those described. Minor modifications will be apparent to those skilled in the art, and fall within scope of the invention as defined in the appended claims.

Having thus described and illustrated an embodiment of my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A socket comprising a body portion of insulating material provided with a series of through and through apertures partially closed at the bottom, a contact member disposed in each aperture, each contact member having a head larger than the partially closed portion of the aperture and a flat reduced shank protruding below the body, a rectangular interior portion of the shank of each contact member being severed from the shank along its top and side edges and twisted on the longitudinal axis of the shank to form a resilient transverse wall projecting on both sides of the shank and abutting against the bottom of the body portion and preventing withdrawal of the contact member from the body portion.

2. A socket comprising a cylinder of insulating material provided with at least one through and through aperture partially closed at the bottom, and a metallic contact member disposed in the aperture, the contact member having a sheet metal shank fitting and protruding through the bottom of the cylinder, an interior portion of the shank being severed from the shank on three sides and twisted on a longitudinal axis lying in the plane of the shank to form a transverse wall integral with the shank and extending equally from opposite sides thereof, and abutting the bottom of the cylinder.

3. A contact member for sockets, which comprises a head, a reduced shank, a rectangular interior portion of the shank being cut and twisted

to form a resilient wall integral with the shank along its lower edge and disconnected therefrom along its upper and side edges, said wall being normally perpendicular to the plane of the shank and yieldingly rotatable about an axis lying in the plane of the shank.

4. A contact member for electric terminals, which comprises a single strip of metal having an enlarged head and a reduced shank, contiguous transverse areas of the head being severed by transverse cuts and bowed outwardly in opposite directions from the plane of the strip to form an axial passage, the bowed areas being convergent toward the edges nearest the shank, whereby the bowed areas not only define the axial passage but also act as barbs resisting withdrawal of a terminal inserted in the passage.

5. A contact member for electric terminals, which comprises a strip of metal, contiguous areas of which are severed from one another by transverse cuts, the alternate areas thus formed being bowed outwardly in opposite directions from the plane of the strip thus providing an axial passage and converging inwardly toward their lower edges to form arcuate barbs resisting withdrawal of a terminal inserted in the passage.

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