

Oct. 7, 1952

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2,613,244

ELECTRIC SOCKET FOR MINIATURE TUBES

Filed Sept. 2, 1948

2 SHEETS—SHEET 1

FIG. 1.

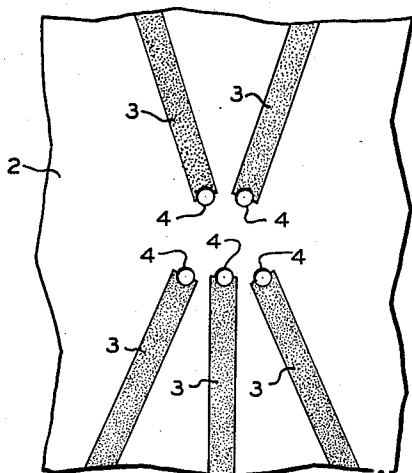


FIG. 2.

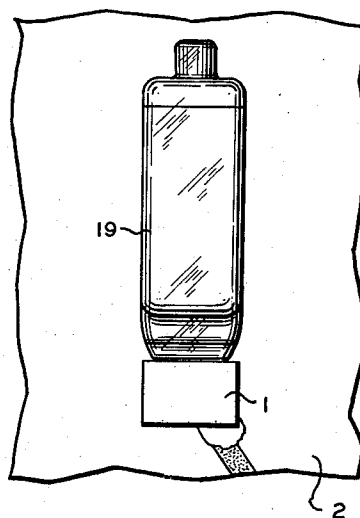


FIG. 3.

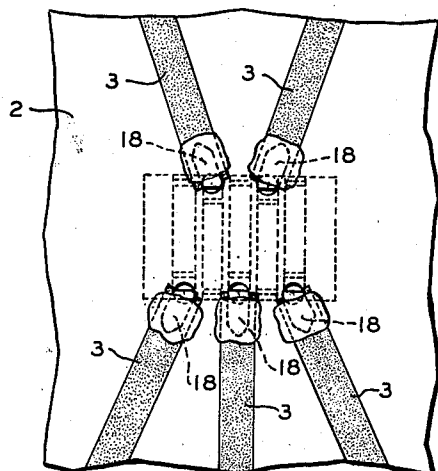


FIG. 4.

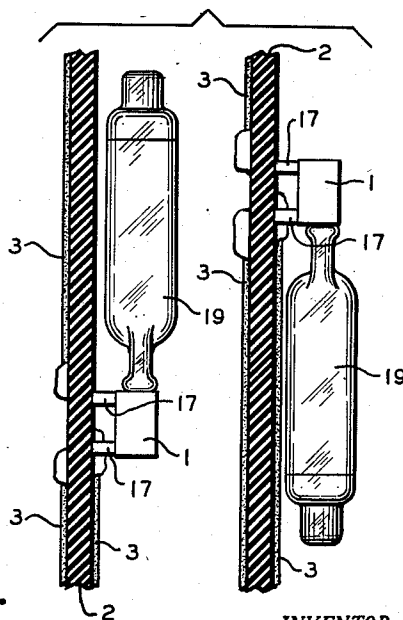


FIG. 5.

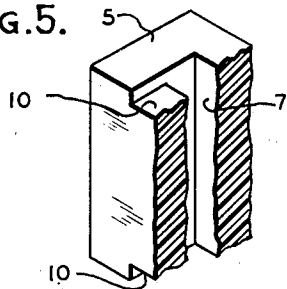
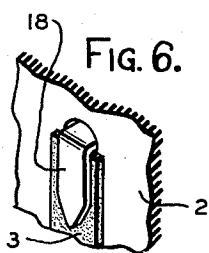


FIG. 6.



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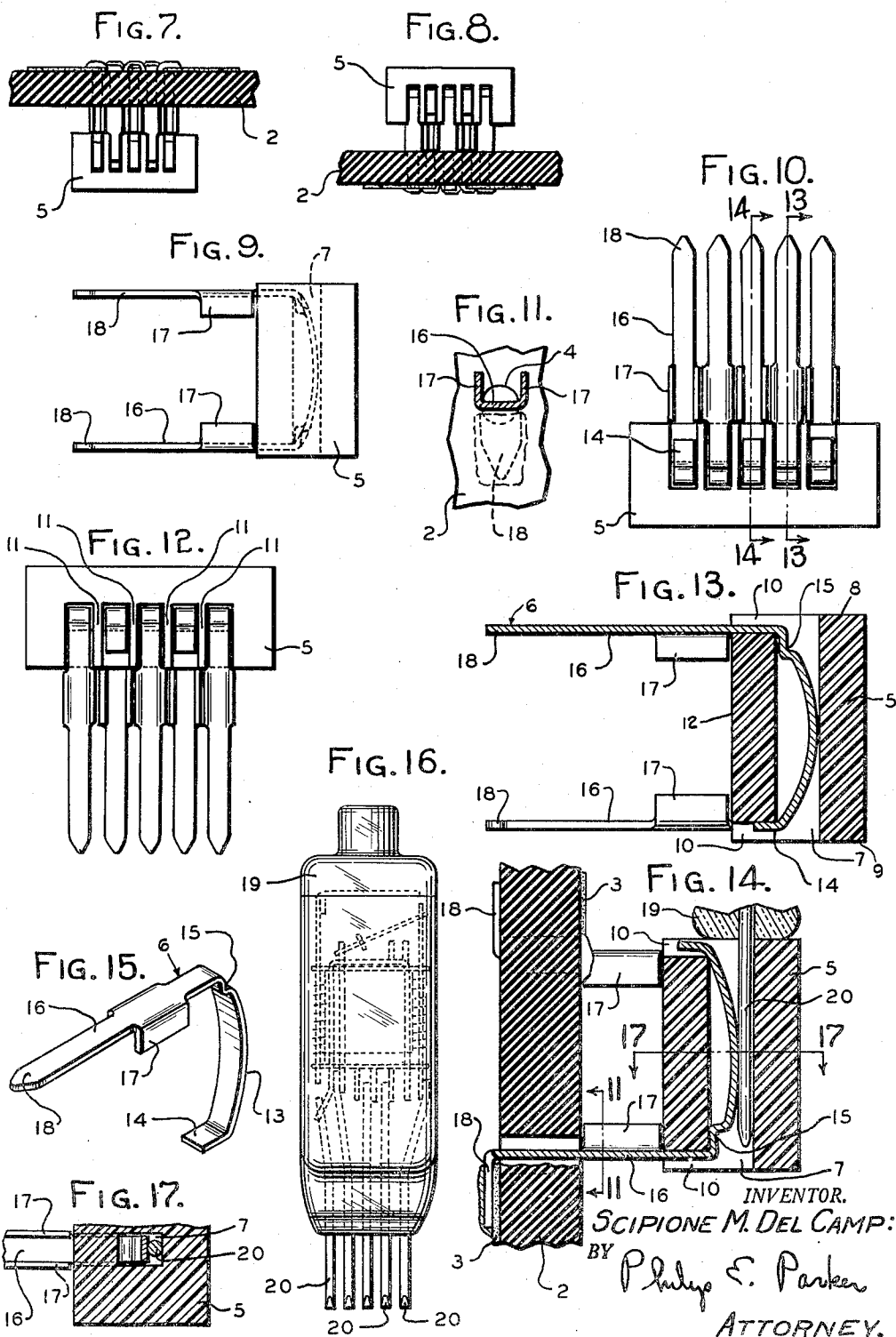
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2 SHEETS—SHEET 2



UNITED STATES PATENT OFFICE

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ELECTRIC SOCKET FOR MINIATURE TUBES

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6 Claims. (Cl. 173—328)

1

The present invention relates to sockets for vacuum tubes, connector plugs and the like and more particularly to sockets adapted for holding extremely small vacuum tubes.

Within recent years, the art of making electronic devices using extremely small circuit components has been developed, so that it is now possible to construct such devices using a number of vacuum tubes of a size that such an electronic device may be placed in a vest pocket or in the fuse nose of a shell or bomb. The vacuum tubes developed for such electronic devices measure only about an inch and a quarter in length and about a quarter of an inch width and thickness. In order that the wiring of such circuits may be reduced to a minimum in size, a method has been developed of printing, painting or otherwise adhesively applying circuit components and conducting elements upon an insulating plate. Generally, it has been necessary to solder the terminals of these small vacuum tubes to these conducting elements.

Since the tubes are soldered into these circuits, the replacement of defective vacuum tubes requires the unsoldering of the defective tube and the resoldering of the circuit with a new replacement. Where the life of such devices was necessarily short, as for example, those in the fuses of shells or bombs, ease of replacement of the vacuum tubes was not important. But where the circuits of this type are used in hearing aids, miniature radios, or other electronic devices having a long useful life, the ease of replacement of vacuum tubes becomes extremely important in reducing maintenance and repair costs. Consequently, the need for a suitable socket for these small vacuum tubes becomes evident. Furthermore, in manufacturing operations it is more convenient and easy to manufacture a compact electronic circuit device using sockets in place of the more fragile vacuum tubes.

However, the standard construction of vacuum tube sockets for standard sized vacuum tubes has been found not to be particularly adapted for use in making small sockets suitable for holding the extremely small vacuum tubes.

A principal object of my invention is to provide an improved vacuum tube socket particularly adapted for use with subminiature vacuum tubes in electronic or electrical devices where small size and compactness of construction are required.

Another object is to provide a socket of the above type adapted for use in electronic devices where the circuit conducting elements are printed or painted on an insulating panel.

A further object of my invention is to provide a socket for vacuum tubes, connector plugs, and the like which is small and compact with a minimum of parts and is relatively easy to manufacture.

Another object is to provide a socket of the above type which may be easily installed and mounted in electronic or electrical devices man-

2

ufactured or assembled under the so-called printed or painted circuit technique.

A still further object of my invention is to provide an improved socket for vacuum tubes, connector plugs, and the like having means integral with the socket terminal members for spacing the socket from the mounting panel.

Still another object of my invention is to provide an improved socket installation for use with vacuum tubes, connector plugs, and the like which is small and compact and simply manufactured and assembled.

Other objects and advantages of my invention will be pointed out in the following description and claims and illustrated in the accompanying drawing, which disclose by way of example, the principles of my invention and the best mode, which has been contemplated, of applying these principles.

In the drawings:

Fig. 1 shows an enlarged portion of a base showing the apertures for mounting the socket of my invention together with the printed circuit conductor elements;

Fig. 2 shows an enlarged plan view of the socket of my invention mounted to a portion of the base and holding a sub-miniature vacuum tube;

Fig. 3 shows an enlarged view of the reverse of Fig. 2 showing the terminals of the socket soldered to the printed circuit elements of Fig. 1;

Fig. 4 shows enlarged side elevations of the socket of Fig. 2 with the subminiature vacuum tube mounted at opposite ends of the socket;

Fig. 5 shows an enlarged perspective cross-sectional view of the socket body showing the contact cavity;

Fig. 6 shows an enlarged perspective view of a portion of the base showing the mounting aperture and terminal end of the contact of my socket in mechanical contact with a conductor element of the printed circuit;

Fig. 7 shows an enlarged end elevation of the socket;

Fig. 8 shows an enlarged elevation of the opposite end of the socket of Fig. 7;

Fig. 9 shows an enlarged side elevation of the socket together with the contact prongs and with the cavity and the portion of the contact prongs thereon shown in dotted line;

Fig. 10 shows a still further enlarged end elevation of the socket;

Fig. 11 shows a cross-sectional view of one of the contacts and a portion of the base taken on line 11—11 of Fig. 14;

Fig. 12 shows an elevation of the opposite end of the socket of Fig. 10;

Fig. 13 shows a cross-sectional view taken on line 13—13 of Fig. 10;

Fig. 14 shows a cross-sectional view of the socket taken on line 14—14 of Fig. 10 with the socket mounted on a supporting base shown in cross section;

Fig. 15 shows a perspective view of the contact which is used in the socket;

3

Fig. 16 shows a greatly enlarged plan view of a sub-miniature vacuum tube suitable for mounting in a socket of my invention; and

Fig. 17 shows a cross-sectional view taken on line 17-17 of Fig. 14 showing the tube prong in the contact bore and the contact.

In the preferred embodiment of my invention shown in the drawing, the socket 1 of my invention is shown mounted on a panel 2. This panel or base 2 may be of ceramic or other insulating materials and may be the panel on which the circuit components such as conductors, inductances, resistors, and condensers, are mounted in assembling an electronic circuit device by methods known by those skilled in the art. In the more compact devices certain of these components may be printed, painted, adhesively secured or otherwise mounted on the panel. In the drawing there is shown only the electronic circuit conductor elements 3 which connect to the socket 1. These elements may be strips of foil, adhesively secured to the panel or conducting strips of metal or other material adhesively or otherwise mounted to the panel 2.

In the panel or base 2 are shown five apertures 4 disposed in two substantially parallel lines for mounting the socket 1. The conducting elements 3 are shown mounted on the panel extending from and adjacent the apertures 4. One element is shown on one face of the panel 2 leading away from one aperture and five are shown on the reverse side, one leading away from each aperture.

The socket 1 of my invention comprises a socket body 5 of insulating material in which are mounted the contact prongs 6. The socket body 2 in the embodiment shown is a substantially rectangular block having five substantially parallel rectangular cross-sectional contact-receiving bores 7 extending from one end 8 of the block to the opposite end 9. The number of apertures, however, may be varied to suit the requirements of the vacuum tube used in the circuit. In these opposite end faces 8 and 9 of the block are disposed grooves 10 extending substantially parallel to each other from the ends of the contact-receiving bores 7 and to one face or base 12 of the block 5 and providing ridges 11 between the grooves 10.

The contacts 6 for the socket are made from strips of conducting material having a width approximately equal to the width of the contact-receiving bore 7 of the socket. Each contact element 6 has an arcuate resilient portion 13 which is disposed in a contact-receiving bore 7 of the socket body 5 with its ends in engagement with the side of the bore 7 adjacent the base 12 of the socket body 5 and its center in spring engagement with the opposite side of the bore 7.

At one end of the resilient portion is provided a hook portion 14 which is disposed in the groove 10 adjacent the end. At the other end of the arcuate portion 13 there may be disposed an angular offset 15 providing a portion of the strip for bearing against the side of the bore 7 adjacent the base. Also, at this other end there is disposed a terminal portion 16 extending along the groove 10 adjacent that end and beyond the base 12 of the socket body. Both the hook portion 14 and the terminal portion 16 are parallelly disposed to each other and extend substantially normal to an imaginary line connecting the ends of the resilient arcuate portion 13. On the terminal portion 16 are disposed wing portions 17 extending from opposite side edges thereof spaced from the arcuate portion 13 by an amount substantially equal to the distance from the contact-receiving

4

bore 7 in the socket along the groove to the base 12 of the socket body.

The resilient arcuate portion 13 is disposed in the contact-receiving bore with the hook portion 14 and the terminal portion 18 engaging the grooves 10 between the ridges 11 with the terminal portion extending beyond the socket body with the terminal wings 17 disposed adjacent the surface of the body. The ridges 11 provide means for insulating and separating portions of adjacent contact prongs 6. In the embodiment shown the terminal portions 16 of the contacts 6 are shown disposed at alternate ends of adjacent bores 7. However, such symmetrical displacement is not necessary and the disposition of the terminal ends can be varied in accordance with the technical requirements of the device in which the socket is mounted.

The socket 1 is secured to the base 2 by inserting the terminal portions 16 through the apertures 4 of the base 2 until the wings 17 rest upon the base 2 thereby spacing the socket 1 from the base 2. The ends 18 of the terminal portions may then be folded or otherwise bent securely against the base 2 or any conducting element 3 on the surface of the base 2 adjacent to the aperture 4 through which the particular end 18 extends. These terminal ends 18 may be soldered to the circuit conducting elements in order to improve connection therewith. The wing elements 17 are caused to be in mechanical contact with the surface of the base and may be soldered to any conducting element on that face of the base 2 and disposed adjacent thereto.

Generally the socket of my invention is particularly adapted for use with subminiature vacuum tubes 19 of the type shown in Fig. 16 which is a greatly enlarged view. These tubes 19 are generally about an inch to an inch and a quarter in length and have their terminal prongs 20 disposed substantially in a plane extending from one end of the tube. The prongs 20 of the tube 19 may be inserted in accordance with the circuit and design requirements of the particular device through either end 8 or 9 of the socket 1 with the tube prongs sliding between the arcuate contact portion and the side of the bore making an electrical contact therewith and holding the same in the socket 1 by spring tension.

Having now described and illustrated one form of my invention I wish it to be understood that my invention is not to be limited to the specific form or arrangement of parts herein described and shown, except insofar as such limitations are specified in the appended claims.

I claim:

1. A socket for vacuum tubes, connector plugs and the like comprising a socket body having a plurality of prong-receiving bores extending from one end to an opposite end and a prong-engaging contact mounted in one of said bores, said contact including a contact portion, a hook portion, and a terminal portion extending substantially normal to said contact portion, said contact portion being arcuate with its ends in engagement with one side of said bore and its center bowed toward an opposite side of said bore, said hook portion being disposed at one end of said contact portion in engagement with one end of said body, and said terminal portion being disposed at the opposite end of said contact portion in engagement with the opposite end of said body, said terminal portion having a wing extending from a side edge thereof adjacent said socket body with one side edge in engagement

5

with a face of said socket body and an opposite side edge for engagement with a face of a support and having its free end adapted for extending through an aperture in the support and engaging an opposite face of the support, said opposite side edge of said wing and said free end of said terminal portion being adapted for connection to conducting elements mounted on opposite faces of said support adjacent the aperture therein.

2. A socket for vacuum tubes, connector plugs and the like comprising a socket body having a plurality of prong-receiving bores extending from one end to an opposite end and grooves at each of said ends extending from said bores to and cutting a common face and prong-engaging contact mounted in said bores, each of said contacts including a contact portion, a hook portion, and a terminal portion, said contact portion being arcuate in shape with its ends in engagement with the side of said bore adjacent said grooves and with its center bowed toward an opposite side of said bore, said hook portion being engaged at one end of said contact portion in the groove at the adjacent end of said bore, and said terminal portion being disposed at the opposite end of said contact portion in the groove at the adjacent end of said bore and extending beyond and substantially normal to said common face of said socket body, certain of said contacts being disposed with their terminal portions adjacent one end of said body and the remainder of said contacts being disposed with their terminal portions adjacent the opposite end of said body, and said terminal portions having wings extending from side edges thereof adjacent said socket body and their free ends adapted for extending through apertures in a support and for deformation for engaging a face of the support opposite said socket body, said wings having side edges adapted for engaging a face of the support adjacent the socket body, and said wings and said free ends being adapted for making external connections thereto.

3. A prong-engaging contact for use in a socket body having a contact-receiving bore extending from one end face of said body to the opposite end face, said contact comprising a conducting strip having an arcuate portion with its ends adapted for engaging a side of such a bore and its center adapted for tensioning toward an opposite side of said bore and engaging therewith a contact prong, and having a hook portion disposed at one end of said contact portion for engaging one end face of such a body and a terminal portion at the other end for engaging the opposite end face of said body, said terminal portion being adapted to extend beyond said socket body and having wings extending from the side edges intermediate the ends thereof and having its free end adapted for engagement with an aperture in a support, said wings having opposing side edges for engaging a face of the socket body and a surface of the support.

4. A prong-engaging contact for a socket for vacuum tubes, connector plugs, and the like having a socket body with contact-receiving bores extending from one end face to an opposite end face, said contact comprising: a conducting strip having a resilient arcuate portion, a hook portion disposed at one end of said arcuate portion extending substantially normal to a plane passing through the ends of said arcuate portion in a direction opposite the direction of bowing of said arcuate portion, an angularly offset portion at

6

the opposite end of said arcuate portion having a portion disposed in said plane, and a terminal portion extending from said angularly offset portion substantially parallel to and in the same direction as said hook portion, said terminal portion extending a distance substantially greater than said hook portion and including wing portions spaced from said angularly offset portion intermediate the ends of said terminal portion and extending from the side edges of said terminal portion.

5. A vacuum tube socket installation comprising an insulating panel having at least one aperture therein, a conducting element affixed to a surface of said panel adjacent said aperture, a socket body having a plurality of prong-receiving bores extending through said body from one end face to an opposite end face substantially parallel a side face of said body, a contact member including a resilient prong-engaging portion having an element extending out of the plane thereof and engaging one end face of said body and a terminal portion extending in substantially perpendicular relation to said prong-engaging portion, said terminal portion having an element engaging an opposite end face of said body and combining with said first mentioned body-engaging element to secure said contact member to said body, said terminal portion having laterally extending portions in engagement with said socket body and said panel for spacing said socket body from said panel, the free end of said terminal extending through said aperture of said panel and being electrically engaged with said conducting element.

6. A prong-engaging contact for use in a socket body having a contact-receiving bore extending from one end face of said body to the opposite end face, said contact comprising a conducting strip having a resilient prong-engaging portion, said strip having elements at opposed ends of said prong-engaging portion for engaging said opposed end faces of said body, and said strip having a terminal portion at one end extending in substantially perpendicular relation to said prong-engaging portion, said terminal portion having laterally extending elements providing oppositely facing surfaces for abutting said socket body and a supporting panel whereby said socket body is spaced from said panel.

SCIPIONE M. DEL CAMP.

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