May 18, 1943 N. R. SMITH 2,319,564

BASE AND SOCKET

Filed June 28, 1941

Fig. 1

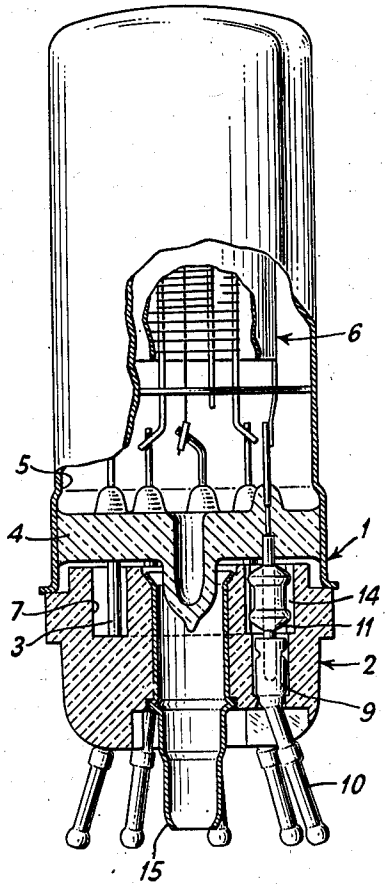


Fig. 2

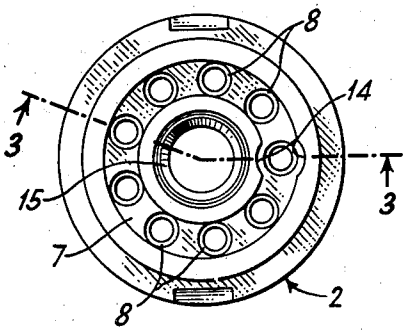


Fig. 3

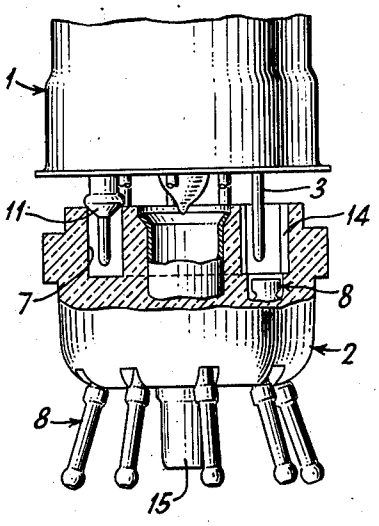
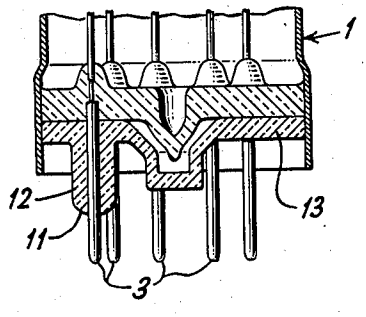


Fig. 5



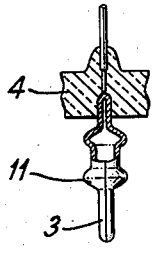


Fig. 4

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BASE AND SOCKET

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Application June 28, 1941, Serial No. 400,167

4 Claims. (Cl. 173—328)

My invention relates to electrical connectors of the type having male and female elements and exemplified in cable connectors and radio tube bases and sockets.

It is common practice to asymmetrically arrange the male contact pins of a base and the female contactors of a socket to rotationally orient the two members before electrical contact is made. Speed and ease of assembly, however, is much reduced by such combinations of bases and sockets because of the false starts that may be made before the base can be brought to the proper position for insertion. If the socket is inaccessible or out of sight, the sense of touch of the operator may be the only way of "finding" the socket with the base, but this is not feasible because the pins may be strained when forced into the wrong socket openings. The so-called "bayonet and slot" employed for sockets and bases of some radio tubes, where the socket comprises a cylinder with a slot to receive an indexing pin on the side of the base, is costly and impractical for many connectors.

An object of my invention is an improved combination of male and female connector elements for easy and speedy assembly.

A more specific object of my invention is an improved male and female connector which may be assembled without false starting of the male contact pins into the socket.

Characteristic features of my invention are defined in the appended claims and one embodiment thereof is described in the following specification and shown in the accompanying drawing in which:

Figure 1 shows, partly in section, an assembled base and socket constructed according to my invention;

Figure 2 is a top plan view of the socket of my novel connector combination;

Figure 3 is a view of my novel socket, sectioned along line 3—3 of Figure 2, and shows the positional relation of the base at the beginning of assembly;

Figure 4 shows in detail one male contactor that may be used with my novel socket; and

Figure 5 shows in section another base or male connector embodying my invention.

The base or male element 1, which cooperates with the socket 2, of my novel connector combination is illustrated as the base of a radio tube although this male element may comprise, for example, the plug of a cable connector. The contact pins 3 of the base are parallel and circularly arranged and are supported in the tube of Figure 1 in the glass disc header 4 which is sealed in the end of the envelope 5. The inner ends of the pins are connected to the various electrodes 6 in the envelope. The pins may, if desired, be uniformly spaced in the pin circle.

The socket 2 of my novel combination comprises a body of insulating material having a circular groove 7 in its top surface, the groove being wide enough to receive the contact pins, and having a mean diameter substantially equal to the mean diameter of the pin circle. The groove is relatively deep and narrow, its depth being greater than its width. Spaced female contactors 8 are arranged in the bottom of the groove, the contactors corresponding in spacing and number with the pins of the base. The contactors 8 may be of any desired size and shape to make contact with the ends of the pins, the preferred contactors, however, being drawn or rolled or swaged cylindrical barrels 9 fitted into holes in the bottom of the groove and having integral shanks 10 of reduced diameter which extend through openings in the bottom of the socket and are bent to hold the contactors in place. The upper ends of the contact barrels are preferably about flush with the surface of the bottom of the groove.

According to one of the characteristic features of my invention, the ends of the contact pins may be inserted into the groove and freely rotated, the sides of the groove serving as a journal for the pins to guide the pins in a path over the ends of the female contactors. To hold the ends of the pins above the bottom of the groove and prevent the pins from bumping along over the contactors or the holes in which the contactors are fixed as the base is rotated in an upright position, one of the contact pins is provided with a projection or shoulder 11 extending radially beyond the pin circle, this projection being spaced inwardly from the plane through the ends of the pins and adapted to smoothly ride along the outer rim of the groove. This projection may conveniently comprise a shoulder on one of the pins intermediate the ends of the pin and extending radially inward or outward to ride along either the inner or outer rim of the groove, or alternatively, the shoulder may be annular in shape so that it can ride on both rims. The indexing pin of the base may be provided with a short cross arm welded to the pin or a sleeve slipped over the pin as depicted in Figures 1 and 3 and crimped against the side of the pin to hold it in place, or the pin and its stop shoulder may be swaged or drawn in one piece as shown in Figure 4. A third alternative, shown in Figure 5, may comprise a

sleeve 12 of insulating material slipped over the indexing pin and, if desired, molded with a wafer base plate 13 on the tube, the end of the sleeve being the desired distance from the ends of the pin. A slot or keyway 14 is formed in the wall of the groove and extends vertically from the top surface of the socket body to the female contactor, into which the indexing pin is delivered. The keyway is of such a width or radial depth as to receive the projection or shoulder on the locating pin.

A central tubular metal sleeve 15, extending the length of the socket, may, when connected to ground, electrostatically shield the pins from each other, and in cooperation with shields on the inside of the exhaust tube effectively shield the pins and their conductors throughout their length.

To assemble, the pins of the base are inserted into the groove in any random rotational position with the projection 11 riding on the rim of the groove. The partially inserted ends of the pins are rotated until the projection passes over the end of the keyway 14 whereupon the base drops and rotation is stopped. Since the ends of the pins do not touch the bottom of the groove, entrance of the indexing pin into its keyway is the first and only interruption in the smooth rotation of the base and socket and is a distinct indication to the operator that the base has arrived at its correct rotational position for insertion. Downward pressure on the base then forces the pins into proper female contactors. The dumb-bell shape of the indexing pin adapts the pin for engagement with a locking contactor in the socket to positively hold the base and socket together. Good results have been obtained in making sockets for radio tubes of the types commercially known as the miniature metal radio tubes having nine contact pins of .040 inch wire projecting .305 inch from the header of the tube and in which the pin circle is only .425 inch in diameter. In practice the tubes are rapidly inserted in their sockets and are turned to their proper position for insertion without straining the rather delicate male and female elements of the base and socket. My improved male and female connector materially speeds assembly of the connectors because the operator does not contend with false starts and because by sense of touch alone the base can easily "find" the socket.

I claim:

1. In combination a socket and a base, said socket comprising an insulating body having a circular groove in its top side, spaced female contactors in the bottom of said groove, a keyway in the wall of said groove extending from said top side to one of said contactors, said base comprising a plurality of parallel circularly arranged male contact pins, corresponding in number and spacing with said contactors, one of said pins having a projection laterally beyond the circle of the pins, said projection being spaced inward from the plane through the ends of said pins a distance less than the length of said keyway, the lateral extent of said projection being intermediate the width of the groove and of the groove and keyway.

2. In combination, a socket body of insulating material, and a base having a plurality of circularly arranged parallel contact pins, one of said pins having a shoulder intermediate the ends of the pins and radially displaced from the pin circle, said socket having a circular groove in its top surface for journalling the ends of said pins, a plurality of contactors in the bottom of said groove spaced from said top surface a distance greater than the length of the pins beyond said shoulder, and a keyway in the side of said groove extending from said surface to a selected one of said contactors, said shoulder being, in radial extent, intermediate the width of the groove and the width of the groove plus the keyway.

3. A socket comprising a body of electrical insulating material with a relatively deep and narrow circular groove in the surface of said body, said groove having greater depth than width, a plurality of spaced contactors in the bottom of the groove, and a keyway in the side of the groove extending from said surface to one of said contactors.

4. In combination a socket and a base, said socket comprising an insulating body having a flat smooth surface on one side, a relatively deep narrow circular groove in said side, spaced female contactors in the bottom of said groove, a keyway in the wall of said groove extending from the said surface to one of said contactors, said base comprising a plurality of parallel circularly arranged male contact pins corresponding in number and spacing with said contactors so that the ends of said pins may be rotated in said groove, and means for preventing the engagement of the ends of said pins with said contactors while the pins are rotated, comprising a shoulder on said base, said shoulder being displaced from the circle of pins, and spaced from the plane through the outer ends of said pin a distance less than the distance from said side to said contactors, and adapted to slide over said smooth surface and enter said keyway.

NEWELL R. SMITH.