July 1, 1930. H. P. DAVIS 1,768,669

TUBE CONNECTER

Filed July 2, 1925

Fig. 1.

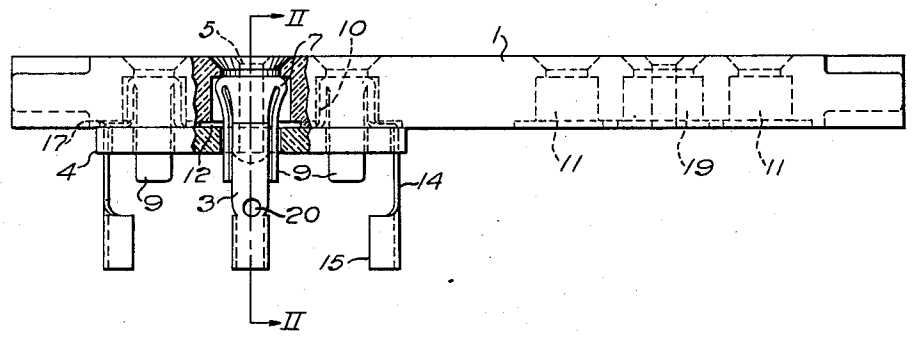


Fig. 2.

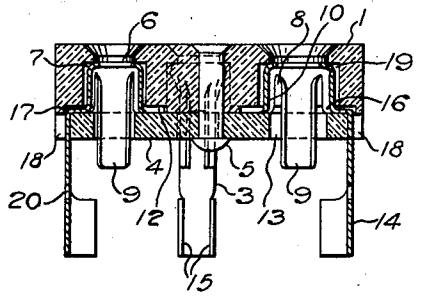
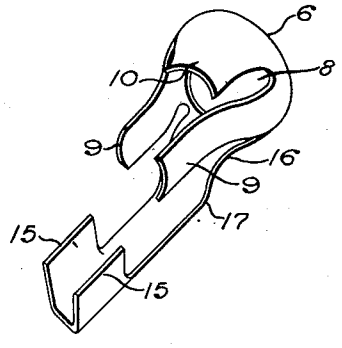


Fig. 3.



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UNITED STATES PATENT OFFICE

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TUBE CONNECTER

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This invention relates to contact terminals of the type used in vacuum-tube sockets for making the connections to the terminals of the vacuum tube.

It is an object of this invention to provide a contactor that shall be more durable than those heretofore used.

It is a further object of this invention to provide a vacuum tube socket in which the several contactors are capable of movement relative to one another whereby slight manufacturing inaccuracies, either in the tubes or in the sockets, can be compensated.

It is a further object of this invention to provide a terminal connecter which will afford an abundant contact surface resiliently held against the vacuum-tube terminal.

It is a further object of this invention to provide for resilience without permitting sufficient movement of the contacting member to cause any permanent distortion of the terminal.

Many attempts have been made heretofore to provide a contact terminal for use in vacuum-tube sockets by rolling or bending a blank of sheet metal into a ring. Such ring-shaped terminals have a split in the ring where the ends of the blank meet. The ring is intended to be distended by the insertion of the tube terminal into the connecter and the split facilitates such movement. The distention produces, sooner or later, a permanent deformation of the ring, after which the contactor will not make satisfactory contact with the tube terminal. My invention avoids this difficulty by making the ring without any split therein.

By making the ring large enough to admit the tube terminal, I avoid the need of distending it. I provide resilient fingers extending from the ring and converging to ensure contact. When the pin is inserted through the ring it pushes the fingers apart but I provide means for limiting this movement whereby it is impossible for the pin to bend the fingers.

Other advantages of my invention and the details of construction will be apparent from the following description and the accompanying drawings, in which

Figure 1 is a side view, partly in section, of a preferred form of my invention, showing some of the terminals in place.

Fig. 2 is a view upon the line II—II of Fig. 1, and

Fig. 3 is a perspective view of a terminal.

Referring to Fig. 1, the tube sockets, which are located in a plate 1, are produced by providing spaced holes in the plate and securing contacting members therein. The holes are provided with metallic contactors 3 which are secured therein by a disc 4 of insulating material. The disc 4 and the plate 1 are fastened together by a rivet 5.

Each contactor comprises a ring 6, which being formed by a drawing operation, has a rounded shoulder 7. The blank from which the ring is made is of such shape that the drawing operation produces not merely the ring but a cylinder considerably longer than the axial thickness of the ring. Extending downward from the ring 6 are a plurality of fingers formed by cutting slots 8 in the cylinder. Two of these fingers 9 are bent inward and slightly arched whereby they are nearer together at the disc 4 than they are within the plate 1. Because of the curvature of the cylinder from which these fingers are made, finished fingers are concave on their inner faces, whereby the fingers will fit the pin terminal of the tube and produce a good electrical contact.

A third finger 10 is cut shorter than the others. The length of the finger 10 is sufficient to cause it to contact with the surface of the disc 4. In order to insure such contact, the finger 10 is left as it was after the drawing operation or even bent slightly outward, whereby, instead of being inclined toward the axis of the cylinder, as are the fingers 9, it is in the cylindrical surface or slightly outside of it.

The upper parts of the contactors, including the ring 6, the finger 10 and the upper portions of the other fingers, are inserted into the holes 11 from the under side of the plate 1. The holes 11 are of slightly larger diameter than the ring 6, whereby the contactors are free to move slightly in any direction parallel to the plate 1. The holes 11 are

countersunk at their lower edges as shown at 12. Correspondingly placed holes 13 are provided in the disk 4, through which the lower portions of the fingers 9 and 14 extend. The holes 13 are each smaller than the corresponding hole 11, whereby the end of the finger 10 will contact with the surface of the disc 4 and not enter the hole 13.

The fourth finger 14 of the sleeve is longer than the other fingers and is provided, at its end, with wings 15 which are bent at an angle to the plane of the finger itself and afford a convenient means for soldering a wire to the terminal. The finger 14 is bent, as indicated at 16, to conform to the counter-base 12 and bent again as shown at 17 to make the lower part of the finger stand at any convenient angle to the lower surface of the plate 1. The disc 4 is provided with notches 18 to accommodate the downwardly projecting parts of the fingers 14.

There are four holes in the plate 1 for each tube socket. One of these holes 19 is larger than the other holes 11 and the terminal 3 inserted in this hole is larger than the other terminals. The co-operating tube is supplied with pins, one of which is larger than the others, in order to insure that the tube cannot be wrongly inserted.

All but one of the fingers 14 in any one tube socket are each provided with a hole 20 to facilitate attaching wires. The finger 14, which is not provided with a hole, is inserted in position to contact one of the filament-terminals of the tube. The several tube-sockets in the plate 1 are so arranged that the unperforated fingers 14 in neighboring sockets are adjacent. When assembling a receiving set, the non-perforated fingers 14 are bent toward one another and soldered together. By this means, the filaments of the tubes are connected together in series without the need of connecting wires.

In the operation of the device, the several connecting wires are inserted through the holes 19 and soldered in place, the wings 15 affording ample surface for the solder. The tube is thrust into the socket, whereby each of the pins on the tube enters the corresponding terminal contactor 3. The friction of the entering pin against the fingers of the connecter causes a downward thrust which is resisted by the bearing of the short finger 10 against the surface of the disc 4. Strain upon the bent portion of the finger 14 is thus avoided.

As the pins enter the terminal contactors, they force the fingers 9 outwardly. The fingers 9 are integral with the ring 6 and the ring 6 does not move outwardly because it is not split, consequently there is no flexing of any part of the contactor except the fingers 9. The outward movement of the fingers 9 is arrested by the surface of the hole 13 in the disc 4. This hole is not only smaller than the hole 11 but so small that the fingers are never displaced outwardly far enough to cause them to be bent beyond their elastic limit. Consequently, no permanent distortion of the contact member can be produced by the act of inserting the tube.

Even the variation in size between the pins of tubes manufactured by different manufacturers, which is larger than the variation permitted in any one factory, is not enough to cause any damage to the terminal contactor. Any pin large enough to force the fingers 9 beyond their elastic limit would be too large to enter the ring 6.

The inward bend given the fingers 9 when the terminal contactor is manufactured is enough to ensure contact with even the smallest pins. The connecter therefore never fails to make contact with the pin nor does it suffer from use with different tubes.

The ring 6, because it is undivided, is rugged enough to stand even prolonged rough handling. The fingers 9 are so located that no rough treatment of them is possible. The fingers 14 are not subjected to any strain of any kind after the receiving set has been completed. Consequently the life of the contact terminals is as great as that of any other part of the set and failure of the receiving set through failure of the terminals is exceedingly unlikely.

The relative position of the pins on a tube varies slightly even among tubes from the same factory. With ordinary tube sockets these variations cause strains on the pins and also on the contactors. By providing room enough in the holes 11 for the contactors to move about I enable the variations to be compensated without strains. This also prolongs the life of the terminals.

Contactors made according to my invention give greater satisfaction because failure of a receiving set through lack of contact between the tube pins and the socket terminals is exceedingly unlikely when the socket terminals are contactors of this kind.

I do not wish to be restricted to the specific arrangement of parts herein set forth, as various modifications thereof may be effected without departing from the spirit and scope of my invention. I desire, therefore, that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. In a terminal contactor, a continuous ring having a plurality of fingers extending therefrom, two parallel insulating members each having holes, a hole in the first of said members serving as a housing for said ring and a hole in the second of said members being so located that certain of said fingers extend therethrough, the end of one of the other fingers contacting with the surface of said second insulating member.

2. In a vacuum-tube socket, a pair of in-

sulating members, each having holes therein equal in number to the terminals of a vacuum-tube, the holes in one of said members being countersunk and aligned with the holes in the other of said members, a terminal contactor comprising a continuous ring housed in the hole in said one insulating member and having a finger extending between said members in the space provided by the countersunk portion, said other insulating member having a notch through which said finger extends, the size of said contactor being such that it is loosely mounted.

3. A pressed-metal contact sleeve adapted to slidably engage a terminal pin on a vacuum-tube base comprising a continuous ring having four integral fingers extending laterally therefrom, a diametrically-opposite pair of said fingers being concave on their opposing faces and having their free ends slightly converging, another of said fingers being cut shorter than said converging pair, and the fourth finger being longer than said pair and provided with means for attaching a lead-wire.

In testimony whereof, I have hereunto subscribed my name this 29 day of June, 1925.

HARRY P. DAVIS.