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E. O. PETERSON ET AL

3,087,136

TUBE SOCKET

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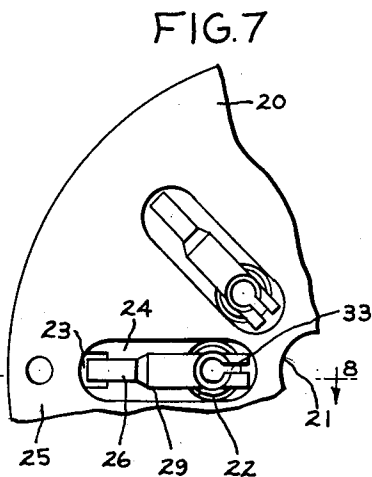
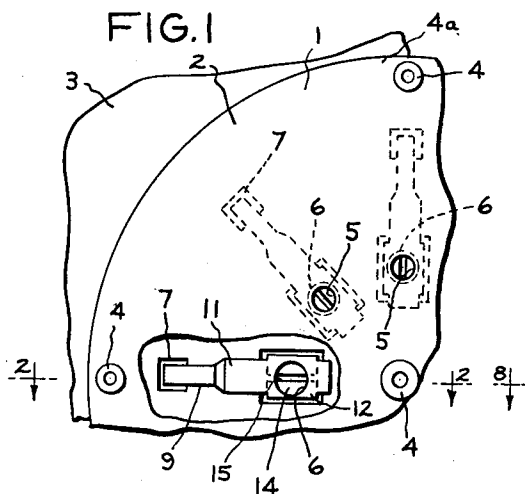


FIG. 2

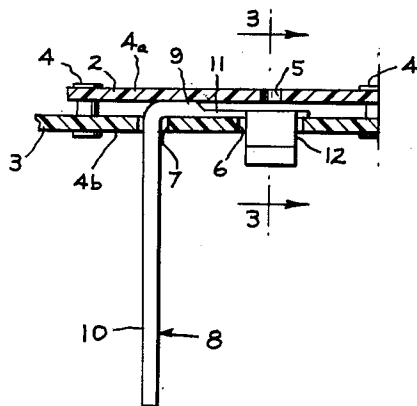


FIG. 8

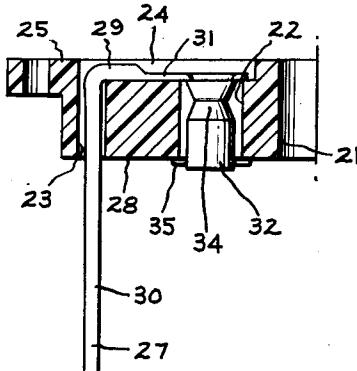


FIG. 4

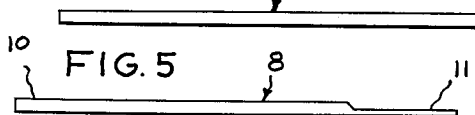


FIG. 5



FIG. 6

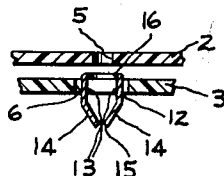
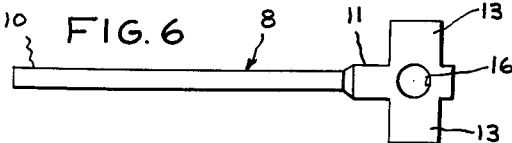


FIG. 3

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TUBE SOCKET

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This invention relates to tube sockets, and more particularly to tube sockets of the type which are adapted for use in assemblies where connections are made by wrapping wire several times about terminals instead of soldering it thereto.

The use of the type of connection wherein a wire to be connected to a terminal is mechanically and electrically secured thereto by wrapping it tightly around the terminal several times is quite widespread, being used to some extent in the manufacture of television receiver sets and the like. This type of connection, known as a wire-wrap connection, is used to eliminate hand crimping and soldering of connections and has already proved itself to be a reliable and suitable means of connection for many purposes.

A substantial amount of difficulty, has, however, been encountered in attempting to apply the wire-wrap connection approach to the terminals of tube sockets. This results, briefly, from the fact that the characteristics required for a member intended to grip and be electrically secured to the pin of a vacuum tube and those required for the portion of the terminal which is intended to be wire-wrapped are very different. The type of material needed for the pin socket proper must be relatively thin, hard and resilient so that without fracturing it will yield slightly when the tube pin is inserted while at the same time clamping tightly onto the pin. A specific material which has been found to give the desired results is, for instance, spring brass on the order of ten to twelve thousandths of an inch in thickness. The terminal which is to be wire-wrapped, on the other hand, needs to be quite thick because of the fact that the wrapping of wires around the terminal is inherently a relatively violent mechanical procedure and substantial rigidity (of the type which must necessarily be lacking in the tube socket proper) is necessary. A further needed attribute of the wire-wrap portion of the terminal is that it should be quite soft relative to the type of material used for the pin socket itself, so that the wire wrapped around the terminal will actually bite into the edges of the terminal to give a good electrical connection. A specific material that has been found effective in this connection is a rectangular section of quarter-hard brass whose dimensions may, for instance, be on the order of .032 by .060 inch.

The fact that two entirely different sets of characteristics are required, one at that part of the terminal which engages the tube pin and one at that part of the terminal which is to be wire-wrapped, has made it most difficult to provide a tube socket suitable for wire wrapping at a reasonably economical price.

It is therefore an object of this invention to provide an improved tube socket which is suitable for wire-wrapping purposes while retaining the necessary resilient clamping characteristics insofar as the pin retaining portion is concerned.

A more specific object of our invention is to achieve an improved tube socket terminal from a single piece of metal, the necessary thinness and hardness of the pin retaining portion of the terminal being obtained by a rolling operation effected on part of a member of relatively soft metal of substantial thickness.

In one aspect of our invention, we provide a tube socket which has the ordinarily provided body section of

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rigid insulating material with a plurality of recesses formed in one face thereof, and with a plurality of openings communicating with the recesses. In each recess there is provided a contact terminal, with each contact terminal being formed from a single elongated piece of metal which is relatively thick and rigid over a first part of its length and relatively thin and resilient over the second remaining part of its length. The thin part of each terminal is positioned in a recess and is formed so as to electrically and mechanically engage a tube pin inserted in the recess. The thick part of the terminal is positioned in one of the openings to extend therefrom, thereby to provide a wire-wrap terminal.

With this construction, the thinness of the pin-receiving portion of the terminal causes it to have the necessary resilience to effect secure clamping about a pin inserted therein while at the same time the thick part of the terminal has the necessary rigidity to accept a wire-wrapping operation and the necessary softness to permit the wire to bite into the edges of the terminal to provide good connection.

The subject matter which constitutes our invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. The invention, together with further objects and advantages thereof, may best be understood by reference to the following description taken in conjunction with the accompanying drawing.

In the drawing,

FIGURE 1 is a fragmentary elevational view of the pin-receiving face of a tube socket constructed in accordance with our invention;

FIGURE 2 is a cross-sectional view along line 2-2 in FIGURE 1;

FIGURE 3 is a cross-sectional view along line 3-3 in FIGURE 2;

FIGURES 4, 5 and 6 illustrate a terminal of the type used in the embodiment of FIGURES 1-3, the terminal being in progressive stages of manufacture in the three figures;

FIGURE 7 is a fragmentary elevational view of the pin-receiving face of a tube socket constructed in accordance with a second embodiment of our invention; and

FIGURE 8 is a view along line 8-8 in FIGURE 7.

Referring now to FIGURES 1, 2 and 3 of the drawing, there is shown a portion of a tube socket having a body section 1 composed of a suitable rigid insulating material. As shown, one conventional means of manufacturing such a socket is to provide two layers, or wafers 2 and 3, of a suitable insulating material such as, for instance, laminated phenolic resin, which are secured together by any suitable means such as rivets 4 so that they are rigidly positioned and somewhat spaced with respect to each other. Wafer 2 (which provides the pin-receiving surface 4a of the socket) is formed with a number of openings 5 spaced from each other about a circle, as partly shown in FIGURE 1, and wafer 3 (which provides a surface 4b opposite surface 4a) is provided with a plurality of openings 6 and a plurality of openings 7, each set of openings 6 and 7 also being spaced from each other in a circle about the tube socket as partly shown in FIGURE 1. Each opening 5 is aligned with an opening 6, and, preferably, each opening 7 is radially aligned with an opening 6 as shown.

A terminal member, generally indicated by the numeral 8, is secured within body section 1 by any suitable means. As shown, with the wafer-type socket illustrated in FIGURES 1, 2 and 3, this may be effected by having a portion 9 of terminal member 8 secured between the two wafers 2 and 3 when they are riveted together so that the securement of the wafers also secures the terminal member in position. The terminal member has

a wire-receiving portion 10 extending out through opening 7; terminal section 10 is of quite substantial thickness and is formed with a substantially rectangular cross section. The other end portion 11 of terminal 8 has a pin-receiving section 12 which, referring particularly to FIGURE 3, includes upstanding tabs 13 which terminate in converging portions 14, with only a relatively small opening 15 being left between the ends of portions 14. The base of section 12 is provided with an aperture 16.

The terminal 8 is secured between wafers 2 and 3 so that portion 12 is within the opening 6, with space 15 and opening 16 of section 12 aligned with each other and with an opening 5.

It will be observed that portion 11 of terminal 8 is substantially thinner than portion 10, as particularly will be observed at the portion 9 which includes parts of both portions 10 and 11. This thinness of portion 11 gives, it, as will be further described herebelow, substantial resilience; as a result, when a tube pin is inserted from above (as viewed in FIGURE 2) through opening 5, it forces tabs 13 apart while at the same time their natural resilience causes them to clamp onto the tube pin securing it within the opening 5 and at the same time providing good electrical contact between the terminal member 8 and the tube pin.

Referring now to FIGURES 4, 5 and 6 the formation of the terminal 8 will be described. Preferably, the terminal is formed of a relatively soft material which, upon being subject to a rolling operation, is hardened. Thus, for instance, the terminal blank 8 indicated in FIGURE 4 may be provided with a substantially rectangular cross section and formed of a suitable relatively soft material, which is nonetheless thick enough to have substantial rigidity. The rigidity permits a wire-wrap operation to be performed without damage, and the softness permits the wrapped wire to bite into the corners of the terminal part. A suitable material for this purpose, is for instance, quarter-hard brass. A suitable rolling operation is then performed on a portion 11 of terminal blank 8 to cause portion 11 to thin and spread out as shown by the two FIGURES 5 and 6. The operation when performed on a relatively rigid soft material such as quarter-hard brass has been found to harden the material and at the same time increase its resilience. Increased hardness and resilience are precisely the qualities required for the pin-receiving portion 12 of the terminal. Thus, by a simple rolling operation, the necessary thinness and resilience are provided where it is vital that these qualities be present—that is where the pin is inserted into the terminal and relative rigidity and softness are provided where they are the essential features, that is, where wire is to be wrapped around the terminal for connection purposes. It will of course be observed from FIGURE 6 that end portion 11 of the member 8 is suitably formed with tabs 13 and opening 16. The terminal 8, as illustrated in FIGURE 6 having the desired tabs 13 and hole 16, may be fabricated by cutting or stamping the terminal from the rolled blank 8 of FIGURE 5. The blank 8 of FIGURE 5 will have a width after rolling and prior to stamping sufficient to form the tabs 13 therefrom.

It will be seen from the foregoing that by the use of a simple rolling operation the necessary characteristics are present at both portions of the terminal, and that in this manner an economical tube socket is made possible which is suitable for wire-wrapping and yet which avoids the substantial expense involved in providing two entirely separate parts for each single terminal.

Referring now to FIGURES 7 and 8, a second embodiment of the invention is shown wherein our improved terminal arrangement is utilized in a tube socket having a different type of body section. Specifically, a body portion 20 of a molded insulating material such as, for instance, phenolic resin, is provided. In general, molded tube sockets have a substantially circular configuration; frequently a central aligning opening 21 is provided as a

female receptacle for an aligning plug on the tube to be inserted into the socket. Body section 20 is molded with a number of circularly spaced openings 22 which are respectively radially aligned with a number of circularly spaced openings 23, a slot 24 being provided in face 25 of the body section 20 to connect each opening 22 to an opening 23. For each group of openings 22 and 23 connected by a slot 24, there is provided a terminal member 26 having a wire-wrap portion 27 extending out of opening 23 from the opposite face 28 of the body portion 20 from face 25. Terminal 27 extends up through opening 23 and has a portion 29 extending across the bottom of slot 24. Portion 29 may include part of portion 27 of the terminal, and part of a relatively thin terminal portion 31. Terminal portion 27 extends out of opening 23, as described, to become a wire-wrap terminal, and because of its thickness, relative softness (the terminal may preferably be made of a material on the general nature of quarter-hard brass), and rectangular configuration, when wire is wrapped on portion 27 it will bite into the edges of the terminal without bending the terminal portion to give a good connection. Portion 31 includes a pin receiving section 32. Section 32 may, as shown, be formed as an annulus having a split or space 33 therein and a necked-down portion 34. Also, tabs 35 may be provided to retain the terminal in position with the body section, the tabs 35 preventing the terminal from moving upwardly with respect to the body section (FIGURE 8) and the portion 29 of the terminal preventing downward movement thereof.

The terminal 26 may be fabricated in the same manner as terminal 8. A blank similar to the blank of FIGURE 4 may have an end rolled so as to provide a thin hard resilient portion 31 similar to section 11 of FIGURE 5. The blank may then be cut or punched in order to provide a unitary terminal 26 having the wirewrap portion 27 and a pin receiving portion 32. The pin receiving section 32 is formed by cutting or punching the rolled section 31 in a manner so as to provide stock of a shape suitable for forming the annulus having the split 33, necked down portion 34 and tabs 35. A suitable forming operation is then performed on the stock in order to form the stock into the pin receiving section 32.

When a tube pin (not shown) is inserted from above, as viewed in FIGURE 8, the pin in passing through necked-down section 34 causes an expansion of the annulus 32 which, because of its resilient nature, clamps onto the pin to give good mechanical and electrical connection. Thus, the embodiment of FIGURES 7 and 8 provides the same advantages in the type of socket utilizing the molded body section as was provided in the embodiment of FIGURES 1, 2 and 3 in the type of socket utilizing a wafer body section.

It will be seen from the foregoing that our invention provides, regardless of the type of body section used, a socket of the type suitable for wire-wrapping operations wherein the different characteristics necessary for the pin contact terminal section and for the wire-wrap terminal portion are readily provided in an economical fashion in the same manner.

While in accordance with the patent statutes we have described what at present are considered to be the preferred embodiments of our invention, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and we therefore aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. For use as a terminal member in a tube socket, a unitary length of metal having a first part of its length formed of a substantially rigid, thick and soft material suitable for accommodating a wire-wrap connection thereto, and the second remaining part of its length formed

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of thin and hard material, said thin part being formed from said thick part by rolling, said thin part shaped as a resilient clamp for receiving a tube pin and providing mechanical and electrical contact therebetween.

2. In a socket having a body section of rigid insulating material including a first plurality of openings formed in a face thereof for accepting a pin grasping segment of a contact terminal member and a second plurality of openings formed in a face thereof for accepting a wire-wrap segment of a contact terminal member, each of said first plurality of openings aligned with an associated one of said second plurality of openings, a contact terminal member having pin grasping and wire-wrap segments for positioning in associated aligned openings, said terminal comprising a single elongated piece of metal which is relatively thick over a first part of its length and relatively thin over a second remaining part of its length, said relatively thick part of said length having a hardness and cross-sectional area suitable for accepting a wire wrapped connection thereto, said relatively thin part having a hardness suitable for forming a resilient clamp therefrom and formed in a resilient clamp in a manner for electrically and mechanically engaging a pin inserted in said clamp.

3. The apparatus defined in claim 1 wherein said body section is formed of a single piece of molded material.

4. The article defined in claim 2 wherein said resilient clamp comprises a split annulus.

5. The apparatus defined in claim 1 wherein said body section is formed of at least two wafers of rigid insulating material secured together in spaced relation to each other.

6. In a tube socket having a body section formed of first and second parallel spaced wafers of rigid insulating material which are secured together, said first wafer having a first and a second plurality of openings formed in a face thereof for accepting pin grasping and wire-wrap segments respectively of a contact terminal member, each of said first plurality of openings aligned respectively with an associated one of said second plurality of openings, said second wafer having a plurality of openings aligned with said first plurality of openings, a contact terminal member having tube pin grasping and wire-wrap segments for positioning intermediate said spaced wafers in associated aligned openings, said terminal comprising a single elongated piece of metal which is relatively thick over a first part of its length and relatively thin over a second remaining part of its length, said thin part of said terminal member having an opening formed therein and a pair of converging tabs, said tabs arranged in a manner for providing a resilient clamp for a tube pin which is inserted in said opening of said thin portion to provide electrical and mechanical connection between the pin and said terminal member, said relatively thick part of said terminal member having a hardness and cross-sectional area suitable for accepting a wire-wrap connection thereto.

7. A tube socket having a body section formed of first and second parallel spaced wafers of rigid insulating material which are secured together, said first wafer having a first and a second plurality of openings formed in a face thereof for accepting pin grasping and wire-wrap segments respectively of a contact terminal member, each of said first plurality of openings aligned respectively with an

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associated one of said second plurality of openings, said second wafer having a plurality of openings aligned with said first plurality of openings, a contact terminal member having tube pin grasping and wire-wrap segments positioned intermediate said spaced wafers in associated aligned openings, said terminal comprising a single elongated piece of metal which is relatively thick over a first part of its length and relatively thin over a second remaining part of its length, said thin part of said terminal member having an opening formed therein and a pair of converging tabs, said tabs arranged in a manner for providing a resilient clamp for a tube pin which is inserted in said opening of said thin portion to provide electrical and mechanical connection between the pin and said terminal member, said relatively thick part of said terminal member having a hardness and cross-sectional area suitable for accepting a wire-wrap connection thereto, said terminal member positioned and associated openings spaced apart for providing the extension of a portion of the relatively thick portion of said member between said wafers.

8. A tube socket having a body section of rigid molded insulating material including a first plurality of openings formed in a face thereof for accepting a pin grasping segment of a contact terminal member and a second plurality of openings formed in a face thereof for accepting a wire-wrap segment of a contact terminal member, each of said first plurality of openings aligned with an associated one of said second plurality of openings and interconnected by a slot, a contact terminal member having pin grasping and wire-wrap segments positioned in associated aligned openings, said terminal comprising a single elongated piece of metal which is relatively thick over a first part of its length and relatively thin over a second remaining part of its length, said relatively thick part of said length having a hardness and cross-sectional area suitable for accepting a wire wrapped connection thereto, said relatively thin part having a hardness suitable for forming a resilient clamp therefrom and formed in a resilient clamp having a split annulus, said openings spaced apart and said terminal member positioned for providing an extension of said relatively thick portion of said length in said slot.

References Cited in the file of this patent

UNITED STATES PATENTS

1,272,163	Wiedey	July 9, 1918
2,203,996	Megow et al.	June 11, 1940
2,246,931	Chiffey	June 24, 1941
2,371,469	Rogoff	Mar. 13, 1945
2,426,429	Bels	Aug. 26, 1947
2,519,121	Del Camp	Aug. 15, 1950
2,600,190	Batcheller	June 10, 1952
2,730,690	Harasek	Jan. 10, 1956
2,796,593	Offerman	June 18, 1957
2,800,638	Hammell	July 23, 1957
2,857,582	Wintriss	Oct. 21, 1958

OTHER REFERENCES

- 60 Reliable Electrical Connectors, Third E.I.A. Conference on Reliable Electrical Connectors, pages 268-271, published by Engineering Publishers, New York, in 1958.