The present invention relates to electronic tube socket mountings and more particularly to an improved construction of connector for facilitating the mounting of electronic tube sockets on printed wiring panels and the like.

In the present day circuit assemblies the use of panels or cards having printed or etched circuit conductors has become quite extensive and has introduced problems not heretofore met in general circuit assemblies. Such etched panels with completed circuits including electronic tubes, resistors, diodes and other components function as a unit to plug into prepared connectors for compact rack or side by side partition arrangement. In such arrangements the available space between adjacent panels is often so limited as to make it difficult, if not impossible, to mount the electronic tubes in position with their axes extending perpendicular to the plane of the panel, in consequence of which such components have required special mountings independent of the panel or bulky assemblies of rather widely spaced panels.

Having in mind the foregoing, it is among the principal objects of the present invention to provide an electronic tube assembly in which novel quick-detachable connectors are employed for mounting electronic tubes and other such electric circuit components upon the side edge of a printed wire panel for plug-in electrical connection with the panel wiring, thereby permitting closer spacing of an assembly of panels than has been possible heretofore and facilitating also the use of single panels in situations where space limitations would normally prevent the use of conventionally mounted tubes and other relatively large circuit components. More specifically, it is an object of the present invention to provide a plug-in type electronic tube socket connector having at one end thereof an electronic tube socket and at the opposite end a plurality of spaced pairs of opposed spring-pressed contacts arranged in a channel which receives the edge of a printed wiring panel, the opposed contacts of each pair thereof being adapted not only to grip opposite sides of the panel for support of the connector thereon but also to make electrical contact with selected wiring elements of the panel to complete the electrical circuit and from the electronic tube fitted in the socket end of the connector, the tube being thus supported with its axis lying substantially in the plane of the wiring panel.

A still further object is to provide an electronic tube socket connector having spaced pairs of contacts for receiving therebetween a panel having etched circuit conductors on opposite sides thereof to respectively engage the connector contacts in association with an electronic tube mounting socket having terminals respectively electrically connected to contacts of the connector.

Still other objects and advantages of the present invention will be apparent more fully hereinafter, it being understood that the present invention consists substantially in the combination, construction, location and relative arrangement of parts, as described in detail in the following specification, as shown in the accompanying drawings and as finally pointed out in the appended claims.

In the accompanying drawings, which are illustrative of an electronic tube socket connector constructed in accordance with the principles of the present invention: Figure 1 is a plan view, partly broken away, showing one face of a panel having printed or etched thereon a plurality of wiring conductors and showing also mounted upon one edge of said panel two of the socket mounting connectors of the present invention; Figure 2 is a sectional view, on an enlarged scale, of the combination socket and connector as taken along the line 2--2 of Figure 1; Figure 3 is a plan view of the socket end of the unit shown in Figure 2; Figure 4 shows exploded sectional views of the main component parts of the combination socket and connector as taken along the line 4--4 of Figure 2; Figure 5 is a bottom plan view of the upper part of the combination unit as viewed from the line 5--5 of Figure 4; Figure 6 is a top plan view of the lower part of the combination unit as viewed from the line 6--6 of Figure 4; Figure 7 is a bottom plan view of the unit as viewed from the line 7--7 of Figure 2; and Figure 8 is a sectional view of a detail as taken along the line 8--8 of Figure 3.

Referring now more particularly to the drawings, it will be observed that the combination socket and the connector of the present invention, designated generally by the reference numeral 10, is shown mounted upon the edge of a printed or etched circuit-establishing panel 11 which is of conventional construction and is provided upon each of its opposite faces with a plurality of spaced, parallel conductors 12. These conductors 12 are, of course, normally insulated from one another by the material of which the panel is formed, such material being usually a phenolic condensation product, such as "bakelite," or rubber or plastic or other such dielectric. The conductors upon one face of the panel preferably are respectively opposed to and in longitudinal registry with those of the opposite face, so that preselected opposed pairs of conductors may be electrically interconnected by bridging the ends thereof at one edge of the panel. Also, selected conductors on one face of the panel may be electrically interconnected, and thus the conductors on both faces of the panel may be selectively employed, as necessary, to complete the wiring circuit to and through various electrical circuit components which may be mounted upon the panel.

As has been pointed out above, the combination unit of the present invention is designed primarily to facilitate the mounting of electronic tubes upon the edge of the wiring panel with the axes thereof disposed substantially in the plane of the panel, thereby reducing the overall height of a tube-mounted panel to permit its use and installation structures wherein available space is exceedingly limited. To this end, the unit of the present invention essentially comprises an electronic tube-receiving main part or socket 13 in association with a second main part 14 which, when assembled with the socket part 13, serves conjointly therewith not only to mount the assembly upon the edge of the wiring panel but to also electrically connect the tube contacts of the socket part to such pre-selected conductors of the wiring panel as are required for proper incorporation of the electronic tube in the electrical circuit.

The socket part 13 of the socket-connector assembly
10 comprises a main body member 15 of molded insulation material, which molded body member is of generally circular shape of substantial thickness to provide a generally flat top surface 16 and a generally flat bottom surface 17, these surfaces 16 and 17 being substantially parallel. The molded body member 15 has a plurality of circumferentially spaced recesses 18 which respectively extend from the top surface 16 of the body member 15 to a level therein just short of its bottom surface 17, each such recess being provided with a slot 19 in continuation thereof to said bottom surface. Also, formed in the body member 15 centrally of the recesses 18 is a through-bore 20 having an enlarged counterbore 21 at its outer end.

Respectively fitted in the recesses 18 of the part 13 are a plurality of contact members 22 for receiving the prongs of an electronic tube 23 (see Figure 1), these contact members 22 being of conventional type and being characterized in that each is provided with a split, tubular prong-receiving barrel part 24 terminating in a tail extension 25. The barrel part 24 of each contact is disposed within one of the recesses 18 with its tail extension projected downwardly through the slot 19, as most clearly shown in Figures 2 and 4, it being noted that the fronds projecting portions of the tail extensions, which are bent flatwise against the bottom surface 17 of the body member 15, extend radially outward of said body member. Preferably, the bottom surface 17 of the body member 15 is provided with a series of circumferentially spaced, radially extending ribs 26, respectively disposed between the adjoining terminal extensions 25 of the socket contacts 22 to maintain the latter in electrically insulated relation.

The aforementioned second part 14 of the socket connector of the present invention also comprises a main body part 26 molded to the shape of a suitable insulating material, said body part 26 being of generally rectangular outline, as best shown in Figure 6, and having flat top and bottom surfaces 27 and 28. Formed in the bottom portion of the part 14 centrally between its opposite side walls 29 and 30 is a longitudinally extending groove, or channel 31, which channel extends for the full length of the part 14 and is thus open at its opposite ends. Also, formed in each of the opposite side walls 29 and 30 of the part 14 are a plurality of uniformly spaced, vertically extending grooves or channels 32, the several grooves or channels 32 in one side wall being respectively disposed opposite the corresponding grooves in the other side wall. Each of said grooves or channels 32 extends laterally across the bottom surface of the part 14, as at 33, to thus form a series of L-shaped grooves upon each opposite side of the part 14, the short sections 33 of which communicate commonly with the main central channel or groove 31.

Fitted in each of the grooves 32 is a contact member 34 of flat spring metal, each such contact member being bent, as best shown in Figure 2, to provide it with a portion 35 which fits snugly in and extends along the full length of the side groove 32, a right-angularly bent intermediate portion 36 which fits snugly in the lateral extension 32 of the same side groove and a reversely bent portion 37 which extends into the main central channel or groove 31. The reversely bent portion 37 of the contact member 34 is preferably shaped, as shown, to provide a bowed inherently resilient panel-containing element. It will be understood, of course, that the portion 37 of the contact 34 may be otherwise shaped as desired to provide it with the degree of resiliency necessary to securely engage one surface of the wiring panel 11 inserted into the channel 31 and make good electrical contact with the conductor 12 etched or printed thereon. The opposite or inner end of each contact 34 is cutaway bent from the side groove 32 to provide it with an extension 39 which is adapted to overlie and electrically contact the proximate radially extending tail extension 25 of the electronic tube prong-receiving contact member 22.

The molded part 14 is centrally provided with an interor threadedly bored 40 adapted for axial registry with the bore 20 of the part 13, the said parts 13 and 14 being secured together by a headed screw 42 the Shank of which projects through the bore 20 of the part 13 and is threaded into the bore 40 of the part 14, as shown in Figure 2. Of course, before the parts 13 and 14 are thus secured together, they are each fitted with their respective contact members as above described with said members so relatively disposed as to present the tail extensions 25 of the socket contacts 22 respectively in electrical contact with the terminal extensions 39 of the connector contacts 34. Preferably, the several tube contact extensions 39 are respectively soldered or otherwise permanently connected to the connector contacts 34.

It will be observed that when the parts 13 and 14 are respectively fitted with their full complements of the tube and connector contacts and are secured together as above described, the panel-receiving channel 31 will be provided with spaced pairs of opposed spring-pressed connector terminals 37 between which the edge of the wiring panel may be freely disposed, as shown in Figures 1 and 2. The opposed pairs of the terminals 37 thus grip opposite sides of the panel and serve to support the socket connector upon the panel with the central axis of the socket part lying substantially in the plane of the panel. The several connector terminals 37, of course, are respectively in electrical contact with the several conductors 12 printed or etched on the panel and thus the tube socket may be electrically connected into the circuit as may be established by the wired panel.

Depending upon the size of the panel and the number and distribution of the conductors thereon, any number of the tube socket connectors of the present invention may be slipped onto the edges of the panel, as desired, with the conductors thereon. In certain instances, as where all of the contacts of tube socket part 13 are not required to establish a particular circuit and thus certain contacts of the socket are omitted or are not used, the corresponding connector terminals of the connector part may be omitted also. Or, certain contacts of the connector part may be employed for purposes other than for connecting the electronic tube prongs into the circuit. Thus, for example, where it may be desired to ground a tube shield 41 (see Figure 6), the socket part 13 may be fitted with a special grounding contact 42 which is disposed opposite a grounding contact 43 fitted on the connector part 14. When such tube shield connection is not required, then the grounding contact 45 (shown dotted in Figure 6) may be omitted.

In the particular arrangement of the socket connector illustrated in the drawings, the socket part 13 is shown provided with nine tube-prong-receiving contacts and one tube-shield-grounding terminal, which are respectively connected to ten contacts fitted in the connector part 14. Of course, the socket part 13 may be provided with a different conventional number of prong-contacts, in which case, the connector part 14 would have a corresponding number of circuit-establishing contacts.

It will be apparent from the foregoing that the socket connector of the present invention facilitates mounting of electronic tubes and other pronged electrical circuit components on the edge of a wired panel and thereby reduces the overall size of the panel and the panel assembly as to make possible its use in installations having limited special dimensions. Other advantages and uses of the present invention will, of course, be obvious to those skilled in the art. To this end, it will be understood that the present invention is susceptible of various changes and modifications which may be made from time to time without departing from the spirit or the essence of the invention, and accordingly it is intended to claim the same broadly, as well as specifically, as indicated by the appended claims.

What is claimed as new and useful is:

1. A mounting for an electronic tube or other pronged
electrical circuit component, in combination, an insulating panel having formed upon at least one surface thereof a plurality of electrical circuit conductors insulated from one another and adapted to be selectively connected in circuit with said component, said conductors being extended to points adjacent at least one marginal edge of the panel, a connector for said pronged component having a kerfed body part adapted to be slip-mounted over said marginal edge of the panel and a second body part adapted to receive said component with the central axis thereof disposed substantially in the plane of said panel, said body parts being respectively provided with interconnected contact members, the contact members of said second body part being respectively adapted for electrical engagement with the terminal prongs of said component and those of said first body part being respectively adapted to clampingly engage the marginal edge of the panel between opposed pairs thereof and to respectively electrically contact pre-selected conductors of said panel.

2. In a mounting as defined in claim 1 wherein said kerfed body part is substantially of rectangular shape with the kerf extending lengthwise thereof and located substantially centrally between the opposite sides of said body, the opposite sides of said kerfed body being each provided with a plurality of spaced parallel grooves for respectively receiving therein a plurality of contacts for engaging the pre-selected panel conductors and said contacts being each provided with panel-engaging, spring-pressed elements which extend into said kerf to provide therein opposed pairs of said elements between which the panel edge is resiliently gripped.

3. In a mounting as defined in claim 1 wherein said kerfed body part is substantially of rectangular shape with the kerf extending lengthwise thereof and located substantially centrally between the opposite sides of said body, the opposite sides of said kerfed body being each provided with a plurality of spaced parallel grooves for respectively receiving therein a plurality of contacts for engaging the pre-selected panel conductors and said contacts being each provided with panel-engaging, spring-pressed elements which extend into said kerf to provide therein opposed pairs of said elements between which the panel edge is resiliently gripped, and wherein said second body part is substantially of circular shape and is provided with a plurality of electronic tube prong-receiving contacts which are respectively in electrical engagement with the contacts of said kerfed body portion.

4. An electronic tube socket connector comprising, in combination, a connective part having a longitudinally extending kerf formed in one end thereof to adapt the same to be slip-fitted over the marginal edge of a wiring panel, a plurality of spaced, respectively insulated contacts fitted on said connector part, each of said contacts having a yieldable terminal element disposed in said kerf and inherently biased to press against at least one surface of a panel when the marginal edge thereof is accommodated in said kerf, a socket part secured to the end of said connector part opposite the kerfed end thereof, and a plurality of relatively insulated tubular contacts fitted in said socket part for respectively receiving the prongs of the electronic tube, the like, said tubular contacts of the socket part being respectively electrically connected to the contacts of the connector parts.

5. A socket connector substantially as described comprising, in combination, a connector part having a kerfed end adapted to be slip-fitted over the marginal edge of a wiring panel of the type having conductors formed upon at least one surface thereof, yieldable means being operative to frictionally retain the connector part in position upon the edge of the wiring panel and to effect electrical connection with the conductors thereof, a socket part for an electronic tube or the like in unitary assembly with said connector part, terminal means integral with said yieldable means extending to said socket part, and contacts extending from said socket part and electrically connected to the terminal means for connecting the tube socket contacts to the panel conductors which are engaged by the yieldable means aforesaid.

6. In a socket connector as defined in claim 5 wherein said connector part is provided with the kerf thereof with a plurality of pairs of opposed yielding contacts for engaging conductors disposed on opposite faces of the wiring panel.

7. In a socket connector as defined in claim 5 wherein said connector part is provided with the kerf thereof with a plurality of pairs of opposed yielding contacts for engaging conductors disposed on opposite faces of the wiring panel, and wherein the socket part is provided with a plurality of circumferentially spaced contacts respectively electrically connected to the yielding contacts of the connector part.

8. A mounting for an electronic tube or other pronged electrical circuit component, in combination, an insulating panel having formed upon at least one surface thereof a plurality of electrical circuit conductors insulated from one another and adapted to be selectively connected in circuit with said component, said conductors being extended to points adjacent at least one marginal edge of the panel, and means for mounting said component upon said panel so that it projects outwardly from said edge of the panel with its central axis disposed substantially in the plane of the panel, said means including a contact assembly having a body portion molded of an insulating material and kerfed at one end thereof to slip-fit over the marginal edge of said panel and which is provided within said kerfed portion thereof with a plurality of pairs of opposed spring-pressed contacts which respectively electrically engage pre-selected conductors of the panel and clampingly engage therebetween the marginal edge of the panel, a separately formed body portion molded of insulating material and provided with a plurality of contact elements electrically connected respectively with those of the first mentioned body portions and adapted for being electrically connected respectively with the terminals of said component to be mounted upon the edge of said panel, and means for securing said body portions together.

9. A socket connector for an electronic tube or the like comprising, in combination, a socket part fitted with contacts to operatively receive an electronic tube or the like, and means for mounting the same upon the edge of a wiring panel having conductors formed upon at least one surface thereof, said mounting means including a connector part having a kerf formed in its outer end adapted to accommodate therein the marginal edge of said wiring panel and fitted with contacts which respectively engage the panel conductors embraced by said kerf and which are respectively electrically connected to the socket contacts, said kerf extending the full length of said connector part and at right angles to the axis of said socket part whereby when said kerfed connector body is slipped over the marginal edge of the wiring panel the socket part is supported with its socket axis lying substantially in the plane of the panel.

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