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TUBE SOCKET FOR PRINTED CIRCUITS

Filed Sept. 2, 1953

3 Sheets-Sheet 1

Fig. 1

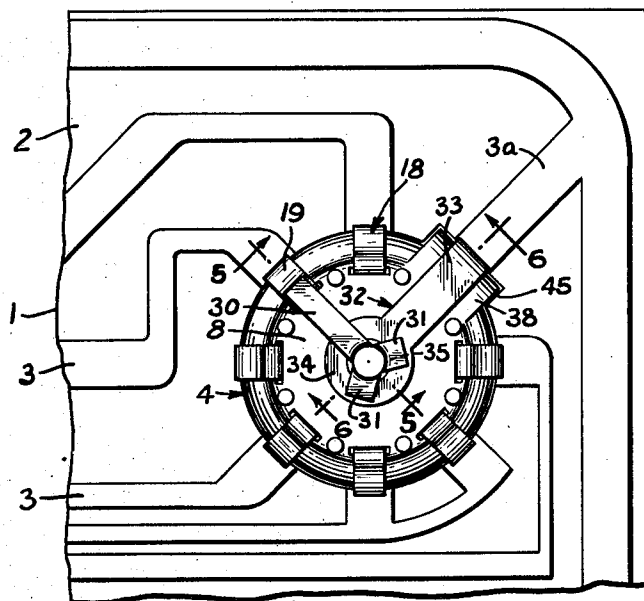
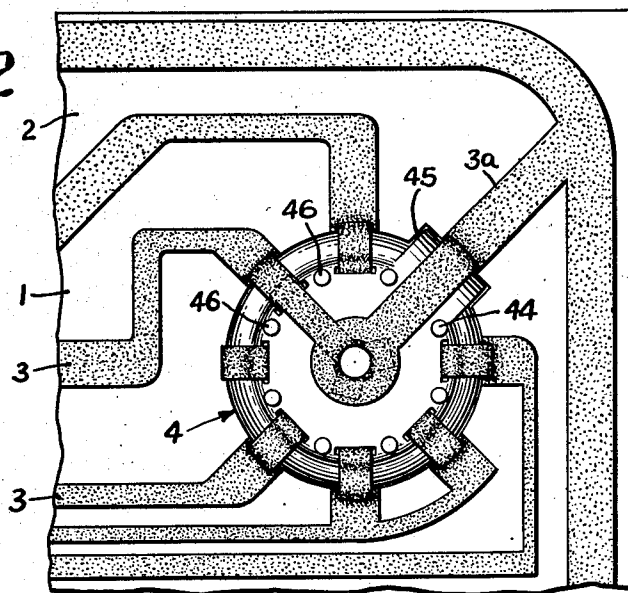


Fig. 2



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Fig. 3

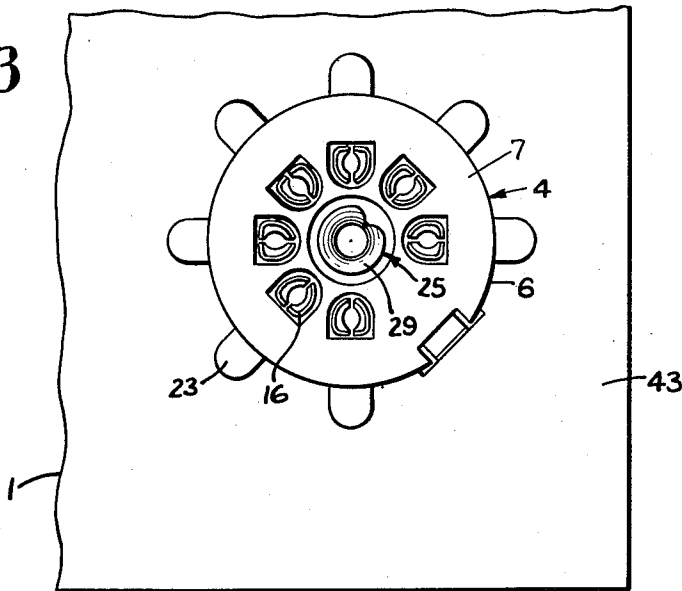


Fig. 4

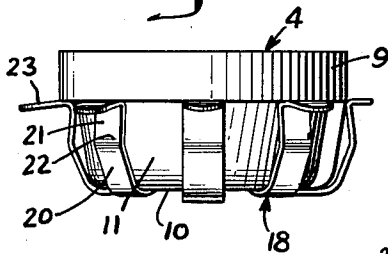


Fig. 5

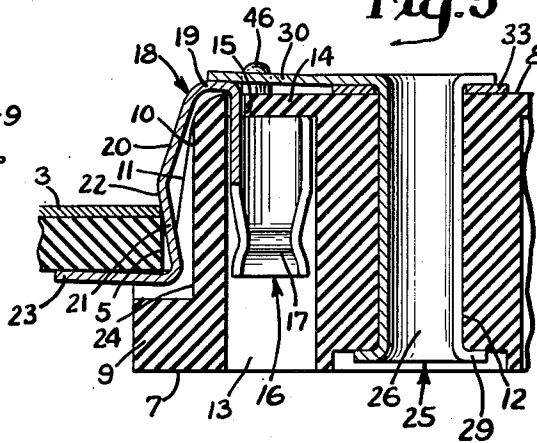
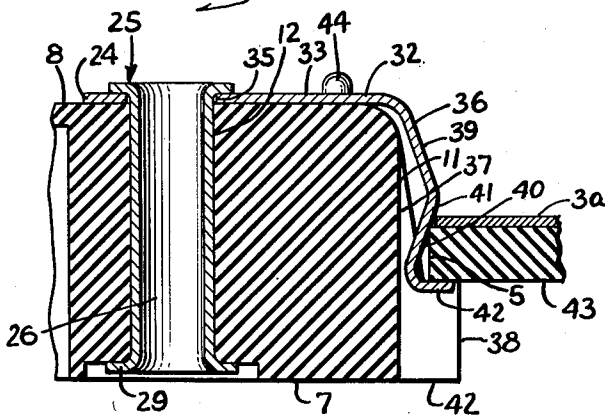


Fig. 6



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TUBE SOCKET FOR PRINTED CIRCUITS

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1 Claim. (Cl. 339-14)

This invention relates to tube socket devices of the type designed for use with so-called printed circuits in which circuits formed by printing, painting, engraving or any similar method are applied to a surface of an insulating structure.

The main object of my invention is the provision of a socket unit of simple design capable of being snapped into assembly with a printed circuit board and providing a novel arrangement of a socket center shield having means for connecting into a ground any desired socket contact.

Other objects and uses of my invention will be apparent from inspection of the drawings and specification hereinbelow set forth.

Referring to the drawings in which I have illustrated preferred embodiments of my invention:

Fig. 1 is a bottom plan view of a printed circuit installation embodying one form of socket device showing the arrangement of the parts prior to final soldering.

Fig. 2 is a view similar to Fig. 1 but showing the installation after the connections have been soldered.

Fig. 3 is a top view of the installation shown in Figs. 1 and 2.

Fig. 4 is a side elevation of one form of the improved socket device.

Fig. 5 is an enlarged section taken along the line 5-5 of Fig. 1.

Fig. 6 is an enlarged section taken along the line 6-6 of Fig. 1.

Fig. 7 is a side elevation of one form of center shield member per se.

Fig. 8 is an elevation of the blank from which the shield member shown in Fig. 7 is formed.

Fig. 9 is a bottom view of a second form of socket device.

Fig. 10 is an elevation of the shorting and grounding member forming part of the second form of socket device, and

Fig. 11 is an enlarged section taken along the line 11-11 of Fig. 9.

Referring in detail to the printed circuit installation illustrated in Figs. 1-8 of the drawings which includes my first form of socket device, I have shown a board 1 of insulating material which has on its undersurface 2 a plurality of printed circuits 3 for electrical connection with prong-receiving contacts carried by the socket device and a circuit 3a which operates to ground appropriate contact and shield elements of the socket device. The board 1 carries my first form of socket unit 4 having contact terminals and a grounding element adapted to be soldered in electrical connection to the printed circuit leads. The unit 4 is snapped into initial engagement with the panel 1 through an opening 5 in the panel in a manner to be described.

My first form of socket unit 4 has a body 6 of suitable insulating material providing an upper face 7 and a lower face 8. The body 6 includes a peripheral rim 9 adjacent its upper face 7 and a portion 10 (Fig. 4) of reduced diameter extending beneath the rim providing a peripheral

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sideface 11. The body 6 has a central aperture 12 extending therethrough. A circular series of contact-receiving apertures 13 (Fig. 5) are disposed about the central aperture 12 and extend from the upper face 7 toward the lower face. The apertures 13 terminate at bottoms 14 which are spaced from the lower face. Each of the apertures 13 has an extension in the form of a slot 15 which intersects the lower face 8. Socket contacts 16 are received in the apertures 13 for engaging the prongs of a cooperating vacuum tube (not shown). Each of the contacts 16 has a prong-engaging portion 17 which abuts at its lower end the respective bottom 14 and a terminal tail 18 integrally joined to the lower end of the portion 17 and extending out of the socket body through the slot 15. Each of the tails 18 has a substantially flat portion 19 disposed adjacent the lower face 8 of the socket body and extending radially outwardly in the direction of the sideface 11 of the socket body. Integral with the outermost end of each of the flat portions 19 of the tails is a spring attaching portion which extends upwardly along the sideface 11 in generally parallel relation to the prong-engaging portions 17. Each of the attaching portions has a diverging element 20 which is integrally joined to its respective flat portion 19 and a converging element 21 forming a continuation of the diverging element 20 and providing a shoulder 22 adjacent the element 20. A laterally extending lip 23 may be provided at the outermost end of each of the converging elements 21. The sidewall 11 of the socket body has a depression 24 (Fig. 5) opposite each of the attaching portions 19 which extends from the lower face 8 upwardly along the sidewall 11 into the rim 9. The depressions 24 are adapted to receive the attaching portions of the terminal tails during contraction thereof for the purpose of snapping the socket unit into the board 1.

In my first form of socket unit, a center shield 25 is disposed within the opening 12 of the socket body 6. The shield 25 has a tubular rivet portion 26 which is preferably formed by curling inwardly opposed side edges 27-27 of a flat blank 28 (Fig. 8). One end of the rivet portion 26 is headed over at 29 to engage the body 6 adjacent the upper face 7 of the body 6 as shown in Fig. 6. The opposite end of the rivet portion 26 extends beyond the lower face 8 of the body 6 and provides a terminal arm 30 and a pair of attaching ears 31 which extend radially from the rivet in substantially perpendicular relation to the axis thereof. A grounding lug 32 is secured in assembly with the body 6 and provides a base element 33 disposed adjacent the lower face 8 of the body. The element 33 has an attaching portion 34 at one end which provides an aperture 35 in alignment with the center opening 12 of the body 6. The rivet portion 26 of the shield 25 extends through the aperture 35 and the attaching ears 31 and a portion of the arm 30 of the shield overlie the portion 34 to hold the lug 32 in assembly with the body 6 and provide contiguous elements for soldering the shield and grounding lug in positive electrical connection. The diameter of the rivet portion 26 is smaller than that of the center opening 12 and the aperture 35 with the result that prior to soldering, the rivet portion is free to rotate for a purpose to be described. The base element 33 has a spring attaching element 36 at its end away from the portion 34 which extends along the sidewall 11 of the unit 5 opposite a slot 37 formed in a rib portion 38 which projects from the sidewall 11. The element 36 comprises a portion 39 diverging away from the sidewall 11 and a portion 40 converging toward the sidewall 11 to form a panel-engaging shoulder 41. The spring element 36 may have a lip 42 at its free end for engaging the upper surface 43 of the panel 1. The soldering lug 32 is held in initial position opposite the slot,

37 by projections 44 extending from the lower surface 8 of the unit 6 on opposed sides of the base element 33.

In assembling the socket unit with the panel 1 the portion 10 is moved into the opening 5 of the panel with the rib element 38 of the socket body received in a slot 45 adjacent the aperture 5 thereby orienting the soldering lug with the grounding circuit 3a and the prong-receiving contacts with appropriate circuits 3. During the action by which the socket unit is moved through the opening 5 the diverging elements 20 of the contact tails and diverging element 39 of the soldering lug 36 contract until their points most laterally remote from the sidewall 11 have passed through the opening 5 at which time they expand to engage the shoulders 22 of the contact tails and the shoulder 41 of the soldering lug behind the lower surface 2 of the panel 1. The socket unit is now firmly assembled with the panel 1 with the shoulders 22 of the contact tails and the shoulder 41 of the soldering lug adjacent the respective circuits 3 and 3a. Either after assembly of the socket unit with the panel 1 or prior to such assembly any one of the prong-engaging contacts may be shorted into the grounding circuit by rotating the arm 30 of the shield member to engage it with the flat portion 19 of the prong-engaging contact which it is desired to short. In this initial position of the parts, the terminal arm 30 is maintained in contact with the appropriate flat portion 19 by means of positioning projections 46 which extend from the lower surface 8—8 of the unit 6 on opposite sides of the arm 30. The connections are now ready for soldering and this is preferably accomplished by dipping the panel installation into a solder bath whereby the ears 31 of the shield member and the end of the terminal arm 30 adjacent the rivet portion 26 are soldered to the base 34 of the soldering lug. At the same time the outer end of the arm 30 is soldered to its appropriate flat portion 19. In the same dipping operation the tails 18 are soldered to the respective circuits 3 adjacent the shoulders 22 thereof and the spring element 36 of the grounding lug is soldered to the circuit 3a adjacent the shoulder 41. As a result of the soldering operation the socket unit is secured in fixed assembly with the panel 1 and all of the connections are in soldered electrical engagement.

In my second form of socket unit illustrated in Figs. 9 to 11, I have shown a socket device carrying 9 prong-receiving contacts adapted for assembly with a printed circuit panel of the general type illustrated and described in connection with my first form of socket device. The second form of socket device provides a central shielding means and includes elements designed to connect a plurality of socket contacts into the grounding circuit. Referring to the socket unit 47 illustrated in Figs. 9 and 11 of the drawing, I have provided a socket body 48 which is substantially identical to the socket body 6 of my first form of invention. The body 48 has a central aperture 49 which extends from adjacent the upper surface 50 through the lower surface 51. A plurality of contact-receiving apertures 52, which for illustrative purposes have been shown as nine, are arranged around the central aperture 49. Each of the apertures 52 terminates at a bottom portion 53 and provides an extension in the form of a slot 54 which intersects the lower surface 51 of the body 48. Socket contacts 55 are disposed in the openings 52 and each contact provides a prong-engaging portion 56 which rests on the bottom 53. A terminal tail 57 extends from each of the prong-engaging portions 56 through the slot 54 and the lower surface 51 of the body 48. Each terminal tail 57 has a flat portion 58 extending radially along the lower surface 51 of the body 48 to a point adjacent the peripheral edge of the lower surface. Each of the terminal tails 57 has a spring attaching portion 59 integral with the outer end of the flat portion 58 extending along the sidewall 60 in the direction of the upper sur-

face 50 of the body 48. The attaching portions 59 include a divergent portion 61 extending from its point of junction with the flat portion 58 outwardly away from the sidewall 60 of the body 48 and a converging portion 62 at its outermost end projecting toward the sidewall 60 to form a shoulder 63.

The grounding member 64 of my second form of socket unit is formed from one piece of metal and is assembled with the body 48 adjacent the lower surface 51 of the body 48. The grounding member has a central base element 65 which has an aperture 66 adapted to be aligned with the aperture 49 of the socket body. The grounding member has a plurality of finger-shaped contact elements 67 integral with the peripheral edges of the base 65 and extending radially therefrom. In original manufacture of the grounding member, there is preferably provided a number of finger-shaped elements 67 corresponding to the number of prong-engaging contacts to be carried by the socket body. It will be noted that the finger-shaped elements 67 are angularly arranged in such a way that their free ends 68 will contact the flat portions 58 of the socket contacts when the opening 66 of the grounding member is centered with the opening 49 of the socket body. Prior to assembly of the grounding member with the socket body, it is determined which socket contacts will not be shorted and the appropriate finger-shaped elements 67 are cut off adjacent the base 65. Thus, in actual practice, the grounding member may short only six socket contacts as shown in Fig. 9 or, by cutting off more or less of the elements 67 any desired number of contacts may be shorted. Extending from the peripheral edge of the base 65 of the grounding member is a grounding lug 69 which is of greater length than the elements 67 and adapted to be soldered directly to the grounding circuit of the printed circuit panel in the manner of the lug 36 of the first form of my device. The lug 69 has a strip portion 70 which extends along the surface 51 of the body 48 to the peripheral edge of the surface 51 and a spring attaching portion 71 integral with the outermost edge of the strip 70 and extending along the sidewall 60 of the body 48 in the direction of the upper surface 50 of the socket body. The attaching portion 71 provides a diverging portion 72 which extends from the outer end of the strip 70 outwardly away from the sidewall 60 of the socket body and a converging portion 73 which extends inwardly toward the sidewall 60 to form a shoulder 74.

The grounding member 64 is secured to the socket body by means of a rivet-like shield member 75 which has a head portion 76 adjacent the surface 50, a shank 77 extending through the socket body 48 and the opening 66 of the grounding member and a head 78 which overlies the material of the grounding member adjacent the opening 66. It is not desired that the elements 67 of the grounding member 64 be rotatable and, accordingly, the grounding member 64 is maintained in non-rotatable position with relation to the shield member 75 by means of projections 79 which extend from the lower surface 51 of the body 48 and are arranged to be disposed adjacent opposed side edges of the elements 67 and the lug 69 as illustrated in Fig. 9.

My second form of socket unit is assembled with a printed circuit panel by moving the socket body through a panel opening to snap the shoulders 63 of the elements 67 and the shoulder 74 of the lug 69 behind the panel in the manner of the attachment of my first form of socket unit. After the socket unit has been snapped into initial assembly with the panel, the panel installation is dipped in a solder bath to solder the attaching portions 59 of the terminal tails and the attaching portion 71 of the soldering lug to their respective printed circuits in the manner of the equivalent elements of the first form of my device. At the same time, the free ends 68 of each of the elements 67 will be soldered to the respective

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flat portions of the terminal tails and the head 78 of the shield member 75 will be soldered to the base 65 of the grounding member. Thus, in final assembly of the parts of the printed circuit installation the shield member 75 and those socket contacts which it is desired to short are connected into the grounding circuit of the panel through the grounding lug 64.

Although I have illustrated and described preferred embodiments of my invention, I do not wish to be limited thereby as the scope of my invention is best defined by the following claim.

I claim:

In a socket device for use with a part having contact prongs, a socket body of insulating material having top and bottom faces, said body having a center recess extending therethrough and a series of prong-receiving recesses disposed around said center recess, said prong-receiving recesses extending into said body from said top face thereof, a prong-receiving contact element seated in each of said recesses, each of said contact elements having a terminal portion extending beyond said bottom face of said body, a rivet-like shield member disposed in said center recess, said rivet member having a head portion

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adjacent said top face of said body, a conductor member disposed adjacent said bottom face of said body, said conductor member having a substantially flat apertured base portion, said rivet extending through said aperture of said base and having a head portion at its end away from said first-mentioned head portion electrically engaging said base adjacent said aperture thereof, conductor elements extending radially from the peripheral edge of said base portion for electrical engagement with terminal portions of said contact elements, and a grounding lug extending from said peripheral edge.

References Cited in the file of this patent

UNITED STATES PATENTS

15	2,259,738	Del Camp	Oct. 21, 1941
	2,259,739	Del Camp	Oct. 21, 1941
	2,505,163	Wanner	Apr. 25, 1950
	2,616,994	Luhn	Nov. 4, 1952
20	2,742,627	Lazzery	Apr. 17, 1956

FOREIGN PATENTS

693,918	Great Britain	July 8, 1935
711,016	Great Britain	June 23, 1954