Dec. 6, 1960 S. M. DEL CAMP 2,963,534

TELESCOPING SHIELD AND SOCKET ASSEMBLY

Filed May 3, 1957

Fig. 1

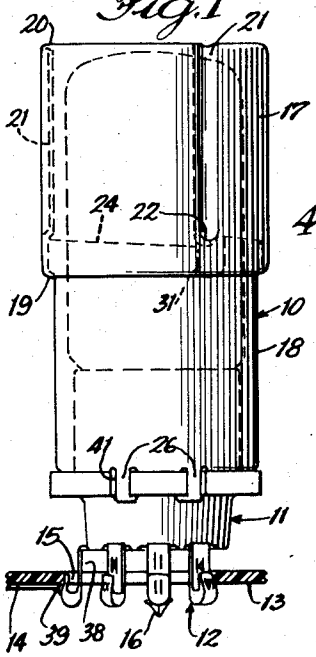


Fig. 2

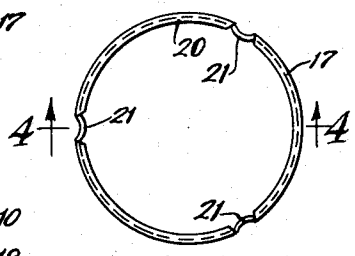


Fig. 3

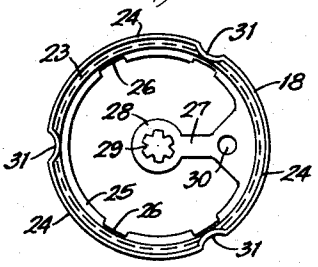


Fig. 4

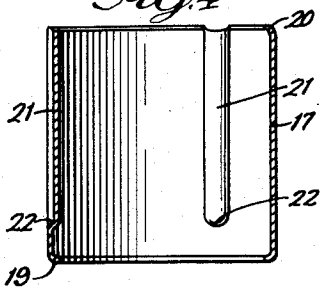


Fig. 5

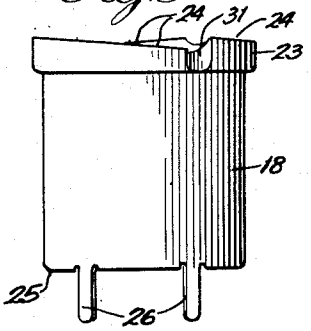
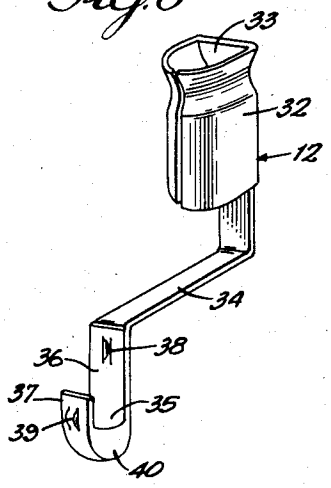


Fig. 6



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TELESCOPING SHIELD AND SOCKET ASSEMBLY

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5 Claims. (Cl. 174—35)

This invention relates to a tube socket assembly, and more especially to a socket assembly having a telescoping or collapsible shield. The assembly is useful, for example, with miniature tubes and in printed wire circuits.

In socket assemblies, there are among others an important condition that needs to be satisfied, and that is the necessity of shielding the tubes used in certain of the stages of a circuit, which is accomplished by substantially enclosing the tube in a grounded cylindrical metal shield. As is well known, if a unitary shield is employed for enclosing the tube, it is necessary to remove the shield in order to change the tube for otherwise the tube is inaccessible and cannot be grasped. Removable shields have been employed extensively with the old conventional chassis wherein circuit interconnections are defined by insulated wires. However, their use with printed circuits is undesirable, for printed wires are most often exposed and uninsulated so if a repairman places a removed shield on the panel when changing a tube and then fails to replace it, the shield becomes a serious hazard in that it may short across one or more of the printed wires.

To avoid this difficulty, shields have been developed that are fixedly secured to the socket castings so as to prevent their removal, and this arrangement necessitates one of two types of shields—the first being one of reduced length permitting exposure of the upper end portion of the tube so that it may be grasped for removal and replacement. This expedient is undesirable for it is apparent that such a shield cannot completely perform the function intended therefor of shielding all of the tube elements, many of which are located in the upper end portion of the tube. The second type comprises a pair of telescoping shield sections longitudinally movable with respect to each other whereby they may be collapsed to reduce the length thereof and thereby afford access to the upper end of the tube. This manner of construction overcomes the disadvantage of the shortened tube shield described above, but has instead another objection, namely that of inadequate electrical contact between the sections whereby the electrostatic and magnetic fields developed in the upper tube section are slowly drained off or conducted to the lower section and then to ground through restricted points of engagement, thereby seriously reducing the beneficial shielding properties of the entire shield and particularly the upper section thereof.

A need exists for an improved tube shield and socket assembly, and it is accordingly an object of this invention to provide such an improvement. Another object of the invention is that of providing a telescoping or collapsible tube shield that may be fixedly anchored to a socket casting, and which when extended completely sheathes or encloses a tube mounted in the socket, and when collapsed permits such tube to be readily grasped for removal and replacement. Still another object is to provide a tubular shield comprising a pair of shield sections, one telescopically receivable within the other, and when extended having a good electrical connection therebetween wherein the full shielding capacity of the unit is realized.

Yet another object is in the provision of a socket assembly having a tube shield of the character described, and wherein the inner or lower, and outer or upper shield sections when telescopically extended define a continuous perimetric contact or connection therebetween, thereby affording an excellent conducting path for the electrostatic and magnetic fields developed in the upper section. Still a further object is that of providing a tube shield of the type described in which cam means are employed to drivingly urge and tightly seat the perimetric edge portions of the upper shield section on corresponding perimetric portions of the lower section, thereby assuring an excellent and continuous electrical connection therebetween. Yet a further object of the invention is to provide cam-equipped shield sections of the character referred to, wherein the telescopic movement is constrained along predetermined longitudinal lines and permits the sections to be telescoped from collapsed to extended position, and vice versa, in a single rapid movement, and wherein the camming relation is effected by rotating the sections relative to each other when extended to selectively establish and release the uninterrupted electrical contact therebetween.

Additional objects and advantages as refer to this invention will become apparent as the specification develops.

An embodiment of the invention is illustrated in the accompanying drawing, in which—

Figure 1 is a side view in elevation of a socket assembly embodying the invention, shown mounted in a printed wire panel and wherein the panel is illustrated in section for clarity; Figure 2 is a top plan view of the upper shield section; Figure 3 is a top plan view of the lower shield section; Figure 4 is a transverse sectional view of the upper shield section taken along the line 4—4 of Figure 2; Figure 5 is a side view in elevation of the lower shield section; and Figure 6 is a perspective view of one of the socket contacts or terminals.

The socket assembly illustrated in Figure 1 comprises a tube shield or can indicated generally with the numeral **10**, a casting designated with the numeral **11**, and a plurality of socket terminals or contacts that in general are indicated by the numeral **12**. The socket assembly is mounted on a printed wire board or panel **13** having a plurality of printed wires **14** thereon. As is well known, the wires **14** may extend along either or both surfaces of the panel **13** for connection to the various terminals **12**. It is apparent from Figure 1 that the panel **13** will be provided with a plurality of openings or apertures **15** therein oriented to receive the various terminals **12** and the center pin **16** which is ordinarily connected to ground, and in a manner to be described in greater detail hereinafter, serves as a ground connection for the shield **10**.

The shield **10** comprises a pair of shield sections **17** and **18** that may be referred to, respectively, as the upper or outer, and inner or lower sections. The inner section **18** is longitudinally movable with respect to the outer section **17**, and is telescopically received therein. When the sections are extended, as shown in Figure 1, their height is sufficient to substantially enclose any of the various tubes that may be used with the socket assembly, such tubes having in general uniform or similar lengths. The dimensional relationship between the sections **17** and **18** also desirably permits the outer section **17** to almost completely enclose the inner section **18** when the sections are collapsed or telescopically retracted.

The outer section **17** is tubular, and in the illustration

given is a hollow cylindrical shell having an inwardly turned or rolled lower end 19 defining a continuous or perimetric edge. At its upper end, this section is also turned inwardly as indicated at 20, which serves as a stop to prevent the inner section 18 from being moved outwardly through the upper end. Thus, the longitudinal or telescopic movement of the section 18 within the outer shield section 17 is established by the limits defined by the inwardly turned edges or ends 19 and 20. Extending longitudinally of the section 17 at circumferentially spaced points thereabout are a plurality of inwardly pressed ribs 21 that initiate adjacent the upper end 20 thereof and terminate a spaced distance above the lower edge 19 in cam followers 22.

The section 18 has adjacent the upper end thereof an outwardly and upwardly turned perimetric shoulder or flange 23 defining along its upper end a plurality of cams or cam surfaces 24. There is provided a cam surface for each of the ribs 21 and cam followers 22 of the section 17 so that in the exemplary embodiment of the invention illustrated, there are three in number and these of course are spaced apart by equal arcs of 180°. The lower end of the section 18 may be drawn inwardly as shown at 25, and depending from that edge are a plurality of tongues 26—four in number—these being arranged in pairs on opposite sides of the section.

It is necessary to connect the shield 10 to ground, or more particularly to the center pin 16 of the socket assembly. This may be accomplished by equipping the section 18 along the lower edge thereof with an integral inwardly turned ground clip or member 27 having an enlarged end portion 28 centrally aligned with the longitudinal axis of the shield and having an opening therethrough preferably provided with a plurality of spaced spurs 29 extending radially thereinto. The enlargement 28 is adapted to receive a portion of the center pin 16 therein and establish electric contact therewith through the spurs or ears 29. With certain casting structures, it may be desirable to provide an opening 30 in the clip adjacent the shield section 18.

Figures 3 and 5 show that the section 18 within the shoulder 23 is provided with a plurality of recesses or guide channels 31 therein, alignable with the ribs 21 of the outer section 17 and adapted to slidably receive the same therein. These guide channels are of importance for when the ribs 21 are aligned therewith, the sections are free to move longitudinally with respect to each other to telescopically retract the section 18 into the outer section 17. These channels also establish the initiating end of the cam surfaces 24, and such surfaces rise from right to left therefrom as shown in Figure 5, or clockwise in the illustration of Figure 3.

Each of the contacts or terminals 12 has an upper end 32 adapted to seat within terminal openings (not shown) therefor in the casting 11. Such upper end has a passage 33 extending therethrough adapted to receive the pin of a tube therein, with the walls that define the passage frictionally gripping such pin to make electrical contact therewith. The terminal also has a tail 34 extending laterally below the pin-receiving end 32, and along the undersurface of the casting 11 when the terminal is mounted therein. The end of the tail 34 is turned downwardly and then bent upwardly along itself to provide a U-shaped or hook-shaped end 35. For identification, the portions of the tail end which define the hook are designated with the numerals 36 and 37 and are seen to be provided, respectively, with projections or stop seats 38 and 39 struck outwardly therefrom.

The projections 38 and 39 are vertically spaced by a distance substantially equalling that of the thickness of the printed wire panel 13 so that when the socket assembly is snapped into position, the projection 38 bears against the upper surface of the panel, while the projection 39 bears against the undersurface thereof thereby locking the terminal to the panel. Initially, the tail leg portions 36 and 37 may be substantially parallel and spaced apart by slightly more than the width of the openings 15 in the printed wire panel so that when the hook is pressed therethrough, it is compressed slightly as shown in Figure 1, whereby the inherent resilience of the metal tends to urge the legs against the walls of the opening and thus further anchor the terminal thereto. It will be noted from Figure 1 that the end of the leg portion 37 is oriented between the upper and lower surfaces of the panel 13 when the projections 38 and 39 are contiguous with these respective surfaces. If desired, the eye or opening in the hook 35 may be of enlarged thickness as shown at 40, which is of value in dip-soldering operations.

In assembly of the socket unit, the shield 10 is secured in position on the casting 11 by inserting the tongues 26 of the lower shield section 18 into recesses 41 formed therefor in the casting, and then turning the ends of the tongues laterally as shown in Figure 1. The various terminals 12 are mounted in the casting 11 in the customary manner, and after being positioned therein the tails 34 are bent to the configuration shown in Figure 6. The center pin 16 is also placed in the central opening therefor in the casting 11 by standard methods, and is in electrical contact with the ground clip 27 through the engagement thereof with the contact points or spurs 29.

The assembled unit may now be mounted on a printed wire panel 13 by aligning the respective terminals 12 with the openings 15 therefor in the panel, and thereafter snapping the U-shaped portions 35 of the terminals thereinto. The bearing engagement of the terminal projections 38 and 39 against the respective opposite sides of the panel 13 will mechanically anchor the assembly thereto, and as is indicated in Figure 1, the projections may also serve as a means to aid connection of the various terminals to the printed wires 14 of the panel.

Ordinarily, the ribs 21 of the outer shield section 17 are in alignment with the guide channels 31 of the section 18 so that the two sections may be moved freely in longitudinal directions with respect to each other. In such orientation then, the sections may be collapsed to the height of the inner section 18 to enable a tube to be easily mounted in the casting 11. Thereafter, the outer section 17 is moved upwardly with respect to the section 18 until the inwardly turned edge 19 of the upper section engages the shoulder 23. Next, the section 17 is rotated toward the left as viewed in Figure 1, which brings the lower ends or cam followers 22 of the ribs into engagement with the lowermost point of the respective cam edges 24. The dotted lines in Figure 1 indicate the initial engagement of the cam followers 22 with the cams 24.

Continued rotation of the section 17 in the same direction brings the inwardly turned end 19 thereof into increasingly tight engagement with the shoulder 23. Very slight rotational movement between the two sections, in the order of a few degrees, affords a rigid interlock between the sections, maintaining them in the extended position; and since a plurality of cam followers and cam edges are employed at spaced points about the shield, a continuous abutting engagement is established between the perimetric edge 19 and shoulder 23. This tight engagement establishes an excellent electrical contact therebetween so that there is substantially no interruption thereof along the entire circumference of the shield. To collapse the shield sections, a slight rotation of the outer section 17 in the opposite direction releases the cams and cam followers and aligns the ribs 21 with the guide channels 31 whereby, in the vertical orientation of the shield shown in Figure 1, the outer shield section is free to fall into telescopic enclosure of the inner section 18.

It is apparent that the cooperative ribs 21 and guide channels 31 prevent relative rotation between the shield

sections at all times except when the sections are telescopically extended. Therefore, the sections are always in proper alignment for immediate engagement of the cams and cam followers when extended. Since each cam edge initiates at one side of a guide channel **31** and terminates at the opposite side of another guide channel, as shown clearly in Figures 1 and 5, the sections can be relatively rotated only in one direction to engage the cams and followers, for abutment of the followers **22** with the high side of the guide channels (the right side in Figures 1 and 5) prevents relative rotation in an opposite direction. This same abutment assures alignment of the ribs **21** and guide channels **31** when the sections are rotated to release the cams and followers, whereby the sections are automatically positioned for telescopic retraction.

While in the foregoing specification an embodiment of the invention has been described in considerable detail for purposes of making an adequate disclosure thereof, it will be apparent to those skilled in the art that numerous changes may be made in those details without departing from the spirit and principles of the invention.

I claim:

1. A tube shield adapted for use in a socket assembly of the character described, comprising a pair of hollow cylindrical shield sections, said sections being disposed in coaxial alignment one within the other, the outer section being equipped with a plurality of inwardly projecting, longitudinally extending ribs each terminating a spaced distance above the lower end thereof to define a cam follower, the inner section having at the upper end thereof a cam surface for each of said cam followers, said sections being telescopically movable with respect to each other between a retracted position and an extended position whereat the cams and cam followers are aligned for cooperative engagement when the sections are rotated slightly with respect to each other to urge them toward further extension, and aligned perimetric surfaces provided by the respective sections for abutment with each other when the sections are telescopically extended, whereby rotation of the sections when extended to bring said cam followers into engagement with said cams results in a condition of tight abutment of said aligned surfaces to establish a good electrical connection therebetween.

2. The shield structure of claim 1 in which the upper end of the inner section is enlarged to define a substantially continuous outwardly extending shoulder providing one of said aligned surfaces, and in which said outwardly extending shoulder is provided with a guide channel therein for each of said ribs to slidably receive the same therein, said ribs and guide channels constraining said sections against rotation except when the sections are moved to their extended position.

3. The shield structure of claim 2 in which the lower end of the outer shield section is turned inwardly to provide the other of the aforesaid aligned surfaces.

4. In a tube shield, a pair of tubular shield sections, one of said sections being telescopically received within the other and movable with respect thereto between the extended and retracted positions, the lower end of the outer section being turned inwardly and the upper end of the inner section being turned outwardly to provide abutting surfaces when the sections are extended, said inner section having an inclined perimetric edge adjacent said upper end defining a cam, said outer shield having an inward projection adjacent the lower end thereof engageable with said perimetric edge of said inner shield thereby to operate as a cam follower, said perimetric edge of said inner shield and said projection of said outer shield being cooperative when said sections are rotated slightly with respect to each other in their extended condition to urge the respective inwardly and outwardly turned ends into tight abutting relation.

5. The shield structure of claim 4 in which the outer shield is equipped with an inwardly extending longitudinal rib defining said projection at the lower end thereof, and in which said outwardly turned upper end of the inner section is provided with a guide channel therein adapted to slidably received said rib to constrain said sections against relative rotation except when within their extended position.

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