Jan. 7, 1964 B. E. OLSSON ET AL 3,116,960

ELECTRICAL SOCKET

Filed Aug. 3, 1959

Fig. 1

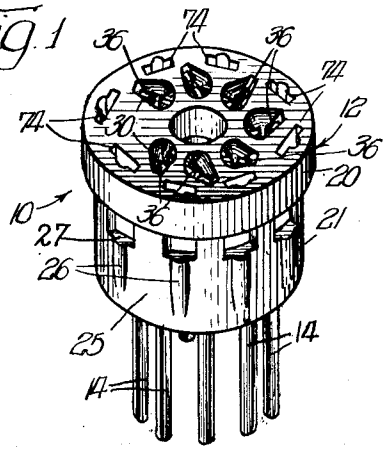


Fig. 2.

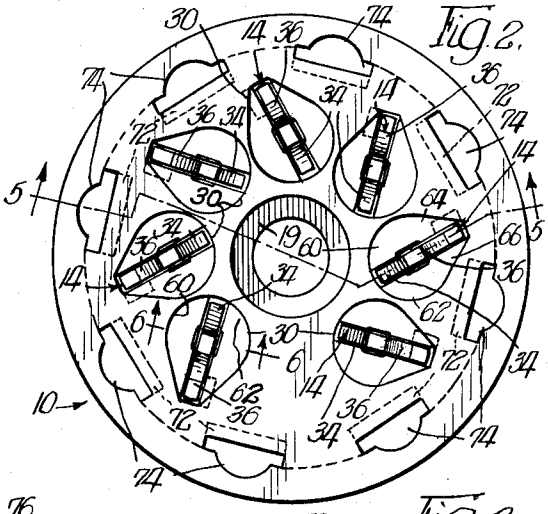


Fig. 4

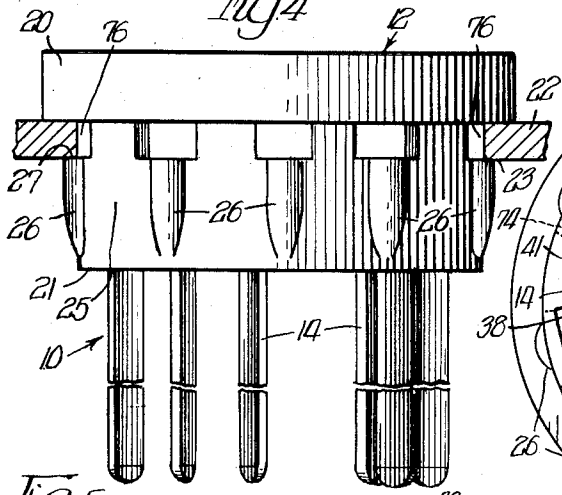


Fig. 3

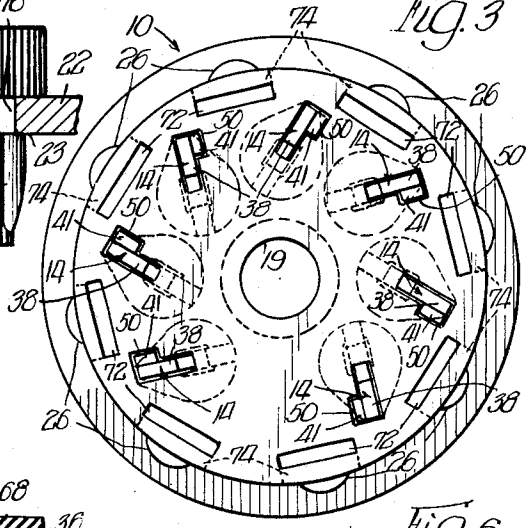


Fig. 5.

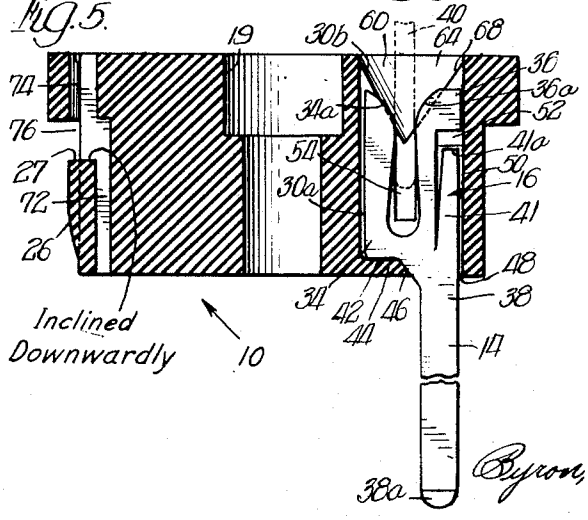
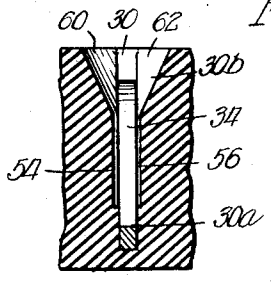


Fig. 6.



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ELECTRICAL SOCKET

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6 Claims. (Cl. 339—128)

The present invention relates to electrical sockets and, more specifically, to electrical sockets adapted to be snapped into mounting position on a support.

It is an object of the present invention to provide a new and improved electrical socket.

It is another object of the present invention to provide a new and improved electrical socket of the snap-in type.

It is a further object of the present invention to provide a new and improved electrical socket that directs automatically dispensed, contact terminals into predetermined positions within the body of the socket.

It is a further object of the present invention to provide in a socket a new and improved opening structure for receiving and guiding a plurality of contact terminals into selective positions relative to the socket.

It is yet a further object of the present invention to provide a new and improved electrical socket embodying a resilient rib structure adapted to facilitate mounting of the socket on a support or the like.

It is another object of the present invention to provide in a socket a new and improved rib structure which permits deformation of spaced apart ribs along their entire lengths during insertion of the socket into an apertured support, yet maintains the socket in locked mounting position after insertion into the apertured support.

It is yet another object of the present invention to provide a new and improved electrical socket that is adapted to be readily molded by axially movable mold halves, thereby obviating the use of transversely movable mold halves and camming devices which limit the number of sockets that can be produced in a given space.

It is still a further object of the present invention to provide a new and improved electrical socket wherein a generally transversely extending structure adapted to coact with a support is molded by axially movable mold halves.

It is still a further object of the present invention to provide a new and improved electrical socket embodying a new and improved body and forked-type contact terminals.

The above and other objects of the present invention are achieved by providing a new and improved electrical socket adapted to be snapped into mounting position on an apertured support, for example a metallic chassis or baseboard. The electrical socket comprises a body molded from insulating material, for example plastic or the like, and a plurality of contact terminals made of electrically conductive metal, for example copper bronze and the like. The contact terminals are suitably supported by the body to provide electrical connection between electrical leads and the prongs of an electrical device inserted into the socket body.

In accordance with one aspect of the present invention, the body is provided with a plurality of openings for receiving, respectively, the contact terminals which are adapted to be locked within the body of the socket. The openings are so constructed that the contact terminals, which are randomly positioned above the socket body, are guided by the openings into the body of the socket to assume preselected positions relative to one another.

In another aspect of the present invention, a new and improved rib structure is embodied in the socket body to facilitate insertion of the socket in the apertured support. In this connection, a plurality of axially extending slots are respectively spatially arranged relative to a plurality of ribs provided on the side of the socket body so that, as the socket is inserted into the apertured support, the ribs are permitted to be deformed inwardly into the slotted portions throughout their entire length. Thus, a socket embodying the improved rib structure is more easily and quickly snapped into mounting position on the support.

In accordance with yet another aspect of the invention, the socket is molded by the use of axially movable mold halves. Particularly, the axially moving mold halves produce transversely extending locking structure that is used to retain the socket in the apertured support. Thus, the use of transversely movable mold halves and camming devices that produce relatively high manufacturing costs are entirely avoided.

Furthermore, the present invention envisions particularly constructed fork-type contact terminals and particularly configured openings in the socket body for coacting with the terminals to fixedly secure them to the socket body.

The invention, both as to its organization and method of operation, taken with further objects and advantages thereof, will best be understood by reference to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is an isometric view of an electrical socket embodying the features of the present invention;

FIG. 2 is an enlarged top plan view of the socket of FIG. 1;

FIG. 3 is an enlarged bottom plan view of the socket of FIG. 1;

FIG. 4 is an enlarged side elevational view of the socket of FIG. 1;

FIG. 5 is a sectional view taken along line 5—5 of FIG. 2; and

FIG. 6 is a sectional view taken along line 6—6 of FIG. 2.

Referring now to the drawing and particularly to FIG. 1, an electrical socket 10 embodying the features of the present invention is illustrated and is identified generally by reference numeral 10. The electrical socket, herein referred to as a tube socket, is of the snap-in type and, thus, is adapted to be snapped into an oversized aperture provided in a support, for example an apertured metallic chassis or baseboard (shown only in FIG. 4). With the tube socket 10 fixedly secured to the metallic chassis, it is adapted to receive prongs or the like of an electrical device, for example a vacuum tube. The tube socket, as described below, respectively interconnects the prongs of the vacuum tube to a plurality of electrical leads connected in an electrical circuit.

Briefly, the tube socket 10 comprises an insulating body 12 of generally solid cylindrical configuration provided with a plurality of axially extending openings 30 for respectively accommodating a plurality of electrically conductive contact terminals 14. The openings 30 are configured so that the contact terminals 14 are guided into the openings 30 and furthermore are configured to accommodate a locking means 16 embodied in the terminals 14. When the locking means 16 coacts with the openings 30, the terminals 14 are fixedly secured to the socket body 12 so that their legs depend downwardly from the body 12. The contact terminals 14 are of the forked, wire-wrap type and, as is well known, electrical leads, e.g., wire conductors, leads from electrical elements and the like, are adapted to be wrapped around and soldered to the legs of the contact terminals 14, thereby providing good electrical connections between the electrical leads and the contact members 14 and, hence, the specific prongs

associated with the vacuum tube when inserted in the socket 10.

Referring now specifically to the detailed construction of the fork-type, contact terminals 14, attention is directed to FIG. 5, wherein one of the contact terminals 14 is illustrated in elevation. As shown, the terminal 14 comprises a flat blade of generally Y construction. The blade terminal 14 specifically includes a pair of generally parallel arms 34 and 36 integrally connected to a leg 38 which actually comprises an extension of the arm 36. The arms 34 and 36 define therebetween a space for accommodating a prong 40 of a vacuum tube or the like and are somewhat resilient in the sense that they are capable of limited relative movement toward and away from one another in the plane of the blade. Consequently, incident to insertion of the prong 40, illustrated in dotted lines of FIG. 5, between the arms 34 and 36, the prong 40 moves the arms 34 and 36 apart and enters the above-referred to space. The arms 34 and 36, being deformed outwardly, are resiliently biased toward one another to provide a good pressure contact between the prong 40 and the contact terminal 14. To facilitate the passage of the prong 40 into the space between the arms 34 and 36, the inner corners 34*a* and 36*a* of the upper ends of the arms 34 and 36 are curved so as to guide the prong 40 downwardly between the arms 34 and 36.

For the purpose of locking each of the contact terminals 14 to the socket body 12 by simply positioning the terminal 14 in the opening 30, a locking means is embodied in each contact member 14. Referring now to FIG. 5, the locking means 16 comprises a generally rectangular finger 41 which is stamped out of the right side of the arm 36. The finger 41 is integrally attached at its lower end to the arm 36 and is deformed, as it is stamped, upwardly and rearwardly so that the tip 41*a* of the finger 41 is displaced rearwardly of the blade terminal 14 to coact with suitable structure in the socket body 12, described hereinbelow.

Considering now the body 12 of the socket 10 in greater detail, it is manufactured from suitable plastic or the like material by a suitable molding process and, thus, is relatively rigid but at the same time is slightly resilient. As illustrated in FIGS. 1, 2, 3, and 4, the generally cylindrical socket body 12 includes an axially extending, centrally located bore 19 for receiving suitable shielding or the like devices. The body 12, having a generally flat and parallel top and bottom, includes adjacent its top a generally annular lead 20, the lower surface of which is adapted to engage the upper surface of a metallic chassis or baseboard 22 or the like (shown in FIG. 4), and also includes adjacent its bottom a shank 21 that is inserted into a slightly oversized opening 23 of the metallic chassis 22. The shank 21 is of smaller diameter than the head 20 and has a length approximately twice as long as the head 20. As described in greater detail hereinbelow, the shank 21 is provided with a rib structure including a plurality of axially extending and spatially arranged ribs 26 formed in the cylindrical side of the shank 21. The ribs 26 terminate at their upper ends in ledges 27 that coact with the under surface of the metallic chassis 22 and in cooperation with the head 20 lock the tube socket 10 to the chassis 22. Although not clearly shown in the drawing, the ledges 27 are inclined downwardly several degrees to assure that the ribs 26 and the head 20 snugly engage the metallic chassis 22, thereby to assure that a substantially tight fit is obtained between the socket 10 and the chassis 22.

As best shown in FIGS. 2, 3, and 5, the plurality of spatially arranged openings 30 defined in the body 12 extend axially between the top and bottom of the socket body, i.e., extend through both the annular head 20 and the shank 21. By this construction contact terminals 14, which are individually or collectively dispensed into the openings 30 by automatic machinery, pass downwardly under gravity into the openings 30 until the locking finger 41 engages the socket 10 to arrest the movement of the terminals. Thereafter, a suitable insertion device drives the terminals 14 downwardly into locking engagement with the socket body 12, wherein the legs 38 extend downwardly from the tube socket 10. In any event, the openings 30 are located substantially equidistantly between the bore 19 and the cylindrical side of the shank 21 and are equally spaced apart similarly to the prongs of a vacuum tube so that the vacuum tube prongs register with the openings 30. In this connection, one opening is omitted as indicated at FIGS. 1, 2, and 3, to provide an indexing or aligning means to assure proper orientation of the vacuum tube in the socket 10.

Considering now the construction of the openings 30 in greater detail, attention is specifically directed to FIGS. 2, 5, and 6. The openings 30 are each of identical construction and in the interest of simplifying the specification, only a single opening 30 will be described. Briefly, each of the openings 30 comprises a terminal retaining or lower portion 30*a* of generally rectangular cross section for accommodating the arms 34 and 36 of a contact terminal 14 and, in addition, a mouth portion 30*b* for guiding and directing a contact terminal 14 downwardly into the retaining portion 30*a*. The retaining portion 30*a* comprises a slightly oversized slot to permit the arms 34 and 36 of the terminal 14 to move easily downward into their mated position, wherein the lower end 42 of the arm 34 seats on a lip 44 which defines a reduced neck slot 48 through which the leg 38 extends. The lip 44 is provided with a flat, downwardly and rightwardly inclined surface 46 for guiding the leg 38 of the contact terminal 14 into the reduced neck slot 48 during assembly of the terminal 14 and the socket body 12.

As seen best in FIGS. 3 and 5, the retaining portion 30*a* includes adjacent its lower end a chamber 50 which extends downwardly to the bottom of the socket body 12. The chamber 50 is slot-like and actually comprises an integral extension of the retaining portion 30*a* to accommodate the rearwardly and upwardly displaced finger 41 of the terminal 14. The chamber 50 is closed at its upper end by structure 52 provided in the socket body 12 and is open at the bottom of the socket body 12 to facilitate withdrawal of the mold half or the like. By this construction, the tip 41*a* of the finger 41 coacts with the structure 52 to prevent upward movement of the contact terminal 14, while the lower end 42 of the arm 34 coacts with the lip 44 to prevent the downward movement of the contact terminal 14. Thus, once the contact terminal 14 is inserted into the opening 30 into its mating position, it is locked in situ in the socket body 12 simply and quickly and subsequent disassembly of the contact terminal 14 and the socket body 12 is effected only by the use of special tools.

The retaining portion 30*a* of the opening 30 also includes a pair of axially extending keyways 54 and 56, best seen in FIGS. 5 and 6, for accommodating the prong 40 of the vacuum tube or the like. The keyways 54 and 56 are generally rectangular in section and extend downwardly to a point two-thirds the depth of the socket body 12. They are located in the walls of the retaining portion 30*a* so as to lie between the arms 34 and 36 of the contact member 14 and, in essence, widen the middle of the slot-like retaining portion 30*a*. Accordingly, the prong 40 of a vacuum tube or the like moves unobstructed into the widened or oversized middle part of the receiving portion 30*a* and is engaged only by the resilient arms 34 and 36 of the contact member—not any part of the socket body 12.

In accordance with an aspect of the present invention, the mouth 30*b* of the opening 30 performs a dual function. First, it guides and directs the contact terminal 14 into the retaining portion 30*a* of the opening 30 incident to disposition of the contact terminal 14 into the opening

30 by automatic machinery or the like and, secondly, guides the prongs 40 of the vacuum tubes or the like into engagement with the arms 34 and 36 of the contact terminals 14 when fixedly held by the socket body 12. The configuration of the mouth 30*b* of the opening 30 is clearly shown in FIGS. 2, 5, and 6, and may be conveniently described as being "tear-shaped" because of its generally teardrop cross section shown best in FIG. 2. As illustrated therein, the mouth 30*b* provides a transition from a generally circular entrance of the opening 30, i.e., the part of the opening at the top of the socket, to the slot-like retaining portion 30*a*. In addition, the mouth 30*b* and the retaining portion 30*a* join together to provide an opening 30 having a continuous and uninterrupted surface within the socket body 12. More particularly, the mouth 30*b* includes a pair of generally conical surfaces 60 and 62 which generally extend away from one another to extend on opposite sides of the left end of the retaining portion 30*a*, as seen in FIG. 5, and a pair of generally flat surfaces 64 and 66 converging towards the right end of the lower portion 30*a*. The generally conical surface 60 and the generally flat surface 64 are continuous and uninterrupted as is the generally conical surface 62 and generally flat surface 66. The surfaces 60, 64 and surfaces 62, 66 respectively intercept the longitudinal walls of the retaining portion 30*a* and each define a V, the intersection between the surfaces 60, 64 and the adjacent wall of the retaining portion 30*a* being identified by reference numeral 68 in FIG. 5.

As indicated above, the contact terminals 14 are positioned above and dispensed into the openings 30 by automatic machinery. The automatic machinery is so oriented relative to the socket that the leg 38 of each terminal 14 enters the tear-shaped mouth 30*b* (FIG. 5) near the center of the mouth 30*b* and not adjacent the converging ends of the surfaces 64 and 66, as might be expected in view of the ultimate position of the leg 38. Thus, as the terminal 14 moves downwardly, initially by gravity and thereafter under the ejection force of the automatic machinery, the lower end 38*a* of the leg 38 engages either of the flat surfaces 64 or 66 at a point generally equidistant from their ends, whereupon the lower end 38*a* is guided into the retaining slot-like portion 30*a*. The contact terminal 14 continues to move downwardly through the retaining opening 30*a* and, since the end 38*a* is not adjacent the right end of the slot-like portion 30*a*, the lower end 38*a* engages the inclined surface 46 of the lip 44 and is directed into the reduced neck 48. In this connection, the lower end 38*a* is rounded to facilitate movement of the leg 38 through the neck 48. The leg 38 continues its downward movement through the neck 48 until the lower end 42 of the arm 34 engages and seats on the lip 44. It will be appreciated that the entire weight of the contact terminal 14 is supported by the lip 44 and the terminal 14 is maintained in position illustrated in FIG. 5 under the force of gravity.

Returning now to the movement of the contact terminal 14, the spring finger 41 stamped out of the arm 36 is deflected into the plane of the contact terminal 14 as the arms 34 and 36 enter and pass through the upper part of the slot-like portion 30*a*. Specifically, the finger 41 engages the intersection 68 and then the structure 52 of the body 12 and, when the contact terminal 14 moves into the position illustrated in FIG. 5, the resilient finger 41 is free to move outwardly into the chamber 50 to assume a position generally inclined to the terminal arm 36. The movement of the finger 41 causes the tip 41*a* to move into a position immediately beneath the structure 52 of the socket body 12. Accordingly, as a result of the coaction of the tip 41*a* of the finger 41 and the structure 52, upward movement of the contact terminal 14 is prevented, whereby the terminal 14 is fixedly held or locked in the opening 30 of the socket body 12.

In accordance with another aspect of the present invention, the new and improved rib structure embodied in the socket body 12 permits improved snap-in mounting of the socket 12 to the metallic chassis 22. In this connection, the plurality of axially extending ribs 26 are equally spaced around and extend substantially the entire length of the cylindrical side 25 of the shank 21 of the socket body 12. Each of the ribs 26 extends outwardly from the shank 21 and has a generally curved surface that is inclined downwardly so that the upper end of the rib 26 is offset more from the side 25 than the lower end of the rib 26. By this construction, the ribs 26 define for the shank 21 a progressively larger effective diameter which at some vertical point is larger than the diameter of the opening 23. As shown best in FIGS. 4 and 5, the extreme upper end of the rib 26 terminates in the ledge 27 that extends laterally to coact with the under surface of the metallic chassis 22. Since the tube socket body 12 is made from plastic material that is generally rigid yet resilient, the axially extending ribs 26 are deformed inwardly incident to insertion of the tube socket 12 into the opening 23 in the chassis 22.

To permit the ribs 26 to be displaced as the socket 10 is snapped into its mounting position on the chassis 22, slots 72 are defined radially inwardly of and immediately adjacent to the ribs 26. As best shown in FIG. 5, the slots 72 are rectangular in cross section and are defined through the length of the shank 21 of the socket body 12 so as to extend the length of the ribs 26. Accordingly, as the socket body 12 is inserted into the opening 23 of the chassis 22 and the ribs 26 engage the opening 23, the ribs 26 are deflected inwardly into the slots 72 with the result that the effective diameter of the shank 21 is reduced to permit the socket 12 to easily pass into the opening 23. Once the head 20 of the socket 12 abuts against the upper surface of the chassis 22 and the ribs 26 clear the opening 23, the ribs 26 are resiliently urged back into their deformed positions, with the result that the ledges 27 move outwardly to coact with the lower surface of the chassis 22 and lock the socket 12 to the chassis 22. It will thus be appreciated that a greatly improved resilient rib structure is provided by providing a slot throughout the entire length of the rib; moreover, the performance of the rib structure of the present invention has proven to be far superior to existing rib structures in which slots are provided only adjacent portions of the ribs.

In accordance with yet another aspect of the present invention, the socket body 12 and in particular the rib structure comprising the ribs 26 and the slots 72, are manufactured by a molding process embodying a pair of axially movable mold halves. In contrast to present day electrical sockets wherein transversely movable mold halves and camming devices are employed to produce ledges, similar to ledges 27, for engaging the metallic chassis 22, the socket body 12 is manufactured with axially movable mold halves which facilitate the manufacture of the socket bodies and decrease their production costs. More specifically, the lower mold half is provided with upwardly extending parts (not shown) which produce the slots 72 located adjacent to the ribs 26 while the upper mold half includes downwardly extending parts which produce a plurality of the slots 74 extending above the ledges 27, a part of each slot 74 being of the same cross section as the ledges 27. In fact, as best shown in FIGS. 4 and 5, the parts of the mold halves producing the slots 72 and 74 cooperate to define the laterally extending ledges 27 and, furthermore, coact to define in the side wall 25 of the socket shank 21 a plurality of openings 76 that communicate with the slots 74 and 72. The openings 76 are located immediately above the ribs 26 and receive portions of the apertured metallic chassis 22.

It has been observed that in existing sockets, the ledges on top of the ribs are produced by using transversely moving mold halves which require camming devices for effecting the separation of the mold halves. According-

ly, only a limited number of rows of the molds can be located in a given area, since the camming devices occupy a certain amount of space adjacent each row of molds. However, by using axially movable mold halves that include parts to define the ledges 27, the camming devices are entirely eliminated, with the result that a greater number of rows of molds can be located within the same area. Hence, a greater number of sockets can be produced by the same molding press during a single molding operation, whereby a greater number of sockets can be produced in a given time to substantially reduce the production costs of the electrical sockets.

While the embodiment described herein is at present considered to be preferred, it is understood that various modifications and improvements may be made therein, and it is intended to cover in the appended claims all such modifications and improvements as fall within the true spirit and scope of the invention.

What is desired to be claimed and secured by Letters Patent of the United States is:

1. An electrical socket of the snap-in type comprising a body having a plurality of axially extending rib means spatially arranged about its side, each of said rib means having a cut-away portion for accommodating in cooperation with the head of the socket a support and further having an inclined, generally curved outwardly facing portion for coacting with an aperture structure in said support, said body further having a plurality of slots respectively located entirely within said body radially inwardly of and spaced from said rib means to permit inward movement of said rib means incident to insertion of the socket into the aperture in said support.

2. An electrical socket of the snap-in type comprising a body having an enlarged head portion for coacting with one surface of a support means and a lower shank of reduced diameter, said lower portion including a plurality of spatially arranged rib means defining at its upper ends transversely extending ledge means for coacting with the opposite surface of the support means and further including a plurality of slots disposed within the lower portion and spaced from and extending the length of said rib means, said head portion including openings located vertically above said ledge means and extending through said head portion.

3. An electrical socket of the type adapted to be snap mounted to an apertured support comprising a body, a plurality of axially extending rib means in said body for slidably coacting with the apertured portion of said support, said rib means having at one end ledge means, and a plurality of slots extending axially throughout the entire body, said axially extending slots being exposed within said body and cooperatively spaced inwardly from said rib means to permit movement of said rib means during passage of said rib means through said apertured support.

4. An electrical socket of the snap-in type comprising a body, a plurality of slots extending axially entirely through and within said body, a plurality of axially extending rib means provided in said body and disposed radially outwardly of and slightly spaced from said slots, said slots having lengths at least as great as the length of the rib means, said rib means adapted to be slidably engaged by an apertured portion of said support and to be temporarily radially inwardly deformed toward said slots as the rib means pass through the apertured support.

5. The socket of claim 3 wherein the body includes a plurality of radially extending openings adjacent the ledge means of said axially extending rib means, respectively, for accommodating the peripheral surface of the apertured structure of said support.

6. The socket of claim 3 wherein the lower ends of said rib means slope toward and terminate adjacent the lower surface of said socket, whereby the rib means are enabled to be easily deformed inwardly incident to insertion of said socket into said apertured support.

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