March 20, 1962 W. GLUCK 3,026,496

ELECTRICAL SOCKET AND CONTACT THEREFOR

Filed June 5, 1957 2 Sheets-Sheet 1

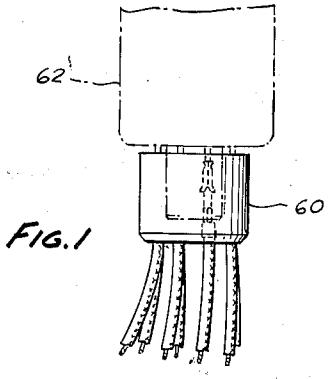


FIG. 1

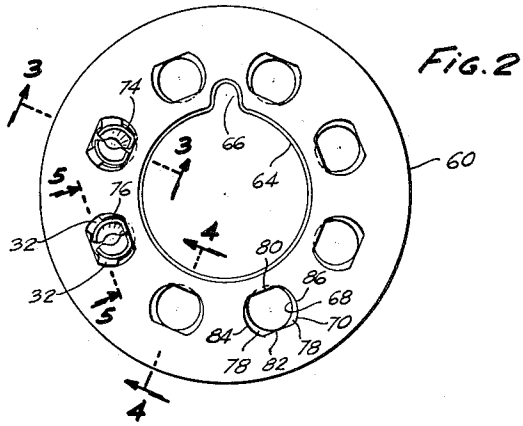


FIG. 2

FIG. 3

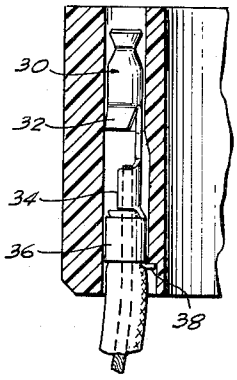


FIG. 4

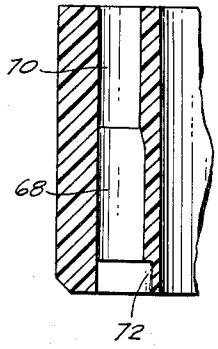


FIG. 5

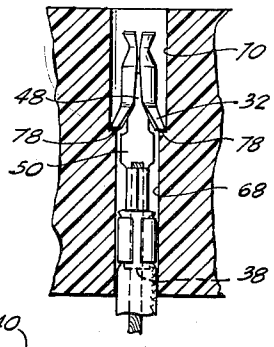
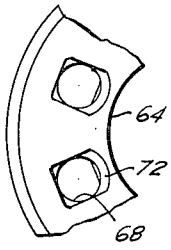


FIG. 6



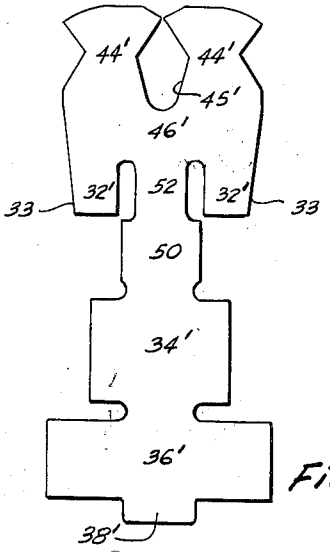


FIG. 7

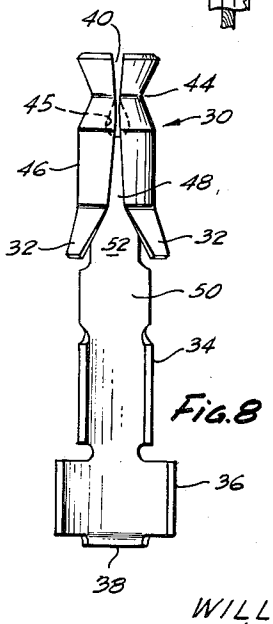


FIG. 8

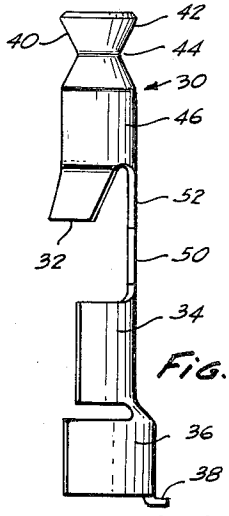


FIG. 9

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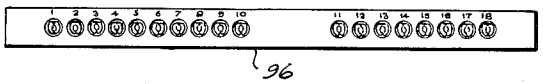
March 20, 1962 W. GLUCK 3,026,496

ELECTRICAL SOCKET AND CONTACT THEREFOR

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FIG. 10



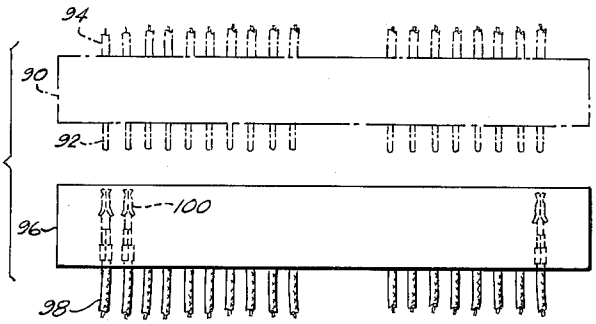


FIG. 11

FIG. 12

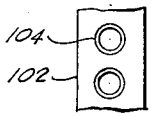


FIG. 15

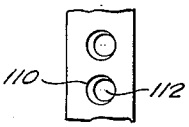


FIG. 13

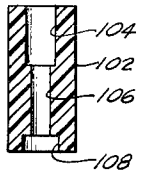


FIG. 16

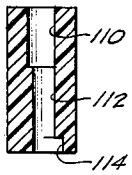


FIG. 14

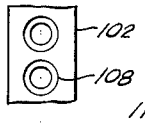


FIG. 17

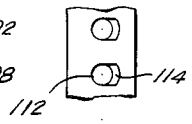


FIG. 18

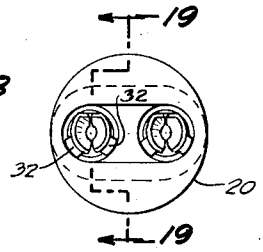


FIG. 19

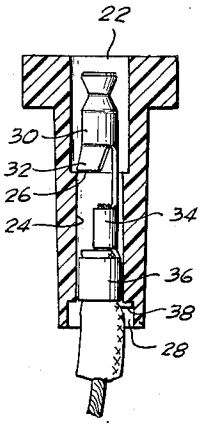


FIG. 20

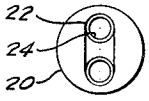


FIG. 21

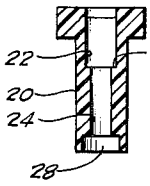


FIG. 22

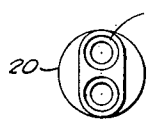
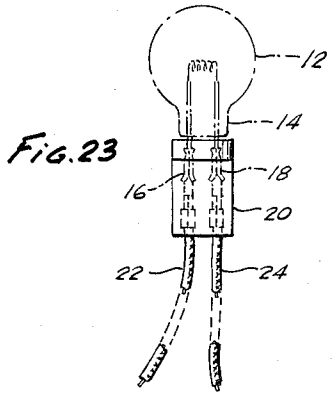


FIG. 23



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Patented Mar. 20, 1962

3,026,496
ELECTRICAL SOCKET AND CONTACT THEREFOR

William Gluck, Yonkers, N.Y., assignor to Industrial Electronic Hardware Corp., a corporation of New York

Filed June 5, 1957, Ser. No. 663,851
5 Claims. (Cl. 339—193)

This invention relates to electrical sockets and female connectors.

The primary object of the present invention is to improve such sockets and connectors. A more particular object is to provide a socket comprising an insulation body and contacts which may be assembled by simply pushing the contacts into the insulation body. Still another object is to provide a socket having insulated wire leads which may be secured to the metal contacts of the socket before inserting the contacts in the insulation body, thus making it feasible to strongly join the contacts and wire, even without the use of solder. A still further object is to provide a socket the insulation body of which may be easily and inexpensively molded in a simple two-part mold.

Another object of the invention is to provide contacts which may be made of brass, work-hardened enough to produce a good resilient grip on the pins received thereby, without requiring heat treatment. A further object is to provide the contact with tangs which yield during insertion, but which are sturdy enough to prevent subsequent removal of the contact. Still another object is to so relate the pin grip and the tangs of the contact that yielding of the pin grip helps afford the desired yield of the tangs, even though the latter are made relatively short and sturdy.

Still another object of the invention is to provide variant forms of socket in which the contacts and wires are either rotatable or non-rotatable. More specific objects are to apply the invention to a socket for a miniature TV picture tube, to a socket for a miniature pilot lamp, and to a socket or female portion of a multi-pin connector.

To accomplish the foregoing general objects, and other more specific objects which will hereinafter appear, my invention resides in the socket elements, and their relation one to another, as are hereinafter more particularly described in the following specification. The specification is accompanied by drawings in which:

FIG. 1 shows the invention applied to a small TV picture tube;

FIG. 2 is a plan view of the socket drawn to enlarged scale;

FIG. 3 is a section taken approximately in the plane of the line 3—3 of FIG. 2;

FIG. 4 is a section taken approximately in the plane of the line 4—4 of FIG. 2;

FIG. 5 is a section taken approximately in the plane of the line 5—5 of FIG. 2;

FIG. 6 is a fragmentary bottom view of the insulation body;

FIG. 7 is a development of a sheet metal blank from which one of the metal contacts of the socket is formed;

FIG. 8 is a front view of the formed contact before attachment to a wire;

FIG. 9 is a side view of the same;

FIG. 10 is a plan view of the socket or female portion of a multipin connector;

FIG. 11 is an elevation showing both halves of the connector of FIG. 10;

FIGS. 12, 13 and 14 are fragmentary plan, sectional, and bottom views, respectively, of one form of insulation body for the multipin connector of FIGS. 10 and 11;

FIGS. 15, 16 and 17 are fragmentary plan, sectional, and bottom views, respectively, of another form of insulation body for the said multipin connector;

FIG. 18 is a plan view of a socket for a pilot lamp;

FIG. 19 is a section taken approximately in the plane of the line 19—19 of FIG. 18;

FIGS. 20, 21 and 22 are top, sectional, and bottom views, respectively, of the insulation body for the socket shown in FIGS. 18 and 19; and

FIG. 23 shows the relation of said socket to a miniature pilot lamp received thereby.

Referring to the drawing, and more particularly to FIG. 23, I there show a miniature pilot lamp 12 of the type which has no metal base, and instead has two stiff wire pins projecting in parallel relation from the pinched lower end 14 of the lamp. These pins are received in two appropriately spaced metal contacts 16 and 18 housed in an insulation body 20. The contacts may be permanently secured to the ends of insulated wires 22 and 24.

The insulation body 20 is shown separately in FIGS. 20, 21 and 22 of the drawing. It is provided with two elongated passages each adapted to house one of the contacts. Each passage has a top portion 22 of suitable section to receive the pin grip and tangs of the contact, and an intermediate portion 24 which is of lesser section, thus providing a ledge or shoulder at 26, against which the tangs of the contact may bear. The bottom portion 28 of the passage is large enough to receive a stop tab formed at the lower end of the contact, which limits insertion of the contact, so that it is held within the insulation body, and against movement either upward or downward. It will be evident from inspection of the drawing that this insulation body may be molded in one piece, and that the molding operation is an easy and inexpensive one, because the parts 22 and 28 of the passage are larger in section than the intermediate part 24, and the piece may be molded between the halves of a simple two-part mold.

The metal contact may be described with reference to FIGS. 7, 8 and 9 of the drawing. The contact is made of a sheet metal blank, the configuration of which is shown in FIG. 7. After being shaped as shown in FIGS. 8 and 9, it comprises a pin grip 30, tangs 32, a wire clamp 34, an auxiliary clamp 36, and a stop tab 38. The pin grip 30 is a resilient split tubular sleeve. It is preferably split not only at the front 40, but also at the back 42 (FIG. 9), and it is preferably necked or convergent at the part 44, thus providing an enlarged funnel shaped entrant end at the top to receive the mating pin.

The body portion 46 of the sleeve is closed at the back, but open at the front, and the slit at the front preferably diverges downward to a relatively wide gap 48 at the lower end of the sleeve. The tangs 32 slope downwardly and outwardly from the lower end of the sleeve, and are preferably disposed immediately at each side of the enlarged gap 48. With this construction, the tangs 32 are resiliently compressible toward one another, and yet may be relatively short and sturdy, for their movement toward one another does not depend on bending of the tangs, but instead is greatly aided by yielding of the entire sleeve at the enlarged gap 48.

The contact preferably includes a flat back 50 connected to the pin grip by a flat neck 52. The wire clamp 34 is shown open in FIGS. 8 and 9, and is adapted to be squeezed directly around the bared end of an insulation wire, as shown in any of FIGS. 1, 3, 11, 19 and 23 of the drawing. The auxiliary clamp 36 is also shown open in FIGS. 8 and 9, and is adapted to be equeezed around the insulation of the wire immediately below the bared

end. The stop tab 38 is bent sidewardly at the bottom of the contact, and preferably in a direction opposite to the gap 48 and tangs 32.

The configuration of the blank shown in FIG. 7 will probably be self-explanatory from the foregoing description, the parts 44' making up the constriction 44, the part 46' making up the sleeve 46, the parts 32' acting as the tangs 32, the rectangle 34' becoming the wire clamp 34, the larger rectangle 36' becoming the auxiliary clamp 36, and the projection 38' becoming the stop tab 38. The parts 50 and 52 remain flat and substantially unchanged. The side edges of the tangs 32' slope inward or converge downwardly as shown at 33, and it is this slope which produces the gap 48 shown in FIGS. 5 and 8. The opening at 45' is what produces the gap at the back of the pin grip, shown in dotted lines at 45 in FIG. 8.

The assembled relation of the described contacts with the insulation body of the pilot lamp socket is shown in FIGS. 18 and 19 of the drawing. The pin grip 30 and tangs 32 are received in the top portion 22 of the passage. The wire clamp 34 and auxiliary clamp 36 are received in the intermediate portion 24 of the passage which is smaller in cross section, thereby providing the ledge 26 against which the tangs 32 bear to prevent downward removal of the contact. The bottom portion 28 receives the stop tab 38 which prevents upward movement of the contact.

The wire and contact may be and preferably are preliminarily secured together in a suitable die, thus dispensing with the need for solder, although a soldered connection may be employed. The combination of contact and wire is assembled with the insulation body by simply pushing the contact upwardly through the passage from the bottom toward the top until the stop tab 38 arrests further movement, at which time the tangs 32 have already sprung outward to anchor the contact in position. For this purpose, the intermediate portion 24 of the passage has a section suitable to pass the pin grip 30 and the wire clamp 34 and the auxiliary clamp 36, and also to pass the tangs 32 when they are squeezed together, but the section at 24 is too small to receive the stop tab 38, and to receive the tangs 32 when they are spread apart. It will also be noted that the configuration of the tangs is such that a downward pull strengthens their hold, because it tends to further spread the tangs.

The same metal contacts may be used in a variety of insulation bodies, to form sockets usable for different purposes. Thus, referring to FIG. 1, I there show a socket 60 used for connection to a cathode ray tube, typically a small kinescope or TV picture tube. The small diameter glass end or neck of the tube is shown at 62. Pins project from the end of the tube, and these are disposed on a circle, which in one commercial size has a diameter of 0.60 inch. The insulation body 60 is cylindrical, as is best shown in FIGS. 1 and 2, and it has a circle of passages housing contacts arranged on a circle of like diameter, in order to mate with the pins of the tube. The said tube 62 also has a keyed center stud, and, as shown in FIG. 2, the insulation body has a mating cylindrical hole 64 with a groove or keyway 66 to properly orient the socket relative to the tube.

In the socket here shown it is preferred to prevent rotation of the contacts, and to orient them in a particular way. For this purpose, the top and bottom portions of the passage receiving the contact are preferably noncircular in section, but the intermediate portion may be circular. In FIG. 2, the intermediate portion is indicated at 68, while the top portion is indicated at 70. In FIG. 6, the intermediate portion is indicated at 68, and the bottom portion is indicated at 72. From inspection of FIG. 6, it will be understood that the stop tab of the contact must point radially inward toward the center of the socket. Thus, the flat back of each contact is disposed tangentially on the side of the passage nearest the center of the socket, as is shown by the contacts 74 and 76 in FIG. 2. The tangs then face outward, as shown at 32. By comparison of the outlines 68 and 70 of FIG. 2, it will be seen that the desired stop ledge 78 is disposed outward in suitable position to receive the tangs 32.

Differently expressed, it may be said that the axis of the top portion 70 is offset from the axis of the intermediate portion 68, and referring to FIG. 6, the bottom portion 72 is offset from the intermediate portion 68, the latter offset being in a direction opposite to the offset of the top portion, or being in such direction that the offset of the top portion accommodates the tangs. Considered more precisely, the top portion 70 (FIG. 2) is defined by two parallel flats 80 and 82, and two arcs 84 and 86 connecting the flats 80 and 82. The arcs 84 and 86 are on a common radius greater than that of the intermediate portion 68, and having a center which is offset in outward direction relative to the center of the intermediate portion 68.

The relation of the contact to the portions of the passage is also clear from FIGS. 3, 4 and 5 of the drawing. The pin grip 30 and tangs 32 are received in the upper portion 70; the wire clamp 34 and auxiliary clamp 36 are received in the intermediate portion 68; and the stop tab 38 is received in the bottom portion 72 of the passage. FIGS. 3 and 4 are somewhat misleading in that the enlargement of the top portion 70 relative to intermediate portion 68 is not shown. This is better brought out in FIG. 5, which is a section taken in tranverse direction, and shows how the tangs 32 bear against stop ledge 78 formed by the enlargement of top portion 70 relative to intermediate portion 68.

The specified orientation of the contacts is preferred because the pins of the picture tube may be bent slightly out of proper parallelism. It is found that in most cases the bend is inward rather than outward. Moreover, if seen to be bent outward, a service man will squeeze or bend the pins inward to correct the difficulty, and may bend them too far. When the pins are inserted in the socket, a bent pin, if bent toward the closed back 52, readily rides along the contact without difficulty, but if bent toward the split 48, may tend to bind. It is therefore found preferable to orient all of the contacts with their closed backs toward the center of the socket.

The application of the present push-in contact to a socket forming half of a multipin connector is shown in FIGS. 10 and 11 of the drawing. FIG. 10 is a plan view of the socket half of an 18-pin connector. The 18 pins are divided in groups of 10 and 8 as one method of insuring proper orientation of one part of the socket relative to the other. FIG. 11 shows a male part 90 which has pins 92 to which flexible insulated wires 94 are connected. The detailed construction of the pins is not shown, and they are assumed to be conventional. The socket part of the connector is shown at 96, and has insulated conductors 98 leading to metal contacts 100 which are the same as those already described. The insulation body of the connector is rectangular, and in the present case, all of the pins and contacts are disposed in one line, but it will be understood that connectors may be made with groups of lines arranged in any desired array, and affording connection of any desired number of conductors.

Referring now to FIGS. 12, 13 and 14, the insulation body 102 has elongated passages therethrough for housing the contacts. The passages here shown comprise a top portion 104 of suitable section to receive the pin grips and tangs, an intermediate portion 106 of lesser section suitable to pass the pin grip and wire clamp, and to pass the tangs when squeezed together. There is also a bottom portion 108 of suitable section to receive a stop tab of the contact.

The passage here is substantially the same as that described in connection with the lamp socket shown in FIGS. 18—23. It is a simplified form of passage in that

each of the three portions is cylindrical, and all portions are concentric. Such passages may be formed by simple drilling operations, but in practice the piece is preferably molded. The illustrated passage is inexpensive in that the mold is a simple one to make. The contacts are rotatable in the passages, but in some cases this is considered advantageous.

If the contacts are to be prevented from rotation, the passages may be made as shown in FIGS. 15, 16 and 17. In this case, the top portion **110** is cylindrical, and the intermediate portion **112** is cylindrical, but the axis of the top portion is offset from the axis of the intermediate portion, to the left as viewed in the drawing. The bottom portion has an offset **114** dimensioned to receive the stop tab, and with the contact here shown, the offset **114** is in a direction opposite to the offset of the top portion **110**.

This passage is somewhat like that shown in FIGS. 2—6, but is simpler in that the top portion is cylindrical instead of having the flats **80** and **82** shown in FIGS. 2—6. The rotation of the contact is prevented largely by the stop tab received at **114**, but also by the tangs.

It will be understood that the simplified passage shown in FIGS. 12—14 and 20—22 may be used in the socket of FIGS. 2—6; that the offset cylindrical passage of FIGS. 15—17 may be used in the socket of FIGS. 2—6, and also in the lamp socket of FIGS. 18—23; and that the non-cylindrical passage of FIGS. 2—6 may be used in either the multipin connector of FIGS. 10 and 11, or the lamp socket of FIGS. 18—23.

It will also be understood that while I have referred to the parts of the passage as "top," "intermediate" and "bottom," these terms are used in a relative sense, for in practice the socket may be disposed in any position. For example, the TV picture tube socket is ordinarily used with its axis horizontal, rather than vertical.

It will be understood that only a fragment of the insulated wires is shown in the drawings, and that in practice the wires extending downward at the bottom of FIG. 1, FIG. 11 and FIG. 23 may be of any desired length for the particular apparatus in which the socket is being used.

It is believed that the construction and method of use, as well as the advantages of my improved socket, and the push-in contact forming a primary part of the same, will be apparent from the foregoing detailed description. The wires are readily and economically secured to the contacts, because this sub-assembly operation is performed before the contacts are put into the socket. Machines have already been developed to mechanically clamp a contact to a wire so effectively that soldering is not needed. The assembly of the socket is then completed by simply pushing the contact into the insulation body. It is pushed until stopped by the stop tab, at which time the tangs have already expanded to holding position. The tangs may be made short and sturdy, yet yield adequately because of the divergent gap formed in the split sleeve immediately at the tangs. The pin grip is effective, and presents a funnel-shaped opening which readily receives the pins. The contact is adapted to be received in a number of kinds of passages, and may be mounted in such a way as to either prevent or to permit rotation, as desired. In all cases, the passage is readily molded because the portions of large cross section are at the top and bottom, while the intermediate portion is of smaller cross section, so that there are no undercuts, and the piece may be molded in a simple two-part mold.

It will be understood that while I have shown and described my invention in several forms, changes may be made without departing from the scope of the invention, as sought to be defined in the following claims.

I claim:

1. A socket comprising a molded insulation body, one or more metal contacts, a plurality of insulated wires leading from said contacts, each contact being a single piece of sheet metal formed into a pin grip, sloping tangs, a wire clamp spaced longitudinally from said pin grip by an amount substantially greater than the length of the tangs, and an auxiliary clamp, said pin grip being a resilient split tubular sleeve, said sleeve being split end-to-end on one side with the upper portion of the sleeve being split on the opposite side and being constricted in diameter between the top and bottom of said upper portion, said tangs depending from said pin grip and being disposed in the open space between the pin grip and the clamp, said tangs being located one at each side of the lower end of the end-to-end split and being resiliently compressible toward one another, said wire clamp being squeezed directly around a bared end of the insulated wire, said auxiliary clamp being squeezed around the insulation immediately adjacent the bared end, said insulation body having an elongated passage housing each of said contacts, said passage having end portions suitable to pass the wire clamp and auxiliary clamp, and an intermediate portion of lesser section suitable to pass the tangs when squeezed together, said lesser section being too small to pass the tangs when spread apart, and the arrangement being such that the socket may be assembled by simply passing a combined contact and wire through a passage until the tangs snap out over a ledge formed between an end portion and the intermediate portion of the passage because of the change of section.

2. A socket as defined in claim 1 in which the intermediate portion of the elongated passage housing the contact is cylindrical, and in which the axis of the top portion is offset from the axis of the intermediate portion, and in which the bottom portion has an offset for the stop tab, said offset being in such direction that the offset of the top portion receives the tangs of the contact.

3. A socket as defined in claim 1 in which the intermediate portion of the elongated passage housing the contact is cylindrical, and in which the top portion has a section defined by two parallel flats and two arcs connecting said flats, said arcs being on a radius greater than that of the intermediate portion, and having a center offset from the center of the intermediate portion, and in which the bottom portion has an offset for the stop tab, said offset being in such direction that the offset of the arcs of the top portion registers with the tangs of the contact.

4. A socket comprising a molded insulation body, one or more metal contacts, each contact being a single piece of sheet metal formed into a pin grip, tangs, a wire clamp spaced longitudinally from said pin grip by an amount substantially greater than the length of the tangs for connection to a wire, and a stop means, said pin grip being a resilient split tubular sleeve, said sleeve being split end-to-end on one side with the upper portion of the sleeve being split on the opposite side and being constricted in diameter between the top and bottom of said upper portion, the lower portion of said end-to-end split being a downwardly divergent wide gap at the lower end of said sleeve, said tangs sloping downwardly and outwardly from the lower end of said sleeve toward said wire clamp, said tangs being located one immediately at each side of the said gap and being resiliently compressible toward one another at said gap, said insulation body having an elongated passage housing each of said contacts, said passage having a top portion of suitable section to receive the pin grip and tangs, an intermediate portion of lesser section suitable to pass the pin grip and to pass the tangs when squeezed together, said lesser section being too small to receive the stop means and the tangs when spread apart, the arrangement being such that the socket may be assembled by simply pushing the contacts through the passages from the bottom to the top until the tangs spring out over the ledge between the top portion and the intermediate portion of the passage.

5. A socket comprising a molded insulation body, one or more metal contacts, a plurality of insulated wires leading from said contacts, each contact being a single piece of sheet metal formed into a pin grip, tangs, a wire clamp spaced longitudinally from said pin grip by an

amount substantially greater than the length of the tangs, an auxiliary clamp, and a stop tab, said pin grip being a resilient split tubular sleeve, said sleeve being split end-to-end on one side with the upper portion of the sleeve being split on the opposite side and being constricted in diameter between the top and bottom of said upper portion, said tangs sloping downwardly and outwardly from the lower end of said pin grip toward said wire clamp, said tangs being located one immediately at each side of the lower end of the end-to-end split and being resiliently compressible toward one another, said wire clamp being squeezed directly around a bared end of the insulated wire, said auxiliary clamp being squeezed around the insulation immediately below the bared end, and said stop tab being turned sidewardly at the bottom end of said contact, said insulation body having an elongated passage housing each of said contacts, said passage having a top portion of suitable section to receive the pin grip and tangs, an intermediate portion of lesser section suitable to pass the pin grip and to pass the tangs when squeezed together, said lesser section being too small to receive the

stop tab and the tangs when spread apart, and a bottom portion of suitable section to pass the contact including the stop tab, the arrangement being such that the socket may be assembled by simply pushing a combined contact and wire through a passage from the bottom toward the top until the tangs spring out over the ledge between the top portion and the intermediate portion of the passage.

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