

[72] Inventor **Albert P. De Vito**
Niles, Ill.
[21] Appl. No. **822,915**
[22] Filed **May 8, 1969**
[45] Patented **June 15, 1971**
[73] Assignee **Alcon Metal Products, Inc.**
Chicago, Ill.

3,077,523 2/1963 Clewes 339/51.12
3,230,497 1/1966 Greasley..... 339/176

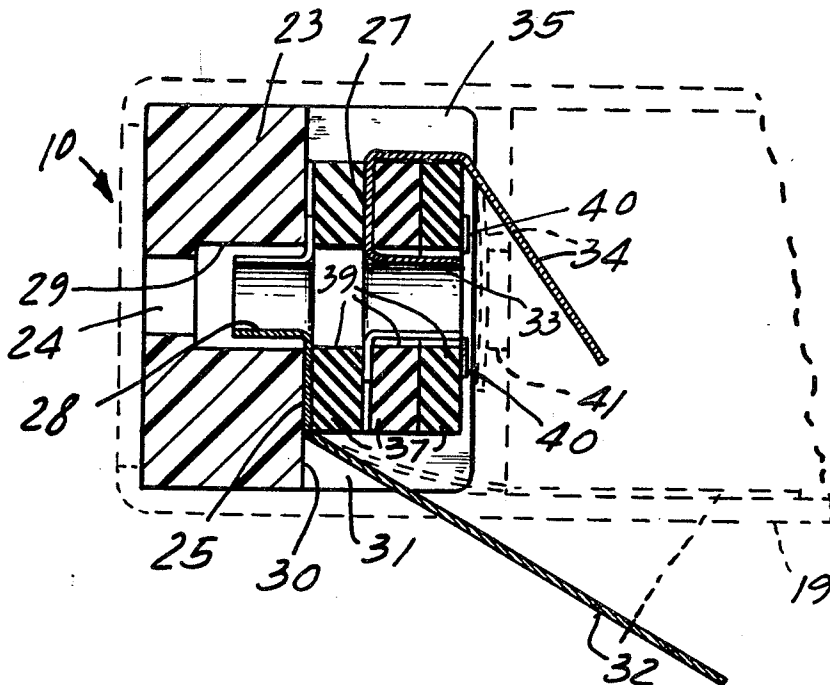
Primary Examiner—Marvin A. Champion
Assistant Examiner—Lawrence J. Staab
Attorney—Hill, Sherman, Meroni, Gross & Simpson

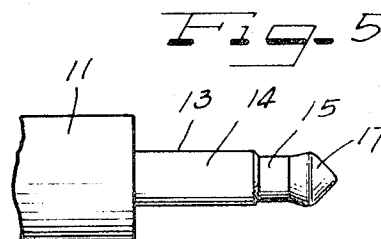
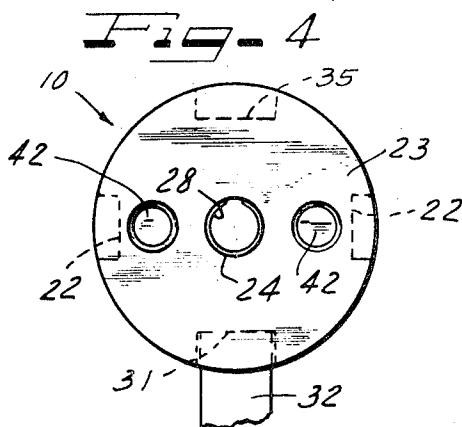
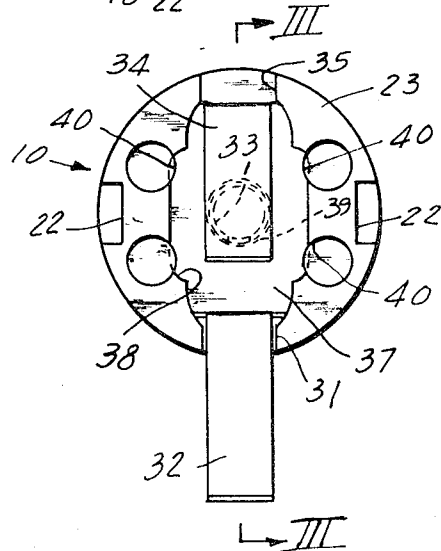
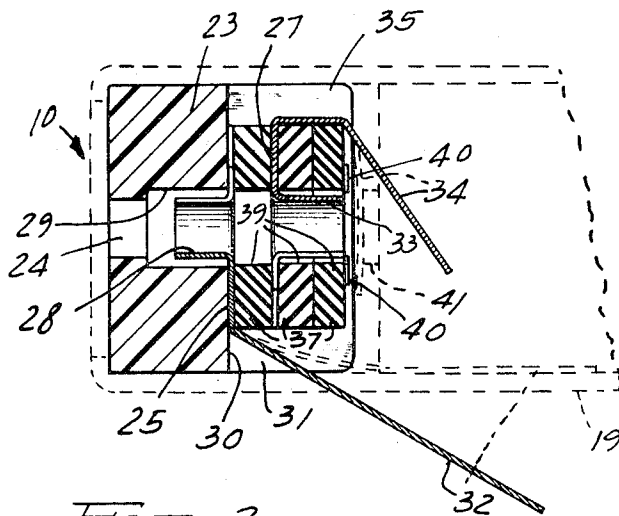
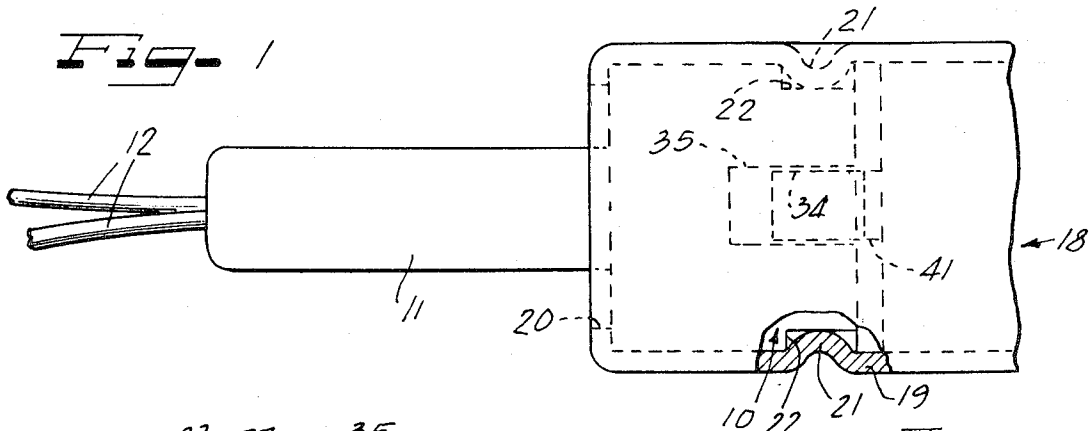
[54] **SINGLE PIN ELECTRICAL SOCKET**
13 Claims, 10 Drawing Figs.

[52] U.S. Cl..... 339/182,
339/210, 339/220
[51] Int. Cl..... H01r 17/18,
H01r 9/14
[50] Field of Search..... 339/182,
183, 206, 207, 210, 212, 217, 220, 218, 176 R,
176 M; 320/2, 3

[56] **References Cited**
UNITED STATES PATENTS
2,736,872 2/1956 Heath et al. 339/142

ABSTRACT: A single pin electrical socket has a dielectric socket body with a plug pin-receiving opening entering from one end of the body. A plurality of electrical contacts, each of which has a contact arm extending generally from the opposite end of the body and respective jack terminal pieces, is mounted on the body by dielectric isolating means which separate the contacts and support the jack terminal pieces thereof in spaced series alignment with the pin-receiving opening to respectively receive aligned terminal contacting portions of a single pin of an electrical plug inserted into the opening.





INVENTOR.

ALBERT P. DeVITO

Kill, Sherman, Meroni, Grass & Simpson

ATTORNEYS

BY

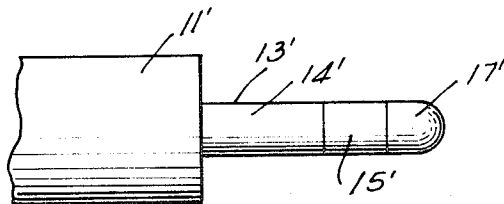
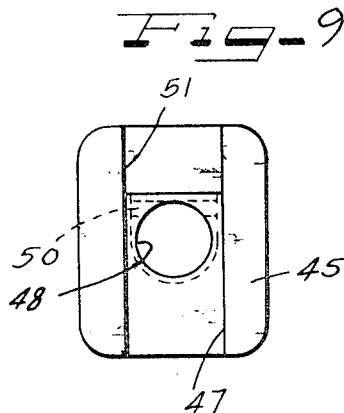
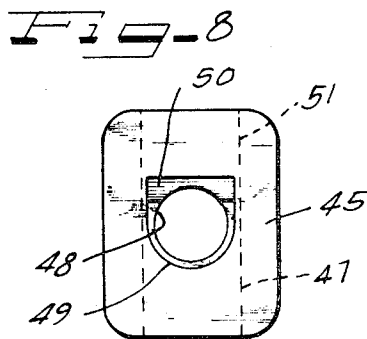
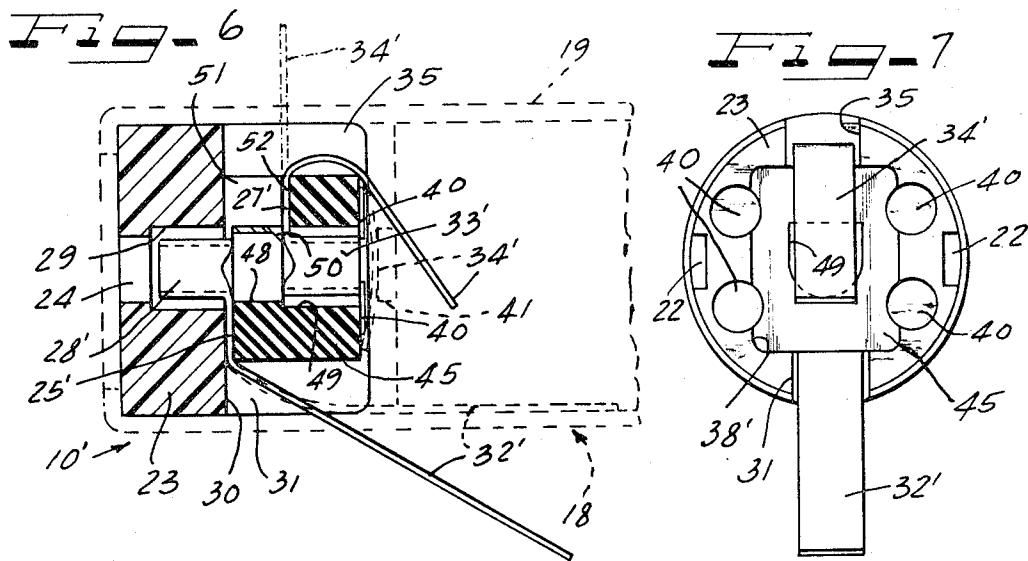


Fig-10

INVENTOR.
ALBERT P. DeVITO

BY *Hell, Sherman, Merani, Galt & Simpson* ATTORNEYS

SINGLE PIN ELECTRICAL SOCKET

This invention relates to a new and improved socket construction and is more particularly concerned with a single pin electrical socket.

Heretofore, relatively small size electrical sockets or jacks to receive connecting plug pins have been employed, for example, to connect small rodlike batteries into electrical communication circuits such as may be installed in helmets of police, construction workers, infantry, and the like, and in other modular applications including radio and TV aerial inputs, phone and earphone connections, etc. Generally these sockets have been provided with two or more electrical contact pin receptacles laterally spaced for receiving respective similarly spaced separate jack plug pins.

Several serious disadvantages of multiple pin plug and jack socket arrangements have been, for example, the necessity for some means such as respectively different diameter plugs for proper orientation to avoid shorting out the circuit, the difficulties encountered in effecting alignment of the plugs to make a connection, and the serious limitations upon miniaturization imposed by the necessary lateral spacing between the plug pins and the matching spacings of the terminal receptacles within the jack sockets.

According to the principles of the present invention, the foregoing and other disadvantages and deficiencies of prior devices and arrangements are successfully overcome by my new and improved single pin plug electrical jack socket in which a dielectric socket body has a single plug-receiving opening entering from one end of the body. A plurality of electrically conductive contacts is supported by the body, each of which has a contact arm extending generally from the opposite end of the body and respective jack terminal pieces separated by dielectric isolating means supporting the terminal pieces in spaced series axial alignment with the opening in the body to receive respective aligned terminal contacting portions of a single pin of an electrical plug inserted into the opening.

An important object of the present invention is to provide a new and improved multicontact single plug electrical jack socket.

Another object of the invention is to provide a new electrical jack socket of the character described having simple, economical, and highly efficiently related parts.

A further object of the invention is to provide a new and improved multicontact single plug electrical jack socket especially suitable for use in effecting electrical connections in miniaturized electrical circuitry.

Other objects, features and advantages of the invention will be readily apparent from the following description of certain preferred embodiments thereof, taken in conjunction with the accompanying drawings, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts of the disclosure, and in which:

FIG. 1 is a fragmentary side elevational view, partially broken away and in section, of a battery assembly employing a socket embodying features of the invention;

FIG. 2 is a rear end view of the socket;

FIG. 3 is a transverse longitudinal sectional detail view of the socket taken substantially on the line III-III of FIG. 2;

FIG. 4 is a front end view of the socket;

FIG. 5 is a fragmentary side elevational view of a single pin plug adapted for use with the socket;

FIG. 6 is a transverse longitudinal sectional detail view, similar to FIG. 3, but showing a modification;

FIG. 7 is a rear end view of the socket of FIG. 6;

FIG. 8 is a rear end view of the molded terminal mounting insert of the socket of FIGS. 6 and 7;

FIG. 9 is a front end view of the molded contact mounting insert; and

FIG. 10 is a fragmentary side elevational view of a modified single pin plug adapted for use with the sockets of the present invention.

A socket 10 according to the invention is constructed and arranged to effect an electrical connection with a single pin plug 11. Such a plug may consist of a dielectric body adapted to receive through one end thereof insulated electrical leads 12 (FIG. 1) and projecting from the opposite end thereof a single electrical pin 13 having a first terminal portion 14 which is located nearest the plug body and has one of the leads 12 electrically permanently connected therewith. Insulated by dielectric piece 15 from the terminal portion 14 but coaxially aligned therewith and in fixed relation thereto is a tip terminal portion 17 which is permanently electrically connected with the other of the electrical leads 12.

By way of example, the socket 10 is shown as assembled with a rodlike dry battery 18 such as may have a metallic case 19 within one end portion of which the socket 10 is secured as by means of a turned over retaining flange 20 on the case engaging an outer end of the socket body, and retaining dimples 21 pressed into the case lockingly engaging in respective recesses 22 in the inner end portion of the perimeter of the socket body. Although the parts are shown in relatively large size in the drawing in order to facilitate illustration, in a practical actual size, the battery case 19 may be of about nine-sixteenths inch outside diameter, the socket 10 may have a body 23 of about one-half inch diameter and slightly shorter in length than its diameter, and the plug pin 13 may be about one-tenth of an inch in diameter in at least its portion 14 while the plug body may be about one-fourth of an inch in diameter.

In a desirable construction, the socket body 23 is constructed as a rigid dielectric casting of bakelite or the like and is provided with a single coaxial plug pin receiving opening 24 through its front end against which the shoulder of the plug 11 is adapted to engage when the pin 13 is fully inserted through the opening 24 into the body 23 which is hollow inwardly from the opening.

Mounted on the body 23 in a manner to be electrically engaged by respectively the pin portion 14 and the pin portion 17 are two electrical contacts 25 and 27. For engagement by and with the pin portion 14, the terminal 25 has a terminal piece 28 which is preferably in the form of a longitudinally split tubular ferrule of a normal inside diameter slightly less than the diameter of the pin portion 14 and projecting forwardly within the socket body in a counterbore clearance enlargement 29 therein coaxially with the entrance portion of the pin opening 24. In a preferred construction, the contact 25 is made as a sheet metal stamping with a flat body received against a rearwardly facing shoulder 30 on the socket body 23 and the terminal piece 28 is formed up integrally with the body of the contact. Extending outwardly and generally rearwardly from the body through a radial slot 31 in the rear end portion thereof is a resilient contact arm 32 of the contact 25.

Construction of the contact 27 is much the same as that of the contact 25 with such modifications as will adapt it for its function in the assembly. To this end, the contact 27 is also desirably constructed as a sheet metal stamping with a flat body which in the assembly is in spaced parallel relation to the body of the contact 25 and has a longitudinally split tubular ferrule terminal piece 33 which extends rearwardly in coaxial alignment with the opening 24 and the terminal piece 28 and is of a normally slightly smaller inside diameter than the terminal portion 17 of the plug pin. Extending generally rearwardly from the body of the terminal 27 is a resiliently flexible contact arm 34 to accommodate which the socket body 23 has a clearance slot 35 in its rear end portion on the diametrically opposite side from the slot 31. In a simple, inexpensive and efficient construction for maintaining the contacts 25 and 27 separated, mounting them in the body 23 and supporting the terminal pieces in spaced series alignment with the opening 24 to receive the respective, aligned terminal portions of the plug pin, a stack of substantially identical dielectric plates 37 may be employed which may be constructed as stampings from a suitable dielectric sheet material such as reinforced bakelite. To receive the discs, the plug body 23 has a rearwardly opening recess 38 which has contours complementary to the edge configuration of the mounting discs 37 to receive them

reasonably snugly. As best seen in FIG. 3, one of the discs 37 is interposed between the flat body portions of the contacts 25 and 27, and two of the discs 37 are stacked against the body of the contact 27. Passage between the terminal pieces 28 and 33 and clearance for the terminal piece 33 are provided by aligned clearance holes 39 through the discs 37. After the assembly of contacts and discs has been inserted into the recess 38, the discs are permanently locked in place, as by upsetting of interlocks 40 (FIG. 2) on the rear end portion of the body 23 onto the outer face of the endmost of the discs 37.

For use of the socket 10 in the battery 18, the contact arm 32 initially preferably extends obliquely laterally and rearwardly through and from the slot 31, while the contact arm 34 extends rearwardly through the slot 35 spaced substantially inwardly from the perimeter of the body 23 and then diagonally rearwardly and generally across the axis of the socket. Then in the assembly within the casing 19 of the battery, the contact arm 32 is deflected resiliently toward the axis of the socket and makes firm electrical contact with the battery casing 19, as best visualized in the broken outline relationship shown in FIG. 3. At the same time, the contact arm 34 is deflected axially toward the back of the socket and makes contact with a central pole 41 of the battery and makes firm electrical contact therewith. To facilitate assembly, a pair of shallow orientation recesses 42 may be provided in the front face of the socket body 23 spaced from the pin receiving opening 24.

By having a single plug pin receiving construction, ease of effecting a connection between the battery 18 and the plug 11 is greatly enhanced because all that need be effected is alignment of the plug pin 13 with the opening 24 and then an axial assembly maneuver which carries the pin terminal 17 through the terminal piece 28 and then on into the terminal piece 33 while the pin portion 14 makes contact with the terminal piece 28. Separation of the contacts is related to the separation of the pin portions 14 and 17 by the dielectric separator 15 so as to assure complete passage of the tip pin terminal portion 17 through and beyond the terminal piece 28 before the terminal portion 17 makes electrical contact with the terminal piece 33, irrespective of any canted approach during the assembly or jacking in of the pin 13. Thereby any possibility of shorting the circuit is precluded.

A somewhat simplified socket 10' is shown in FIG. 6, illustratively adapted for use with the rodlike dry battery 18. Insofar as the socket body 23 of the socket 10' is concerned, it may be substantially identical with the body of the socket 10 and therefore identical reference numerals identify identical parts of the body. In addition, the electrical contacts mounted on the body 23 of the socket assembly 10' are similar to and similarly oriented as the contacts 25 and 27 of the socket 10, and are therefore identified by the same but primed reference numerals thus, the contact 25' has its tubular terminal, receptacle piece 28' extending forwardly and aligned with the opening 24 within the counterbore clearance enlargement 29 and with its flat sheet metal body received against the rearwardly facing shoulder 30 of the socket body, with the resilient contact arm 32' extending outwardly and generally rearwardly from the body through the radial slot 31.

In the socket 10', instead of a stack of dielectric plates for maintaining the contacts 27' and 28' separated, mounted in the body 23 and supporting the terminal pieces in spaced series alignment with the opening 24, a one-piece molded dielectric insert 45 is provided constructed to fit neatly in the recess 38' which is similar to the recess 38 in the socket body 23 of the socket 10, but is desirably of substantially rectangular outline as viewed in the rear end elevation as seen in FIG. 7, with filleted longitudinal corners, and with the insert 45 of complementary shape and of a length to engage the shoulder 30 at its forward or inner end and lie slightly inset from the plane of the rear end face of the body 23 so as to receive the upset interlocks 40 by which the insert is permanently locked in place in the recess 38'.

To accommodate the thickness of the body of the terminal 25', the inner end face of the insert 45 has a shallow groove 47

aligned with the body slot 31 and extending from a clearance hole 39 aligned with the opening 24 and the terminal receptacle 28' to enable passage of a plug pin therethrough to the rearwardly extending tubular receptacle piece 33' of the contact 27' supported in a slightly enlarged rearward extension 49 of the clearance hole 48.

To enable assembly of the contact 27' with the mounting insert 45, a clearance passage 50 is provided from the bore portion 49 into a recess 51 in and opening from the inner end and side of the insert in alignment with the clearance slot 35 of the socket body and which is opposite to that from which the contact 32' extends. A forwardly facing base shoulder 52 of the recess 51 receives the intermediate body portion of the contact 27' in retaining engagement in assembly thereagainst. To effect assembly, the contact leg 34', while in a generally straightened condition as shown in dot-dash outline in FIG. 6, is inserted through the clearance opening or slot 50 and the contact member 27' then canted into assembled position with the intermediate body portion of the contact then resting against the shoulder 52. Thereafter the leg 34' is bent around the adjacent side of the insert 45 rearwardly, in this instance, to, in effect, clench it onto the gripped portion of the insert 45, with a substantial length of the leg 34' extending rearwardly and laterally as shown in full outline. Through this arrangement, upon assembling the socket unit 10' with the battery 18, the contact leg 34' will be in position to be compressed by the battery pole 41 in firm electrical contact, as shown in dash outline. In such assembly with the battery, the contact leg 32' is placed in electrical contact with the casing 19, as shown in dash outline.

A modified single pin jack plug 11' as shown in FIG. 10 may be employed to effect electrical connection with the socket 10 or the socket 10', similarly as the jack plug 11, but differs therefrom in that the single electrical pin 13' has all of the portions thereof in cylindrical alignment, thus providing a more simple and less expensive construction. Thus, the first terminal portion 14', the dielectric insulating piece 15' and the tip terminal portion 17' are in cylindrical alignment, with the tip of the portion 17' of semispherical form. In this instance, the dielectric portion 15' is lengthened as compared to the dielectric portion 15 of the jack plug shown in FIG. 5 whereby to assure freedom from any shorting contact of the electrical contact portions 14' and 17' during assembly or removal of the plug pin with respect to the electrical jack socket.

Although in both of the forms of the single pin electrical socket disclosed herein by way of example only two aligned separated contacts are employed, it is to be understood that any desired plurality of aligned, separated contacts in excess of two may be used where required in a jack arrangement. For example, in a three contact arrangement, two of the contacts 25, 25' may be mounted serially one after the other from front to rear, and with one of the contacts 27, 27' at the rear end of the series. This can readily be effected by duplicating either the stacked dielectric plate arrangement of FIGS. 2 and 3 or the cast insert arrangement of FIGS. 6-9. In such an arrangement, the socket body 23 will be elongated such that the recess 38, 38' will be sufficiently longer to receive the serially arranged dielectric inserts, whether the stack of plates 37 of the molded insert 45, the forwardmost contact 25, 25' will be in the same general orientation shown in FIGS. 3 and 6, the second such contact will be in engagement with the shoulder provided by the rear end of the forwardmost dielectric insert, with its contact ferrule 28, 28' extended forwardly into the clearance hole 39 or 49, as the case may be, and with the contact 27, 27' arranged in the same orientation as depicted in respectively FIGS. 3 and 6 in the rearmost of the dielectric inserts. It will thus be apparent that as many serially arranged contacts as desired may be provided in the socket by the simple modular buildup arrangement described.

It may also be noted that although battery socket utility has been exemplified, the socket is readily adapted for other specific applications such as aerial or tape input jacks, phone jacks, earphone jacks, and the like. Also, if desired, the socket

body 23 may be provided with suitable means for mounting it on an instrument panel or chassis.

I claim as my invention:

1. A single pin electrical socket of the character described, comprising:
 - a socket body having a pin-receiving opening entering from one end of the body;
 - a plurality of electrical contacts each of which has a contact arm extending from the body and a respective terminal piece; and
 - dielectric isolating means separating said contacts, mounting the contacts on said body, and supporting said terminal pieces in spaced series alignment with said opening to respectively receive aligned terminal portions of a single pin of an electrical plug inserted into said opening, the terminal piece of at least one of said contacts being near said one end of said body and projecting toward said one end, and the terminal piece of another of said contacts projecting toward the opposite end of the body.
2. An electrical socket according to claim 1, said contacts being sheet metal members, and said terminal pieces being integral split ferrulelike elements on said contacts.
3. An electrical socket according to claim 2, said contacts having flat body portions from which said terminal pieces project, and said isolating means comprising a dielectric element between said body portions and having a clearance hole therethrough aligned with said opening and said terminal pieces.
4. A single pin electrical socket of the character described, comprising:
 - a socket body having a pin-receiving opening entering from one end of the body;
 - a plurality of electrical contacts each of which has a contact arm extending from the body and a respective terminal piece;
 - dielectric isolating means separating said contacts, mounting the contacts on said body, and supporting said terminal pieces in spaced series alignment with said opening to respectively receive aligned terminal portions of a single pin of an electrical plug inserted into said opening, said contacts having flat bodies;
 - and said isolating means comprising stacked dielectric plates,
 - said body having a recess therein opening from the opposite end of the body and within which recess said plates and said contacts are mounted.
5. An electrical socket according to claim 4, said body having a shoulder at an inner end of said recess, one of said contacts having a portion thereof resting against said shoulder.
6. An electrical socket according to claim 5, one of said plates being interposed between said contacts, and a plurality of additional of the plates being disposed in laminar relation between the contact remote from said shoulder and said opposite end of the body.
7. An electrical socket according to claim 6, said opposite end of said body having means thereon securing said stacked plates and thereby said contacts within said recess.
8. A single pin electrical socket of the character described, comprising:
 - a socket body having a pin-receiving opening entering from one end of the body;
 - a plurality of electrical contacts each of which has a contact arm extending from the body and a respective terminal

- piece;
- said body being of cylindrical shape, having diametrically opposite slots therein providing clearance for said contact arms;
- said body having a pair of respective lock-in recesses in its perimeter and opening through the opposite end of the body at diametrically opposite sides and spaced from said slots for receiving lock-in elements of a tubular battery case within which the socket may be mounted;
- and a pair of shallow orientation recesses in said one end of the body spaced from and at respective opposite sides of said opening and generally aligned with said lock-in recesses.
9. A single pin electrical socket of the character described, comprising:
 - a socket body having a pin-receiving opening entering from one end of the body;
 - a plurality of electrical contacts each of which has a contact arm extending from the body and a respective terminal piece; and
 - dielectric isolating means separating said contacts, mounting the contacts on said body, and supporting said terminal pieces in spaced series alignment with said opening to respectively receive aligned terminal portions of a single pin of an electrical plug inserted into said opening,
 - said isolating means comprising a molded insert, said body having a recess therein opening from the opposite end of the body and within which recess said insert and said contacts are mounted.
10. An electrical socket according to claim 9, said body having a shoulder at an inner end of said recess, one of said contacts having a portion thereof resting against said shoulder, and said insert clamping said portion against said shoulder.
11. An electrical socket according to claim 10, said insert having an opening therein, and another of said contacts being mounted in said opening.
12. An electrical socket according to claim 11, said opposite end of said body having means thereon securing said insert within said recess.
13. A single pin electrical socket of the character described, comprising:
 - a socket body having a pin-receiving opening entering from one end of the body;
 - a plurality of electrical contacts each of which has a contact arm extending from the body and a respective terminal piece;
 - dielectric isolating means separating said contacts, mounting the contacts on said body, and supporting said terminal pieces in spaced series alignment with said opening to respectively receive aligned terminal portions of a single pin of an electrical plug inserted into said opening,
 - said isolating means comprising a one-piece molded insert;
 - said body having a recess therein receptive of said insert;
 - said recess having a shoulder therein adjacent to one of said contacts which engages said shoulder and is secured thereagainst by said insert;
 - said insert having a clearance opening therethrough aligned with said opening entering from one end of the body and within which another of said contacts is mounted;
 - and there being a lateral passage from said clearance opening through which a portion of said another contact extends outwardly relative to said insert.