June 25, 1940. H. H. EBY 2,205,878

ELECTRICAL SOCKET

Filed April 17, 1937

Fig. 1.

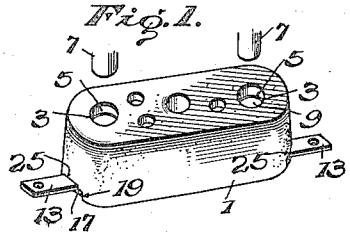


Fig. 2.

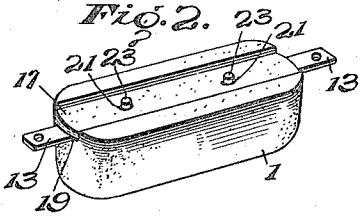


Fig. 5.

Fig. 3.

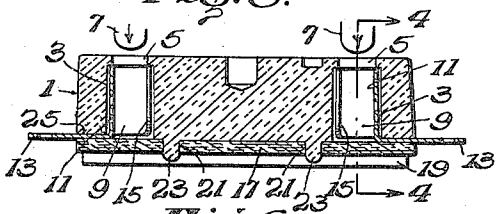


Fig. 4.

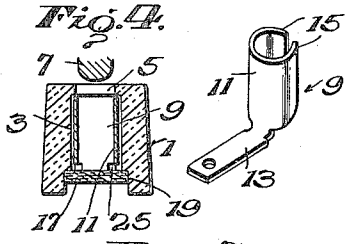


Fig. 6.

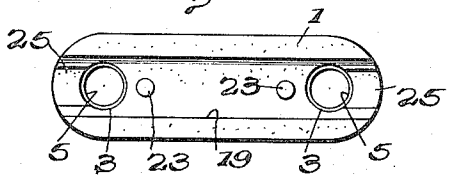


Fig. 7.

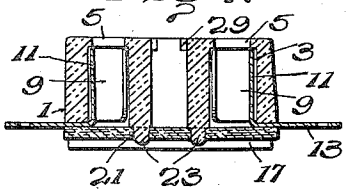


Fig. 8.

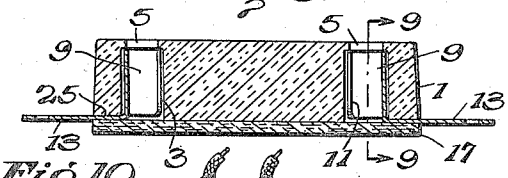


Fig. 9.

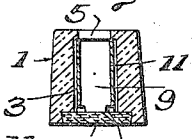


Fig. 10.

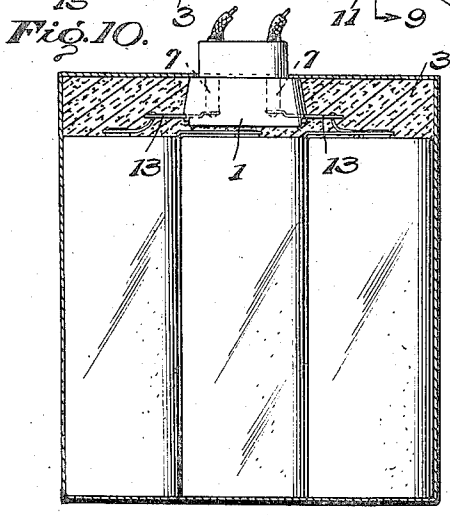


Fig. 11.

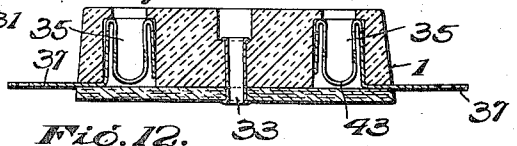


Fig. 12.

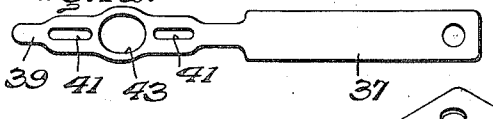
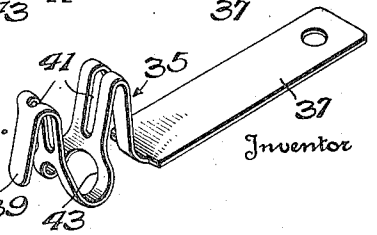


Fig. 13.



Inventor

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By T. R. Goldsborough Attorney

Patented June 25, 1940

2,205,878

UNITED STATES PATENT OFFICE

2,205,878

ELECTRICAL SOCKET

Hugh H. Eby, Philadelphia, Pa., assignor to Hugh H. Eby, Inc., a corporation of Pennsylvania

Application April 17, 1937, Serial No. 137,561

3 Claims. (Cl. 173—332)

My invention relates to electrical sockets and more particularly to sockets of the type applied to dry cell batteries such as are used as a source of current for hearing-aid devices.

A socket of the type to which my invention pertains must be capable of establishing good electrical connection to the prongs of a plug, from which conductors lead to a microphone, and it must also firmly hold the prongs in place even though the person wearing the hearing-aid device indulges in more or less violent movement.

Previous to my invention, dry batteries for hearing-aid devices have been supplied with sockets including non-resilient female contact devices turned from solid stock. Such contact devices are customarily pressed into cavities in a molded insulator and very often are displaced when a plug is inserted or removed. In addition, they are costly to manufacture and require the use of a split prong or of a prong having an auxiliary spring to give the necessary frictional contact and binding action. Obviously such prongs are also expensive.

It is, accordingly, an object of my invention to provide a socket, of the type referred to, that shall be relatively simple in construction and much less expensive to manufacture than sockets heretofore known.

Another object of my invention is to provide a socket that shall not necessitate the use of split prongs or the like.

Another object of my invention is to provide a socket that shall enable the establishment of good electrical contact with the prongs of a plug-in device and shall hold such prongs firmly in place.

Another object of my invention is to provide an improved contact element suitable for use in my new socket.

A still further object of my invention is to provide a socket having such exterior configuration that, when applied to a dry battery or a group of dry batteries of the type used in connection with hearing-aid devices, the battery sealing compound will function to hold it firmly in position.

The foregoing objects and other objects ancillary thereto I prefer to accomplish by providing a socket wherein the prong receiving contact elements are resilient and have such configuration as to establish one or more longitudinal lines of contact with the prongs of a plug when inserted. More specifically, in accordance with my invention, I dispose the resilient contact elements in wells formed in a molded base member, the wells being provided with an interior shoulder adjacent the top surface of the base member for the purpose of preventing the contact members from being pulled out when a plug is removed therefrom.

For the purpose of temporarily holding the contact members in place in the wells, I provide a bottom cover plate that may either be dovetailed into a longitudinal channel formed in the bottom surface of the base member or held in place by means of a rivet extending through the base member and the cover plate. Alternatively, I may provide a plurality of small holes in the cover plate that fit tightly over projections extending downwardly from the base member.

The base member referred to I prefer to mold from Bakelite or the like, although it may be made from any one of the ceramic insulating materials or from any other material having reasonably high resistivity.

The contact element I prefer to utilize has a cross sectional contour somewhat analogous to that of the contact element disclosed in the Draving Reissue Patent 20,162, but it is, of course, to be understood that I may utilize any other resilient contact element that is capable of firmly gripping a prong and of establishing good electrical contact therewith.

The novel features that I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of certain specific embodiments when read in connection with the accompanying drawing, in which:

Fig. 1 is a top view in perspective of an embodiment of my invention.

Fig. 2 is a bottom view in perspective of the device illustrated in Fig. 1.

Fig. 3 is a vertical cross sectional view of a preferred embodiment of my invention.

Fig. 4 is a vertical cross sectional view of an end of the device shown in Fig. 3, taken along a line corresponding to the line 4—4, and looking in the direction of the arrows.

Fig. 5 is a view in perspective of my preferred contact device.

Fig. 6 is a bottom plan view of the device shown in Fig. 3, the contact elements and the cover plate being omitted.

Fig. 7 is a view in vertical cross section of an alternative embodiment of my invention.

Fig. 8 is a view in vertical cross section of a still further modification of my invention.

Fig. 9 is a view in vertical cross section of an

end of the device shown in Fig. 8, taken along a line corresponding to the line 9—9 and looking in the direcion of the arrows.

Fig. 10 is a view, partly in cross section, exemplifying the application of my improved socket to a dry cell assembly.

Fig. 11 is a view in vertical cross section of a still further modification of my invention.

Fig. 12 is a plan view of a blank before it is formed into a contact element of the type shown in Fig. 11.

Fig. 13 is a perspective view of the contact element shown in Fig. 11 before insertion into a well in a base member.

In all the figures of the drawing, identical parts are similarly designated. It is also to be clearly understood that the drawing is not to scale.

Referring now to Figs. 1, 2, 3, 4 and 6 of the drawing, a socket constructed according to my invention comprises a base element or block 1 of insulating material shaped somewhat like a parallelopiped although the ends are rounded and both the ends and sides slope slightly inwardly toward the top. The purpose of the slope will be explained later.

Extending entirely through the block of insulating material is a plurality of openings 3 each of which is provided with an interior annular shoulder 5 closely adjacent to the top surface of the block. The diameter of each opening in the upper surface of the block is substantially the same as the diameter of a prong 7 with which the socket is to be associated.

A resilient contact element 9 is disposed within each of the openings of the block. The contact element, per se, is preferably of the type exemplified by Fig. 5 of the drawing. It comprises a semi-cylindrical portion 11, from one end of which laterally extends an integral soldering tail 13.

Although I refer to the contact element as having a semi-cylindrical portion, it is not truly circular. Instead, it might be said to have a cross section somewhat analogous to the shape of a horseshoe whereby, when a prong is inserted into it, the axially extending edges 15 bite into the prong, thus establishing good electrical contact.

The upper end of the semi-cylindrical portion of each contact element rests against the interior shoulder 5 in the opening in which it is disposed, thereby preventing it from being withdrawn when the prong of a plug is withdrawn. The diameter of the opening below the shoulder is slightly greater than that of the semi-cylindrical portion of the contact element.

In order to temporarily retain the contact elements in their respective openings, a bottom cover plate 17 is provided. This cover plate fits tightly into a longitudinally extending channel 19 formed in the bottom surface of the block of insulating material.

The bottom plate may be provided with a plurality of small openings 21 through each of which a pin 23 carried by the block extends and fits tightly. As exemplified by Fig. 2 of the drawing, the pins 23 may be metallic and they may be molded into the block of insulating material or, as exemplified by Fig. 3 of the drawing, they may be protuberances integral with the block itself.

For the purpose of accommodating the angularly extending soldering tails 13, the extreme ends of the bottom of the block are each provided with a minor channel 25 communicating with the opening in which the semi-cylindrical portion of the contact element is disposed. The minor channels also serve the purpose of preventing the contact elements from rotating.

As exemplified by Fig. 1, the upper surface of the block of insulating material may be provided with means to indicate the polarity of the plug. Such means may take the form of a plurality of small depressions in the upper surface of the block, which depressions may be filled with white paint or the equivalent in order to improve their visibility.

As shown in Fig. 7, the block of insulating material may also be provided with an additional shouldered opening 29 intermediate the two main openings for the purpose of accommodating another contact element. Obviously, a third minor channel may be formed in the base of the block shown in Fig. 7, extending laterally, for the purpose of accommodating the soldering tail of the third contact element if one is utilized. The last mentioned minor channel is not illustrated in the drawing.

It is also possible to dovetail the bottom cover plate 7 into the bottom of the block of insulating material, as clearly exemplified by Figs. 8 and 9 of the drawing.

The bottom cover plate is utilized for the purpose of retaining the contact elements temporarily in place. After the socket has been connected to the terminals of a group of dry cells, as exemplified by Fig. 10 of the drawing, the sealing compound 31, flowing around it, serves to retain the cover plate firmly in position, and the sloping sides and ends of the socket prevent it from being displaced.

In Fig. 11 of the drawing are exemplified two modifications of my invention, namely, the holding of the cover plate in place by means of a central rivet 33 and a contact element 35 having a somewhat different configuration.

The alternative contact element, per se, is exemplified by Figs. 12 and 13 of the drawing. In manufacturing the element, a thin strip of conductive material is fed into a stamping machine by means of which blanks, having a configuration exemplified by Fig. 12, are cut. From an inspection of the drawing it will be noted that one end 37 of the blank is rectangular and that the other end has a tail 39 of reduced width and is provided with an elliptical opening 41 at each side of which there is a longitudinally extending slot 43.

After the stamping operation, the end of the blank provided with the openings is subjected to a forming operation which gives it a shape somewhat analogous to a capital M.

The opening through the block of insulating material has a diameter somewhat less than the greatest width of the M-shape end. When, therefore, the said end is forced upwardly into an opening, the slotted portions are resiliently urged toward each other, the distance between them becoming and remaining slightly less than the diameter of a prong with which the device is to be used. When, therefore, a prong is inserted into the socket shown in Fig. 11, the edges of the slots bite into it and make good electrical contact. The elliptical opening 41 is for the purpose of permitting the use of prongs of varying length; it is not an essential part of the contact element.

It will be apparent from the foregoing description of my invention that it offers many advantages not heretofore attained. The block of

insulating material may be very inexpensively molded, the contact elements per se cost very little, and, although simple in design, they hold the prongs of a plug very firmly against accidental withdrawal. The sloping sides of the block are also advantageous, in that they permit the molding compound to anchor the socket firmly in place and prevent it from being dislodged in use.

Although I have illustrated and described a number of alternative forms of my invention, many modifications will be obvious to those skilled in the art. My invention, therefore, is not to be restricted, except as necessitated by prior art and by the spirit of the appended claims.

I claim as my invention:

1. In combination, a block of insulating material having an upper and a lower surface, each having parallel side edges and being of different projected areas, said block having a pair of parallel openings extending from one surface to the other, said lower surface having three surface levels comprising the lowermost level comprised of spaced parallel side portions defining the side walls of a longitudinal channel the surface of which parallel to the upper surface is the second level and extends as a slotted channel the full length of the block, and the third level is that of a pair of sub-channels extending in the floor of the slotted channel betwen the respective holes and the ends of the block, said openings each having an internal shoulder close to the upper side of the block, contact members each comprising a contact making portion and a substantially normally extending substantially planar soldering tail, said members mounted on the block with the contact making portions in position to engage said shoulder under withdrawing tension of a prong in the respective openings, and with the respective soldering tails in the sub channels and projecting beyond the end of the block, a cover plate mounted in the first mentioned channel and overlying the soldering tails to close the lower entrance into the openings along said tails.

2. In combination, a block of insulating material having an upper face and a larger lower face, the last mentioned face comprised of a longitudinal channel extending the full length of the block from one end to the other, a sub channel narrower than the first mentioned channel formed in the surface of said first mentioned channel and extending from the respective ends inwardly a short distance, said block having openings passing completely through the block from the upper surface to communication with the respective sub channels, a sheet of material of substantially the same dimensions as said first mentioned channel engaged frictionally within the channel to form lateral recesses extending from the ends of the block into the respective openings through the block, a pair of contact devices having contact making portions disposed in the respective openings through the block and having angularly divergent soldering tails disposed in the respective recesses and projecting longitudinally beyond the ends of the block, the whole so arranged that the assembly is substantially closed on the bottom and sides of the block.

3. In combination, a block of insulating material having an upper face and a larger lower face, the last mentioned face comprised of a longitudinal channel extending the full length of the block from one end to the other, a sub channel narrower than the first mentioned channel formed in the surface of said first mentioned channel and extending from the respective ends inwardly a short distance, said block having openings passing completely through the block from the upper surface to communication with the respective sub channels, a sheet of material of substantially the same dimensions as said first mentioned channel engaged frictionally within the channel to form lateral recesses extending from the ends of the block into the respective openings through the block, a pair of contact devices having contact making portions disposed in the respective openings through the block and having angularly divergent soldering tails disposed in the respective recesses and projecting longitudinally beyond the ends of the block, said openings through the block each having an internal shoulder to limit the outward movement of the contact making portion of the contact.

HUGH H. EBY.