Jan. 9, 1951 A. D. PARNES 2,537,370

MALE SAFETY PLUG MEMBER

Filed Oct. 12, 1948

Fig. 1.

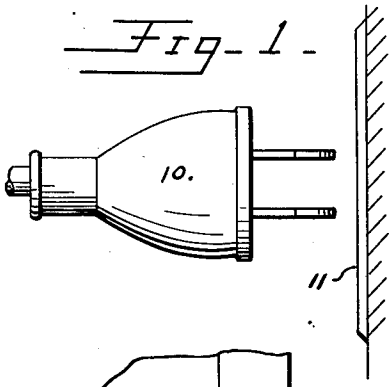


Fig. 2.

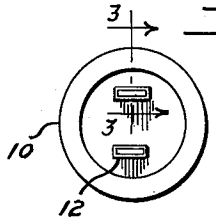


Fig. 8.



Fig. 9.

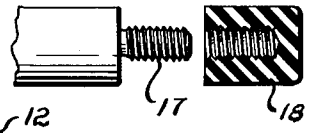


Fig. 3.

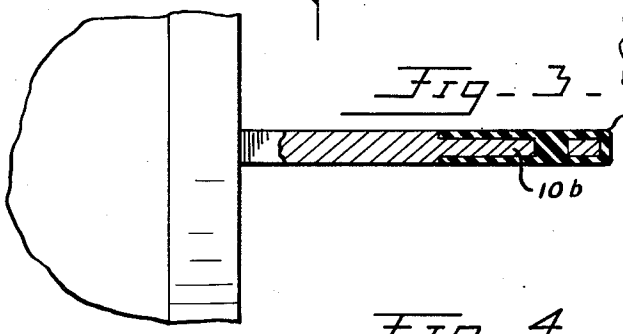


Fig. 4.

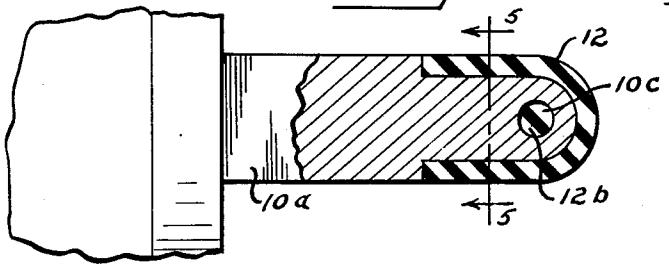
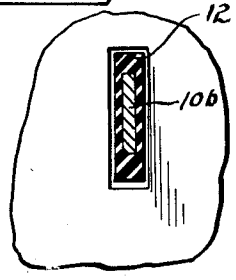


Fig. 5.



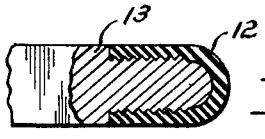


Fig. 6.

Fig. 10.



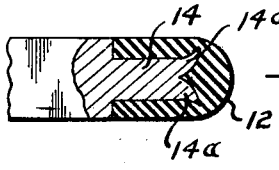


Fig. 7.

Inventor

ABRAHAM D. PARNES

By Frank C. Maley

AGENT

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MALE SAFETY PLUG MEMBER

Abraham D. Parnes, Perth Amboy, N. J.

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2 Claims. (Cl. 173—361)

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This invention relates to improvements in electric plug and socket assemblages, and has particular relation to the construction of a male safety plug member.

Commercial assemblages of this type generally have the plug member formed with a pair of spaced apart prongs individually mounted on an insulating base portion fashioned to permit the end of the two circuit wires to be introduced thereinto and have the ends connected respectively to the prongs. The bases of the latter are relatively insulated from each other with the prongs spaced apart and projecting in parallelism and designed to be inserted into similarly spaced slots of the socket member of the assemblage.

Under normal and intended operation conditions, the ends of the prongs are introduced into the open ends of the slots and the plug then advanced to carry the prongs completely within the slots, thus reaching the remotely-positioned contacts of the socket, thereby completing the connections. However, there are occasions where such normal operation is somewhat difficult, and the present invention is designed more particularly to meet such conditions. The conditions are due generally to the fact that the connection must be capable of carrying the current without losses, and for this reason the prongs and contacts must be formed of a metal of good conducting type, and the need for mounting them on the insulating base and in insulating relation to each other, makes it possible for connections, such as screws, for instance, to work loose. The metal used for the prongs, generally brass or the like, is somewhat vulnerable to bending stresses, so that the distance between the ends of the prongs may become varied from the width needed for ready entrance of such ends into the socket slit ends. The distance may be increased or decreased by such bending, with the result that the prongs will not properly enter. A similar effect is set up should the mounting connections to the prong base become loose through disturbing the desired firm connection between the prong base and the insulated base of the plug, in which case the prongs may tend to wobble relative to each other and thus disturb the distance factor in the spacing of the prong ends to render their insertion into the socket ends more or less difficult.

Obviously, any distance variations of the prong ends, due to either cause, must be corrected, if proper entry of the prongs into the socket slots is to be had, especially since the prongs and slots have a somewhat close working fit to assure that the contact between the prongs and socket contacts may be firm and without spacing such as would permit arcing between them.

The more careless operator follows a course which appears as a simple treatment. Since

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the prongs are bendable, he is prone to grasp the plug by its prongs, bring the prong ends to the socket slot openings, and then bend the prongs while in such location until the ends will readily enter the slots, after which he pushes the prongs inward to a holding position before removing his fingers from the prongs. Such a course is fraught with danger due to the fact that the instant the prong ends touch metallic portions of the socket, a short circuit condition through the fingers and body members of the operator is immediately established, thus setting up possible damaging conditions to the operator and possibly to the circuit.

The present invention is designed primarily to meet these conditions, doing this by applying to the end zone of each of the prongs a surface cover or coating formed of insulating material and having the overall width and thickness of the prong itself so that it does not add to these dimensions of the prong. The prongs, when thus equipped, present an exposed end zone of a desired length which can be safely grasped by the fingers, presented to the socket and manipulated, as by bending until the prong ends have the needed spacing, and then entering the end zones into the socket slots for a distance sufficient to properly support the plug. The fingers are then shifted to the insulated base and the plug pushed into the socket for the remainder of the distance by pressure applied on the base instead of on the prongs. Since the prong end zones are rendered insulated by the covering, such ends can contact the metallic parts of the socket slots, even the contacts therein, without establishing any short-circuiting conditions while the covering remains in contact. Only after the covered zone has advanced in the slot a distance sufficient to bring the bare exposed portion of the prong in rear of the covering into actual contact with the socket contacts are the prongs so positioned as to be activated with the current. Since the fingers can grasp the covering only when the end zone is external and are removed therefrom before the end zone has completely entered the slot, the fingers can form no part of a short-circuiting path, thus protecting both the body and the circuit flow path against such mishap.

To these and other ends, therefore, the nature of which will be hereinafter more fully disclosed, said invention consists in the improved constructions and combinations of parts, hereinafter particularly described in the specification, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

In the accompanying drawings, in which similar reference characters indicate similar parts in each of the views,

Figure 1 is a side elevation of a male plug of

the present invention shown in the vicinity of but removed from a socket with which it is to cooperate, the latter being shown in position in a wall surface.

Fig. 2 is an end view of the prong end of the plug.

Fig. 3 is a view taken on line 3—3 of Fig. 2, the parts being shown on an enlarged scale.

Fig. 4 is a plan view, partly in section, of the structure shown in Fig. 3.

Fig. 5 is a sectional view taken on line 5—5 of Fig. 4.

Fig. 6 is a detail sectional view showing a modified way of mounting the covering.

Fig. 7 is a similar view of a further modification.

Fig. 8 is a fragmentary view of a prong portion showing another modification.

Fig. 9 is an exploded view showing still another modified form.

Fig. 10 is a fragmentary view showing a prong portion in which the end of the insulating zone is given a special configuration.

The plug and socket type of assemblage referred to herein is shown in Fig. 1, in which the plug is indicated at 10 and the socket at 11; both follow the lines of a common form of these members now in general commercial use. No material change is made in the socket member, while the change made in the plug member (and which constitutes the fundamental feature of the present invention) is indicated in this figure and shown in detail in the remaining figures.

The fundamental feature of the invention is that of applying an insulating formation to the free end zone of the prong. This may be provided in different forms and ways, such formation being indicated generally at 12, and shown applied to such zone on the prongs 10*a* of the plug. The overall width and thickness of the zone does not exceed the width and thickness of the prong body so that it does not affect the entrance of the prong into the socket. It is preferable that these dimensions be equal in the body and insulating zones of the prong, but the invention contemplates a formation in which either or both of these dimensions of the insulated zone may be less than the similar dimensions of the body zone of the prong.

The length of the insulated zone will depend on several conditions, but in this respect one condition is constant. It will be understood that the exposed metallic surface of the body portion of the prong will have a length such that when the plug is fully inserted, such exposed surface will intimately contact with the internal contacts of the socket, so that this is a controlling factor in the length of the prong and of the insulated zone, since an exposed surface of the prong must engage the contact to assure completion of the current flow-path. Since, however, the contacts are generally positioned to engage the prong in an intermediate zone in the length of the prong, and the further fact that such engagement need not be active throughout the entire length of such normal engagement zone of the prong, it is obvious that the insulated end zone surface can actually extend into such normal engagement zone without affecting the ability to complete the current flow-path when the plug member is completely seated with respect to the socket member.

This latter condition permits control of the length of the insulating zone, since it is evident that the instant the inner end of the insulating zone reaches the outer end of the contact engagement zone, the flow-path will be broken (during the withdrawal movement of the plug member), and that the instant such inner end of the insulating zone passes forwardly over such outer end of the contact engagement zone (during the entering or positioning movement of the plug member prongs) and on to an intermediate point in the length of such engagement zone, the current flow-path will be completed at that point. Hence, if the prongs be not fully inserted, the question of activity or inactivity of the current flow path will depend upon the position of such inner end of the insulating zone relative to the outer end of such contact engagement zone. Obviously, as long as such inner end of the insulating zone does not reach such outer end of the contact engagement zone, the flow-path will remain broken. Hence, should the seated plug member be accidentally partially withdrawn a distance such that such inner end of the insulating zone has reached and has passed outward beyond such outer end of the contact engagement zone, but the plug member be not wholly withdrawn, the flow-path will be broken and any portion of the plug including the portion of the prongs external of the socket member, can be grasped by the fingers of the operator without danger to the latter.

This condition makes possible the use of the invention for the particular service previously referred to as the primary purpose of the invention, the ability of an operator to properly and without danger insert the prongs by direct grasp of the prongs where the prongs have been relatively displaced to an extent which would make it difficult to insert the prongs by the usual method of supporting the plug member through grasping the periphery of the insulating base element of the plug member. This makes it possible for the operator to grasp any portion of the prongs for bending or otherwise manipulating the prongs to provide efficient and free entry of the prongs into the socket member. This will be understood from the fact that as long as the prongs have been inserted a distance such that the exposed portion is not greater than the width of the thumb, the flow path cannot be established, and it is necessary for the operator to remove his thumb and finger from contact with the prongs in order to establish the flow path by further inward movement of the prongs. This condition assures that the operator can provide all required manipulations of the prongs without danger to himself or the circuit through short-circuiting an active circuit, as long as the exposed zone of the prongs is equal to or greater than the width of the thumb of the operator, the current flow-path cannot be established.

The insulating surface formation may be of different types, materials, and/or applied in different ways. For instance, as in Fig. 3, the free end zone of the prong is cut away on each of its sides and edges to produce a tang 10*b* over which is positioned the cup-like configuration 12 in such manner as to be permanently secured to the tang, the tang being fashioned in one of a number of different ways to anchor the cup on the tang. For instance, the tang may have its side surfaces roughened, or other forms presently described may be employed. The cup 12 may be formed of Bakelite hard rubber or other insulating material. In practice, the length of the cup is generally from ¼ to ½ inch in length, depending on the length of the prong and the positions

of the socket contacts. Fig. 5 presents a cross-section of such construction.

A preferred way of producing the cup is in situ, as by positioning the prepared tangs in mold cavities and pouring the plastic material into the cavities to give the desired surface contour and properly locate the cup relative to the tang. Where this method is employed, it is preferred to provide one or more openings 10c through the tang (see Fig. 4) thus keying the opposite sides together through the opening or openings, and anchoring the cup to the tang, the key being indicated at 12b.

The tang edges may be toothed or serrated, as at 13 (Fig. 6), thus providing an edge anchoring means. Or, as indicated in Fig. 7, the tang may have its free end expanded, as at 14, by bifurcating such end for a short distance and then moving the bifurcations outward to form projecting teeth 14a which, when the cup is in position, will anchor it against endwise movement.

If the socket member contact for a prong is arranged to contact but one side face of the prong, that side face of the insulating formation is brought into the plane of the prong body portion face, and, if desired, the insulating formation may be otherwise be given a preferred configuration within the limits of the cross-sectional dimensions of the prongs. Such arrangement is especially desirable where the prong is of a different cross-section and dimensions from that usually employed, such as square, circular, polygonal, oval or other desired configuration. A prong of this type is shown at 15 in Fig. 8 in which the free end zone of the prong body is shown as bevelled, this leading to a formation 16 of gradually reducing cross-section toward the free end of the formation.

The formation is anchored to the body portion of the prong in suitable manner as indicated for instance in Figs. 3 to 7, which show the use of the prong tang with the cup anchored thereon. However, the assembly may be provided in other ways. One of these is indicated in Fig. 9, in which the tang is substituted by a screw-threaded member 17, while the insulating formation 18 is molded separately with an internally threaded opening open at its rear end. The cup thus formed can be threaded on to the screw-threaded end of the prong.

Since the cup is of molded type, its free end may be given a desired configuration, rounded as in Figs. 3 to 7, or for instance, toothed or fish-tail as at 19 in Fig. 10, the configurations in these respects being determined by the internal construction of the socket member.

In practice, the length of the insulating cover formation of a prong is of limited range, extending from and including the free end of the prong, the range, as heretofore indicated presenting a maximum length of substantially one-half inch with the minimum range length one-fourth inch. Such range is sufficient to include prong lengths such as are utilized commercially. Such range will assure the proper practice of the invention, if needed, since all prongs have a length greater than the width of the thumb of the average user, and it is necessary only that the free end of the prongs enter the socket slots a distance sufficient to prevent shifts of the prongs after removing the thumb and finger which are engaged in producing the proper distance between prongs for entry into the slots. The thumb and finger can thus occupy with safety the non-insulated surface of the prong which is exposed in the inner zone of the prong adjacent the body portion of the plug to which the prongs are secured, since only the insulated zone is found within the entering prong ends. The thumb and finger can then be removed with assurance that the plug can be moved to seated position without difficulty by endwise pressure upon the plug body. Hence, with short prongs, the minimum range length may be employed, with the range length increasing with prong length increase until the maximum range length is reached, beyond which no further increase of range length is needed regardless of increase in prong length, the thumb and finger then grasping the prongs at an intermediate portion of their length to enable better prong manipulation with prongs of considerable length.

While I have herein shown and described the invention broadly and have indicated a number of ways and means by which it may be utilized, it is apparent that changes and/or modifications therein may be found desirable or essential in meeting the exigencies of service or the individual desires of a user. I, therefore, reserve the right to make any and all such changes and/or modifications therein, as may be found desirable or essential insofar as the same may fall within the broad spirit and scope of the invention as expressed in the accompanying claims, when broadly construed.

What is claimed as new is:

1. In an electrical plug and socket assembly, a plug member comprising a pair of parallel spaced apart prongs each of substantially oblong contour in cross-section for entry into corresponding slots in the socket, said prongs each having a portion of their sides, top and bottom reduced at the free ends thereof, and an insulating cover secured on the reduced portions of each prong with the cover completely enclosing and insulating said reduced free ends, each insulating cover being of a size to fill each of said reduced free ends to a size substantially identical with the unreduced portions of the prongs, whereby the prong portions adjacent the reduced portions may be safely grasped by a thumb and finger for properly positioning the prong free ends into the socket slots.

2. A plug construction as in claim 1 in which the maximum length of the reduced portion and insulating cover is one half inch and the minimum length is one fourth inch.

ABRAHAM D. PARNES.

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