

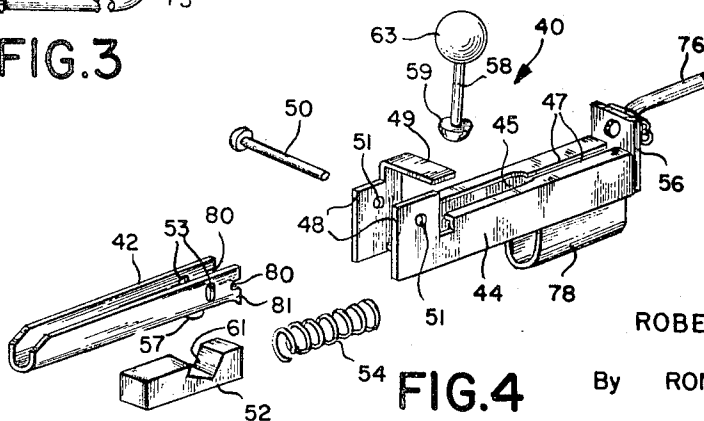
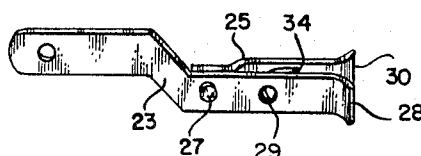
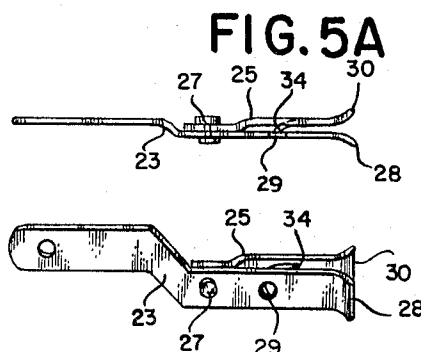
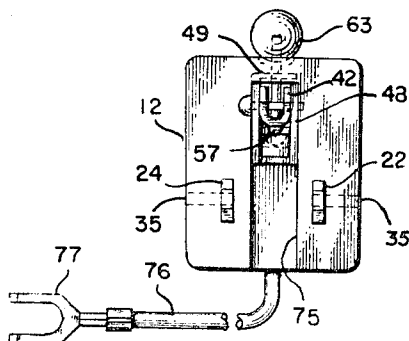
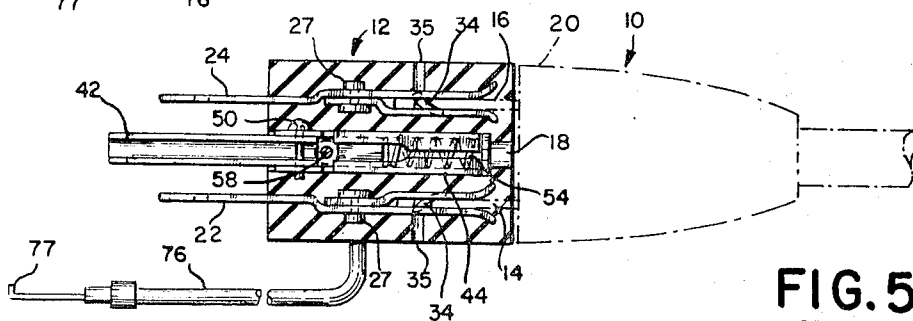
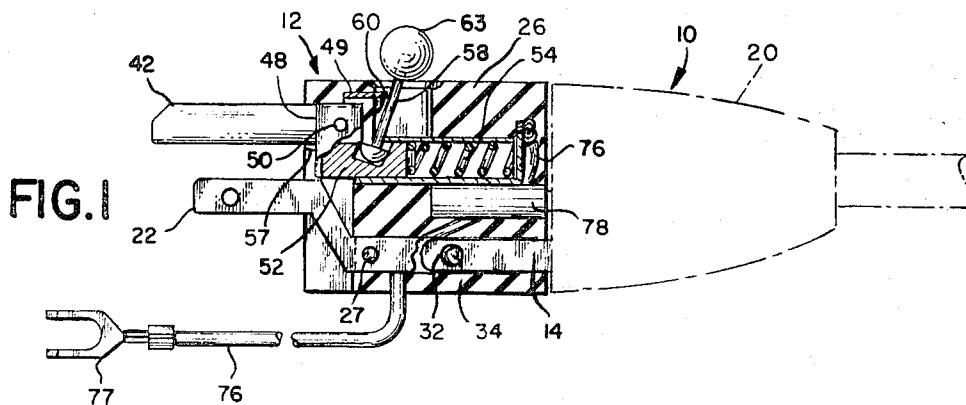
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3,440,591

COLLAPSIBLE TYPE ELECTRICAL CONNECTOR

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COLLAPSIBLE TYPE ELECTRICAL CONNECTOR

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10 Claims

ABSTRACT OF THE DISCLOSURE

Disclosed herein is an electric plug cap adaptor having a three-terminal receptacle to receive a three-terminal plug cap, the receptacle including female contacts positioned to receive male contact blades with the female contacts being adapted to be interlocked with the male contacts of the plug cap and a pair of male contact blades and a ground terminal blade which is movable from an operative position to an inoperative position in the face of the adaptor with a releasable spring biased member mounted to bias the ground terminal blade to the operative position and to hold the ground terminal blade locked in the operation position.

This invention relates to electrical connector plug caps which are provided with a third or ground terminal and more particularly to an improved plug cap or plug cap adaptor whereby said plug caps can be readily converted for use in either a two or three-terminal receptacle.

This invention constitutes an improvement over my electrical connector plug cap disclosed and claimed in Patent No. 3,219,962, granted Nov. 23, 1965. In this patent, a collapsible type ground terminal was disclosed which was pivotally mounted in a support member embedded within the body of a plug cap. A spring was used to bias the terminal to its operative position and to lock it in that position until released. A means for releasing the spring lock was provided so that the ground terminal could be collapsed to an inoperative position in a groove in the face of the plug cap. The movement of the ground terminal although meeting these requirements has not performed as originally expected. The spring, due to wear, became loose and failed to hold the ground terminal firmly in the operative position and also failed to retain the critical tolerances necessary for safe operation.

One of the primary objects of the present invention is to provide a new and improved electrical plug cap adaptor for converting a three-prong plug cap to fit a standard two-prong receptacle.

A further object of the present invention is to provide a convertible three-prong plug cap adaptor which can be permanently mounted on a standard three-prong plug enabling the standard three-prong plug to then have the versatility of converting to a two-prong plug.

Another object of the present invention is to provide an improved electrical plug cap adaptor which has a self-restoring and positive locking feature which is required for use with hand-held electrical tools and equipment.

Another object of the present invention is to provide an improved self-restoring and locking ground terminal for a plug cap or plug cap adaptor that is simple to operate and low in cost to manufacture.

A still further object of the present invention is to provide an improved collapsible type ground terminal that automatically returns to its operative position and firmly locks in that position.

Still another object of the present invention is to provide an improved collapsible type ground terminal that automatically compensates for wear.

A still further object of the present invention is to provide a collapsible type ground terminal for a plug cap

or plug cap adaptor that has contact surfaces that are self-cleaning.

Another object of the present invention is to provide an improved collapsible ground terminal assembly that will automatically displace foreign matter.

These objects are accomplished by embedding two electrical terminals and a third collapsible type ground terminal assembly in an insulated body. The ground terminal assembly includes a ground terminal which is mounted for pivotal motion in a support member and is retained in its operative position by a block. When the block is moved inward away from the plug face a predetermined distance, the ground terminal will then be released so that it can be moved to its inoperative position in a groove provided in the face of the insulated body. When the then collapsed ground terminal is released it will snap back to its operative position due to the bias of a spring acting on the block to move it outward beyond the pivot point of the ground terminal. If the collapsible type ground terminal assembly is mounted in an insulated body that is used as a plug cap adaptor, a three-prong receptacle will be provided on the opposite face of the adaptor and will be electrically connected to the corresponding members of the plug cap. The electrical terminals of the receptacle are provided with self-locking tabs which are designed to engage and hold the electrical contact members in a three-prong plug when inserted into the electrical receptacle in the adaptor. The plug cap adaptor and standard three-prong plug will then be non-separable until manually released from each other.

Other objects and advantages will become more readily apparent from the following detailed description when read in connection with the accompanying drawings, in which:

FIG. 1 is a side view of the adaptor mounted on a plug with the insulated body shown in phantom.

FIG. 2 is a top view of the electrical members with the insulated body shown in phantom.

FIG. 3 is a front view of the electrical contact members showing the collapsible ground.

FIG. 4 is an exploded view of the ground terminal assembly.

FIGS. 5A and 5B are views of one of the self-locking electrical terminals.

In FIG. 1 of the drawing, a three-terminal plug cap 10 is shown connected to a plug cap adaptor 12. The three-terminal plug cap includes electrical contact members 14 and 16 and a permanent type ground terminal 18 all embedded within an insulated body 20. This is a standard type plug cap well known in the art. The distances and relative location of the contacts 14 and 16 and the ground terminal 18 are standardized to provide interchangeability between the plug caps and receptacles. The electrical contact members also have locating apertures or holes 32 near their outer ends which are used to support the contact members during the manufacture of the plug. These holes are used as more clearly described to secure the plug cap adaptor to the plug cap.

The plug cap adaptor has a pair of electrical contact elements 22 and 24 embedded within an insulated type housing 26. The contact elements 22 and 24 are each formed from a single strip of electrically conductive material as seen in FIGS. 5A and B. Each contact element is offset at 23 to maintain the same distance between the ground terminal and the contact members as in the plug cap. An inner contact member 25 is secured to the contact member 22 by rivet 27. The ends 28 and 30 of the members are outwardly flared to receive the ends of the contacts 14 or 16 on the plug. The ends 28 and 30 of the contact members may be rolled outward as shown or rolled inward to act as guides for the contacts 14 and 16. An aperture 29 is provided in the contact member in

line with the tabs to allow for release of the tabs from the contact member as described below.

The contact elements 14 and 16 on the plug cap are of a standard type with aperture 32 provided at the outer end. The aperture is present in all contact elements and is used to hold the contact element in position during the manufacturing operation. The ground terminal 18 usually has an aperture near the end which is used for the same purpose. The aperture is always located at substantially the same point at the end of the contact element which makes it possible to use the aperture as a reference point in the present invention. The contact members 25 are indented to form tabs 34 (see FIGS. 5A and 5B) at a position which corresponds to the location of aperture 32 in the contact members 14 and 16 when the adaptor is mounted on the plug. When the electrical contact members 14 and 16 are inserted into the adaptor the tabs will seat in the aperture 32 locking them in position. Any attempt to remove the plug will cause the tab to seat tightly in the aperture 32 preventing separation of the plug from the adaptor without damaging the contact elements. The tabs can be released from the electrical contact members 14 and 16 by inserting a pointed instrument into holes 35 in the adaptor housing and through apertures 29 and 32 in the contact members to push the tabs out of holes 32. The plug cap 10 can then be pulled out of the plug cap adaptor 12. It should be apparent that the contacts could be engaged by other means to lock them in the adaptor.

A ground terminal assembly 40 (FIG. 4) is embedded within the adaptor housing 26 with the ground terminal 42 positioned above and centered between the contact elements 22 and 24. The location of the ground terminal relative to the contacts 22 and 24 corresponds with the location of the ground terminal 18 relative to the contacts 14 and 16 so that it is interchangeable with standard types of plugs.

The ground terminal assembly includes a support member 44 which is bent to a substantially square configuration with slot 45 across the top. A pair of upright members 48 are provided on each side of the support member to form a pivot support for the ground terminal, with a cross member 49 supported on the upright members. The inner end of the ground terminal is positioned between the upright members and a pivot pin 50 is pushed through apertures 51 in the upright members and elliptical holes 53 in the end of the ground terminal 42. The ground terminal will then be free to pivot on pin 50 from an inoperative position to an operative position.

The ground terminal is held in the operative position by means of a wedge or a block 52 that is slidable within the support member. A compression spring 54 is placed within the support member between the block and the end 56 of the support member to bias the block outward toward the ground terminal. The block is retained in the support member by a pin 58 with the enlarged end 59 of the pin seated in a slot 61 in the block. The pin 58 is movable in slot 45 and is held in place by the edges 47 of slot 45 engaging the enlarged end 59 of the pin. The other end of the pin extends upward through a slot 60 in the top of the insulated housing. Slot 60 is made larger than the end of the pin to allow for a limited amount of free motion of the pin in the block. An insulated button or ball 63 is secured to the outer end of the pin. The button is pushed forward until the pin abuts the cross member 49 on the support member. The pin will pivot around the cross member moving the block backwards away from the end of the ground terminal. The ground terminal will then be free to pivot downward into groove 75 in the face of the insulated housing. When the button or ball is released, the spring will force the block against the ground terminal causing it to rotate back to the operative position. As the ground terminal reaches the operative position, the block will slide forward under the pivot pin. Since both the bottom surface of the ground terminal and the upper surface of the block are substantially flat there

will be no motion between them and the ground terminal will be positively locked in position. However, in the event that the surfaces do not properly match, a small protrusion or knob 57 is made in the bottom of the ground terminal to engage the leading edge of the block. When the block engages the angled surface of the protrusion a solid two-point contact is assured between the ground terminal and block which eliminates any wobble in the ground terminal. The protrusion also acts as a stop to restrict the outward travel of the block.

To release the ground terminal so that it can be moved to the inoperative position within groove 75 in the face of the body, it is only necessary to move the block back into the support member a distance sufficient for the end of the block to clear the pivot pin. This is accomplished by pushing on the button on the end of pin 50. A non-current carrying knob or ball 63 is secured to the end of the pin to provide a larger surface for pushing the pin toward the collapsible ground terminal. The pin 58 will pivot on cross member 49 with the lower end of the pin moving the solid member out from under the ground terminal. The ground terminal will pivot freely downward after the block has been moved out from under the ground terminal. If the contact members 22 and 24 are inserted into a receptacle after the ground terminal has dropped, the ground terminal will contact the receptacle face and be pushed into the groove 75. When the ground terminal is collapsed a ground connection is made by attaching U-shaped terminal 77 on ground wire 76 which is attached to the support member to the center screw on the receptacle. This ground connection should be made on the center screw of the wall plate for a standard receptacle.

In order to provide a positive connection between the ground terminal 18 on the plug and the support member 44 in the adaptor a ground contact 78 is secured to the support member.

There are instances when the tolerances in making the ground terminal and block are such that the ground terminal may droop on initial assembly due to the inner edge of the ground terminal being bent downward or overbent to cause this condition. To overcome this, a notch 80 may be provided in the ends of the sidewalls of the ground terminal 42. If the ground terminal droops slightly the outer end of the ground terminal 42 should be raised forcing the inner overbent end 81 of the ground terminal against the top of the block 52. The corner 81 of the terminal below the notch will be permanently crushed or bent to realign the ground terminal to an exact operative position in relation to the other contacts extending from the face of the plug.

Although the collapsible type ground terminal has been shown in a plug cap adaptor it should be understood that it would be used in a plug cap as well and that other modifications could be made herein.

What is claimed is:

1. An electric plug cap adaptor for converting a three-terminal plug cap to fit a two-terminal receptacle, comprising

- a plug body having two substantially flat surfaces, one of said faces forming a three-terminal receptacle to receive a three-terminal plug cap,
- catch means in said receptacle to lock said receptacle to said plug cap,
- a pair of contact blades projecting parallelly outward from said other face and being electrically connected to said three-terminal plug cap,
- an electrically conductive support member embedded in said body and connected to said ground terminal receptacle,
- a groove in the other face of said body,
- a ground terminal member pivotally mounted on said support member, said ground terminal being rotatable into said groove, and
- lock means biased toward said ground terminal to move said ground terminal out of said groove and for lock-

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ing said ground terminal in a fixed parallel relation with respect to said contact blades.

2. An electric plug cap adaptor according to claim 1 wherein said lock means comprises

a block slidable within said support member and a spring positioned in said support member to bias the block toward a position beneath the ground terminal.

3. An electric plug cap adaptor according to claim 2 wherein said ground terminal includes a limit stop in a position to engage the leading edge of said block, said limit stop also providing a rigid support for said ground terminal.

4. An electric adaptor plug for connection to a plug cap having a pair of contact blades and a ground terminal, said plug comprising,

a unitary plug body having a three-terminal receptacle adapted to receive the contact blades and ground terminal on the plug cap, and

a pair of contact blades and a ground terminal means projecting parallelly outward from said body, said ground terminal means including a ground terminal movable from an operative position to an inoperative position,

means biasing said ground terminal to the operative position and positively locking the ground terminal in the operative position,

said three-terminal receptacle including a pair of electrically conductive members connected to said contact blades and a ground member connected to said ground terminal means,

said contact blades including means for locking said adaptor to the three-terminal plug cap.

5. According to claim 4 wherein said locking means comprises

a detent in said contact blades which engages a hole in said conductive members.

6. According to claim 5 including means to release said locking means from said conductive member.

7. A collapsible type ground terminal assembly for use in a plug cap or plug cap adaptor comprising,

a support member,

a ground terminal pivotally supported in said support member,

block means slidably mounted in said support member,

spring means biasing said block means to a position to prevent pivoting of said ground terminal,

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and actuating means for moving said block means to allow said ground terminal to pivot.

8. A collapsible type ground terminal according to claim 7 wherein said block means comprises a block and said ground terminal includes a protrusion to engage said block to stabilize the ground terminal when in the operative position.

9. An electric plug cap comprising

a housing,

a pair of electric terminals projecting from one surface of said housing,

a ground terminal assembly positioned in said housing and including a ground terminal projecting from said one surface of said housing,

a ground terminal support pivotally supporting said ground terminal,

said terminals being located in a predetermined spaced relation with each other,

block means slidably mounted on said support member for movement into and out of engagement with said ground terminal,

spring means for biasing said block means into engagement with said ground terminal,

and actuating means for moving said block means away from said ground terminal to allow said ground terminal to pivot to an inoperative position.

10. An electric plug cap according to claim 9

wherein said block has a substantially flat upper surface and said ground terminal has a corresponding flat surface whereby on engagement of said two surfaces the ground terminal will be locked in a fixed position.

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