

June 6, 1961

S. E. ESTES
ELECTRICALLY SHIELDED CAP FOR A UNIT OF THE IGNITION
SYSTEM OF INTERNAL-COMBUSTION ENGINES

2,987,587

Filed July 16, 1959

3 Sheets-Sheet 1

FIG. 1.

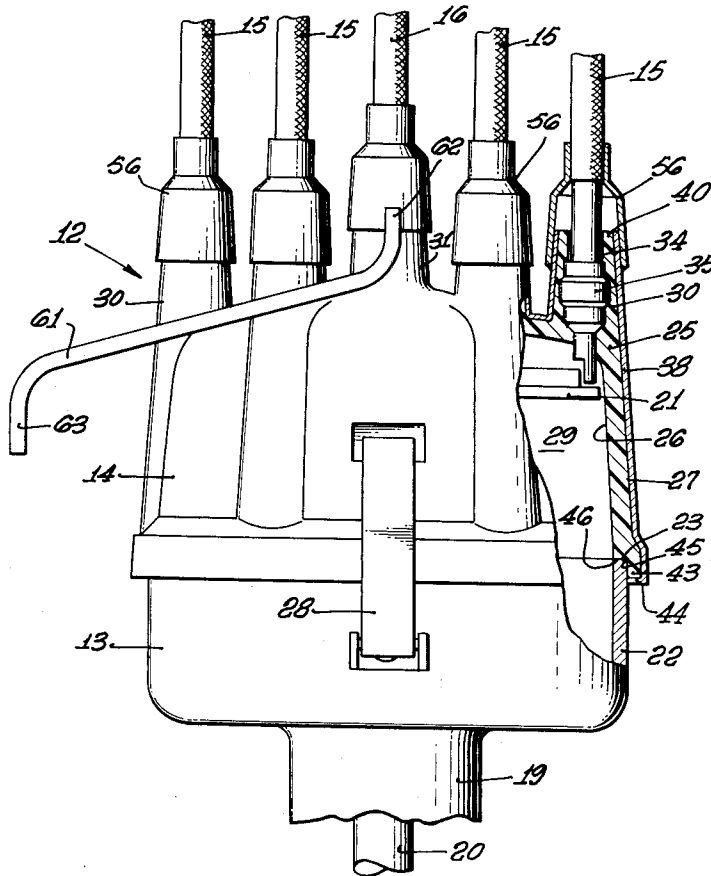


FIG. 2.

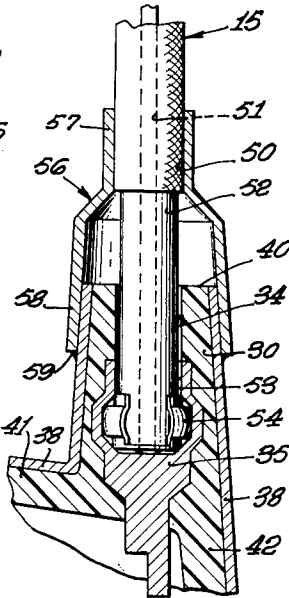


FIG. 3.

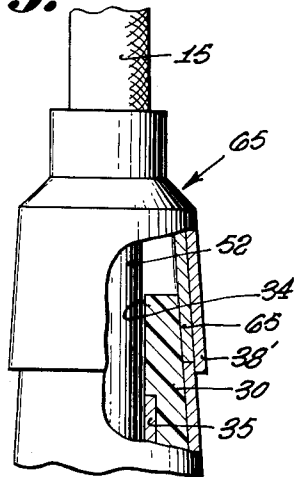
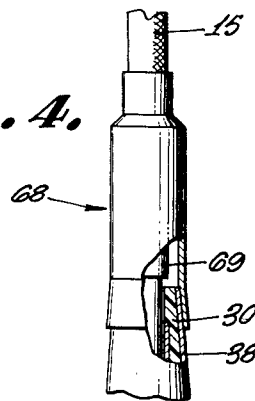


FIG. 4.



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FIG. 5.

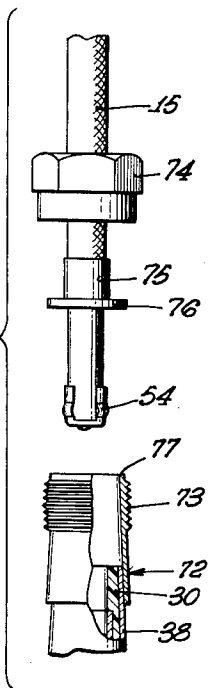


FIG. 6.

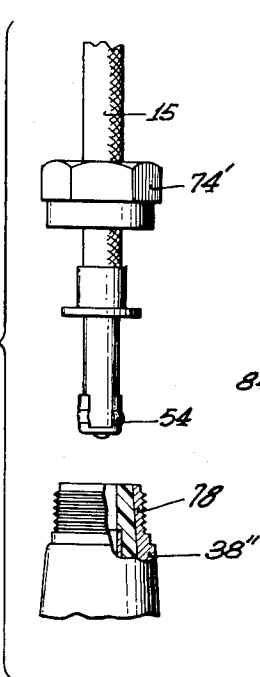


FIG. 7.

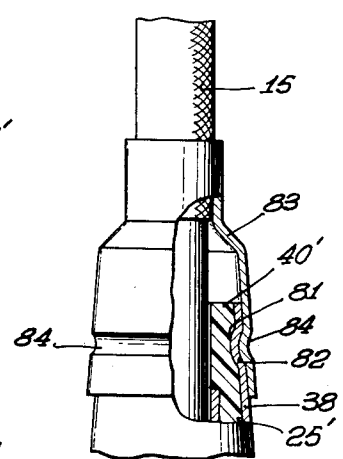


FIG. 8.

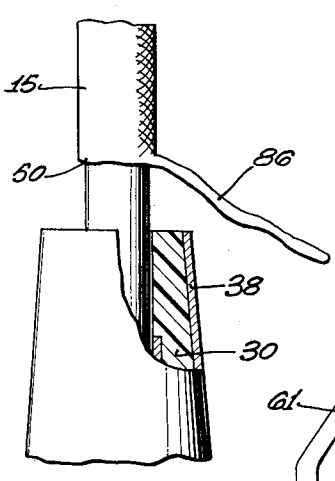


FIG. 9.

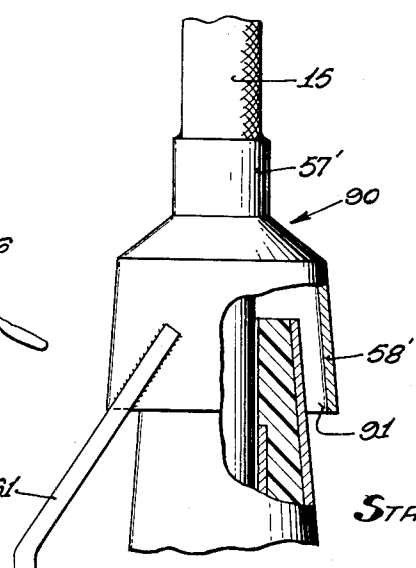
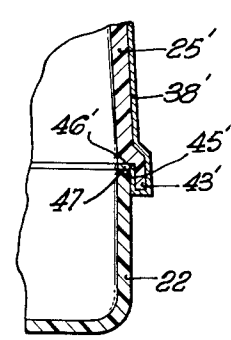


FIG. 10.



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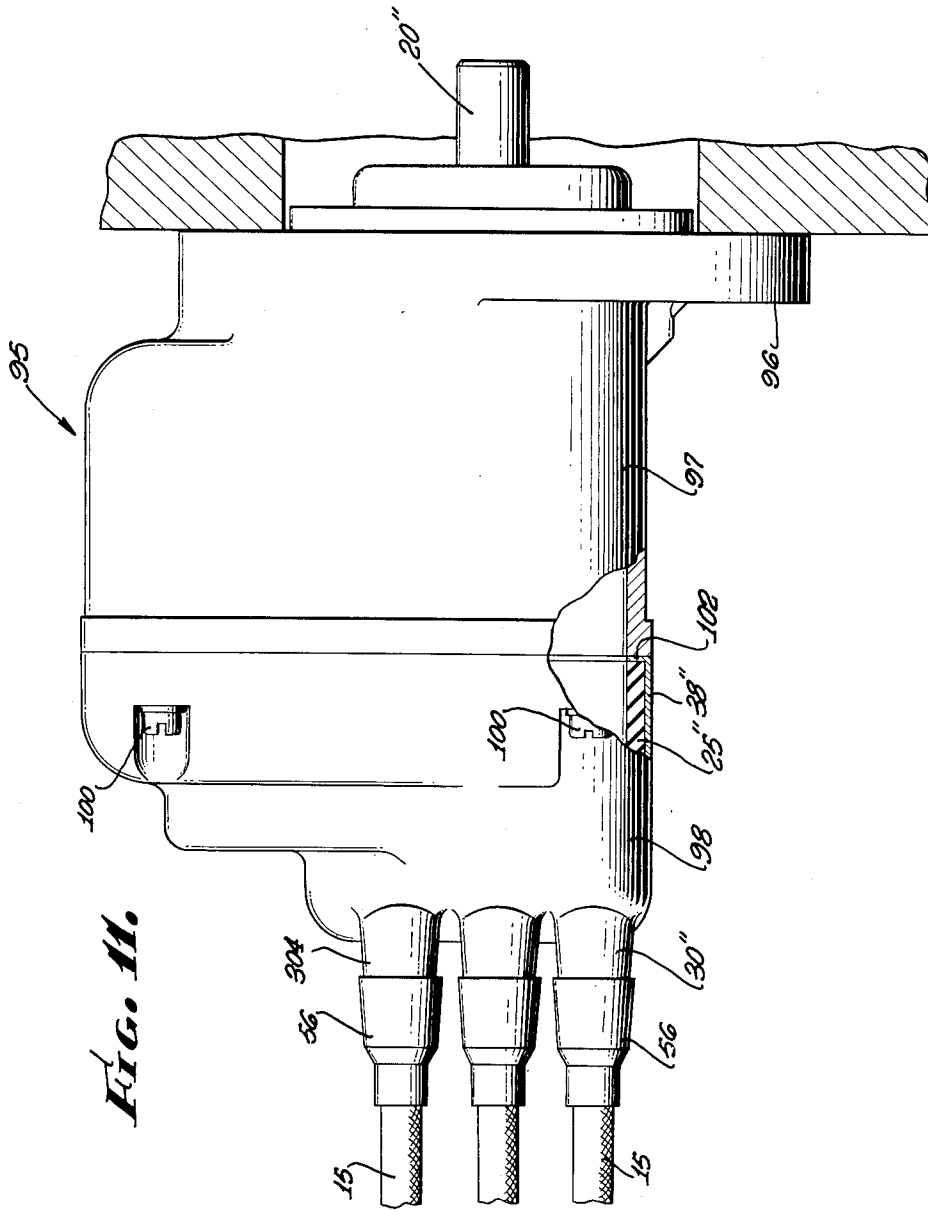


FIG. 11.

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ELECTRICALLY SHIELDED CAP FOR A UNIT OF THE IGNITION SYSTEM OF INTERNAL-COMBUSTION ENGINES

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4 Claims. (Cl. 200—19)

This invention relates to distributors and magnetos for the electric ignition systems of internal-combustion engines and more particularly to a cap for such distributors and magnetos and to conductors by which a distributor or magneto is connected to the spark plugs of an internal-combustion engine.

A distributor or a magneto of an internal-combustion engine emits stray electrical fields which, if not controlled, become picked up by any radio transmitter or receiver located close to the engine, the stray fields causing noise and disturbances in the radio equipment. Radio interferences of that type are objectionable in motor vehicles, airplanes, ships and submarines, and in stationary installations employing radio equipment. Heretofore shields have been employed in the form of metal containers or boxes for enclosing the distributor or the magneto to reduce radio interference; however, such containers have several substantial disadvantages.

By this invention there is provided a shield against emission of stray electrical fields from a unit (distributor or magneto) of the electric system of an engine, the shield being in intimate contact with the outside surface of the unit thereby to locate the shield in close proximity to the source of the stray fields. According to this invention it has been found that this can be accomplished advantageously by coating the outer surface of the insulation cap of a distributor or of a magneto with a metal layer and providing for electrical grounding of the shield. Also by this invention the conductors or cables which connect the distributor or the magneto to the spark plugs of an engine and, in the case of a distributor, to the spark coil of an engine, are adapted to be grounded to the shield and to the engine. Furthermore, the invention results in minimizing increase in bulk of the said electrical units, the slight increase being negligible when compared to the bulk of those shields which have been employed heretofore, whereby distributors and magnetos of this invention may be disposed in a limited space between engine parts and equipment under the hood of an automobile, for example. Also, the invention may be embodied in caps for distributors and magnetos of conventional design, requiring no redesign of caps of the type which are presently on the market. Furthermore, a shield of this invention strengthens a cap against cracking, thereby substantially reducing the possibility of electrical leakage.

It is a general object of this invention to provide an electrical unit for the ignition system of an internal-combustion engine having the above mentioned advantages.

A specific object of this invention is to provide a cap for a distributor or a magneto, of the above mentioned character, which can be manufactured easily and simply and which is rugged in construction and is efficient and reliable in operation.

Further objects and advantages of this invention will appear during the course of the following part of this specification wherein the details of construction and mode of operation of several embodiments of the invention are described with reference to the accompanying drawings, in which:

FIG. 1 is a side elevation of a distributor embodying

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this invention, and connected to cables of an ignition system, a portion of the distributor and an adaptor by which one of the cables is connected to the distributor being cut away to show parts in section;

FIG. 2 is a central vertical section through a boss portion of the distributor cap and an adaptor and cable terminal on an enlarged scale;

FIG. 3 is an enlarged view of a boss portion, adaptor and cable of another embodiment according to this invention for connecting the adaptor to the boss portion;

FIG. 4 is a side elevation with parts cut away in section of a boss portion, adaptor and cable, the adaptor being of still another form;

FIGS. 5 and 6 are exploded views, each showing a boss portion and adaptor of different forms respectively, and showing a cable arranged to be inserted into the boss portion;

FIGS. 7, 8 and 9 are side elevations on an enlarged scale and with parts cut away in section, each showing a boss portion, and means for grounding a cable, and each being of different embodiments, respectively, according to this invention;

FIG. 10 is a detail section showing another embodiment by which a cap of this invention may be seated upon a base portion of an electrical unit; and

FIG. 11 is a side elevation of a magneto embodying this invention, a portion thereof being cut away to show parts in section.

Referring to the drawing in greater detail, there is shown in FIG. 1 a distributor, designated generally by reference numeral 12, of conventional shape and embodying my invention. The distributor comprises a hollow base 13 and a hollow cap 14. The cap is adapted to receive a plurality of peripheral conductors or cables 15 for connection to spark plugs (not shown) of an internal-combustion engine, and a conductor or cable 16 adapted to be connected to a spark coil (not shown) of the electrical system of an internal combustion engine.

The base 13 is formed of metal and comprises a hub portion 19 for receiving a distributor shaft 20 which serves to mount and impart rotation to a rotor 21 within the distributor. The base has a cylindrical wall portion 22 ending in an upwardly facing end surface 23 upon which the cap 14 is seated.

The cap is formed of a body 25 of non-conducting material, e.g. rigid plastic as, for example, Bakelite. The inside surface of the cap body is designated by reference numeral 26, and the outer surface of the plastic material of the body is designated by numeral 27. When the cap is secured upon the top of the base, as with conventional fastener straps 28, the cap and the base portion define a closed chamber 29 within the distributor. The plastic portion of the cap is molded to form a plurality of circular towers or bosses 30 extending upwardly at the top of the cap. The distributor of the illustrated embodiment is one having eight such bosses 30 arranged circumferentially and uniformly spaced apart around the top of the cap, and a single boss 31 disposed centrally in the top of the cap. Only four of the circumferentially disposed bosses 30 appear in FIG. 1. The bosses 30 receive the peripheral cables 15, respectively, while the central boss 31 receives the central cable 16. Each of the bosses has an aperture 34 extending vertically therethrough, each circumferential boss 30 having a contact element 35 secured in its aperture to extend into the chamber 29. As the rotor 21 is rotated, it will closely approach each of the contact elements 35 in succession thereby to transmit electrical impulses from an ignition coil through the center cable 16 and the rotor to each contact element for energizing the spark plugs as is well known by any who understand the mode of operation of a conventional distributor for a gasoline engine.

According to this invention the outer surface of the plastic body portion of the cap 14 is covered by an electrically conductive layer or jacket 38 to provide a shield against emission of stray electrical fields passing out through the distributor, such stray fields resulting from the sparking which occurs between the rotor and the contact elements 35 and in the points (not shown) in the distributor. Also stray fields are transmitted into the distributor from the spark plugs, through the wiring 15.

In its preferred form the jacket 38 is one which is electrolytically deposited upon the outer surface 27 of the insulation body portion 25. An electrolytic deposit of copper, for example, may be formed upon the body portion 25 of the cap according to the following process. The outer surface of the insulation body is first thoroughly cleaned. In the case where improved adhesion of the metal jacket to the insulation material is desired, such outer surface may be sand-blasted. The insulation material is then conditioned for subsequent application of a silver film by dipping the body into a solution of stannous chloride. After rinsing as with distilled water, the insulation body is immersed in a "reducing silver" solution, e.g. an aqueous solution of silver nitrate, ammonium hydroxide and formaldehyde. The insulation body is then rinsed again with distilled water and electroplated in a conventional manner in an acid-copper solution. A copper layer produced as above described should have a minimum thickness of about .005 inch. Thicknesses up to about .03 inch are contemplated.

Metals other than copper may be employed for forming the shielding jacket 38. Jackets of silver, aluminum, brass, steel and metal alloys may be satisfactorily employed. Also metal may be sprayed or painted upon the outside surface of the insulation body to form the jacket 38.

It will be noted that the jacket 38, as shown best in FIG. 1, extends over the entire outer surface of the insulation body of the cap, i.e. from around an annular end surface 40 of each circular boss 30 and 31 to cover the top portion 41 of the insulation body and the outer surface 27 of a skirt portion 42 of the cap body and the outer surface of an annular lip 43 having a lower end surface 44 of the insulation body. The inside of the lower end of the insulation body has an annular recess 45 formed therein to define a shoulder 46 by which the cap rests upon the rim 23 of the base 13.

In the embodiment shown in FIG. 1, the metal jacket 38 terminates in the lower end surface 44. In FIG. 10 it will be seen that the embodiment shown therein is one in which the metal jacket 38' extends upwardly at 47 within annular recess 45' to cover shoulder 46' of insulation body 25' thereby to provide a relatively large contact area of electrical connection between the metal jacket and the base of the distributor for electrical grounding purposes.

In the cases in which the metal jacket 38 is electrolytically deposited or sprayed upon or otherwise applied as a coating upon the outer surface of the insulation body, the inside of the body may be masked, as with a lacquer, prior to the coating operation. The metal coated cap may be used on the distributor with its metal surface exposed, or, if desired, the jacket 38 may be painted or finished in any other suitable manner.

It is preferred that the conductors or cables 15 and 16 be of coaxial type having an outer sheath 50 of fine wire mesh and a core conductor 51, there being an insulation layer 52 within the sheath and around the core conductor. To provide for good electrical connection between the core conductors 51 and the contact elements 35, each of the contact elements has a socket portion 53 which receives a contact clip 54 soldered or otherwise suitably secured on the end of the core conductor of the cable.

Adaptors 56 are provided for supporting the cables upon the bosses 30 of the cap. In the embodiment shown

in FIGS. 1 and 2, each adaptor 56 is tubular and has a cylindrical neck portion 57 for encircling a cable and an enlarged skirt portion 58 for fitting tightly down over a boss. The bosses may be of frusto-conical configuration as shown, and the skirt portions of the adaptors may likewise be of frusto-conical configuration so that as the adaptors are pressed down around the bosses they will become tightly wedged against the outside surface of the metal jacket 38 on the bosses. If desired, the adaptor may be soldered as at 59 to the metal jacket 38.

For electrically grounding the distributor cap of the embodiment shown in FIG. 1, there is provided a conductor 61, one end 62 of which may be soldered to one of the adaptors 56 while the other end 63 thereof may be connected to the base portion 13 or to any other electrically grounded part of the engine.

Referring to FIG. 3, the adapter shown therein is designated by reference numeral 65, the same being seated flush over a boss 30 prior to applying the outside jacket 38'. In this instance the jacket covers the outside surface of the skirt portion of the adaptor thus to provide good electrical connection of the adaptor to the outside jacket.

In FIG. 4 an adaptor 68, shown therein, is an elongate species, designed for accommodating a resistor suppressor 69 or other interference reduction devices as are quite commonly employed in association with distributors for gasoline engines.

In FIG. 5 an adaptor 72 is shown as having an external screw thread 73 for coupling with an internally threaded nut 74 upon a cable 15. A sleeve 75 having an annular flange 76 fits over and is in engagement with the end of the metal sheath of the cable. When the end of the cable is inserted into the socket portion of a contact element 35, the flange 76 will become seated upon the outer end surface 77 of the adaptor by the nut.

In FIG. 6, there is no adaptor which is formed separately from the cap, but instead the metal jacket 38" is one which is relatively thick, permitting the end portion thereof which surrounds the upper end of a boss to have screw threads 78 formed therein for mating with a nut 74' on a cable 15.

In the embodiment shown in FIG. 7, the boss portion of the insulation body 25' has an annular groove 81 formed around its outer surface proximate outer end surface 40' whereupon when the metal jacket 38 is deposited, it, too, will have an annular groove 82 in its outside surface corresponding to the annular groove 81 in the outside surface of the boss. An adaptor 83 for this embodiment has an inside annular projection 84 formed therein for mating with the groove 82 of the metal jacket whereby there is a good electrical connection between the adaptor and the metal jacket.

In FIG. 8 the metal sheath 50 of the cable is cut back to leave an extension portion 86 for electrical grounding purposes as by soldering the extension upon the outside surface of the metal jacket 38, or by attaching the portion 86 to any other electrically grounded part of the engine.

In the embodiment shown in FIG. 9, a skirt portion 53' of an adaptor 90 is shown as being of larger inside size than the cap boss over which the adaptor fits leaving an annular space 91 around the boss. In this case grounding of the adaptor is effected as with a conductor 61. The cylindrical neck portion 57' of the adaptor is secured as with solder to the metal sheath of the cable 15. Spacing of the adaptor from and around the metal jacket 38 of the distributor cap presents a discontinuity for radiated energy, and thus suppresses such radiated energy, by means of deflection against the electrically grounded skirt and metal jacket.

Referring now to FIG. 11 of the drawing, the electrical unit shown therein and which embodies this invention is a magneto, designated generally by reference numeral 95. The illustrated embodiment is of conventional design for

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a magneto adapted to be mounted horizontally on an engine as by a flange 96 on the hollow metal base 97 of the magneto. For the purposes of this specification a description of the particulars of the details of the inside of the magneto is not needed for an understanding of the invention, it being enough to mention that the magneto includes an internal coil connected to a rotor which is mounted on a shaft 20 and arranged to be electrically connected in succession to contact elements in a cap 98 of the magneto, similarly as described above for the distributor.

The magneto cap 98 is formed of a body 25 of non-conducting material, the outside surface thereof being covered by an electrically conductive jacket 38 which serves as a shield against emission of electrical fields therefrom. Instead of the fastener straps 28 of the distributor, there are screws 100 for securing the magneto cap 98 upon the base 97 of the magneto. The metal jacket 38 for the magneto cap has an annular edge 102 which seats flush upon the rim of the hollow base when the screws 100 are tightened in the base, thus providing good electrical contact between the jacket and the base for electrical grounding purposes.

It is to be understood that the towers or bosses 30 of the magneto cap may be of any of the alternative constructions described above for the distributor.

While the instant invention has been shown and described herein, in what are conceived to be the most practical and preferred embodiments, it is recognized that departures may be made therefrom within the scope of the invention, which is therefore not to be limited to the details disclosed herein, but is to be accorded the full scope of the claims.

What I claim is:

1. In an ignition system of an internal-combustion engine having a cap of non-conducting material including a top portion and a peripheral wall portion defining a space within the cap, a plurality of spaced apart bosses extending outwardly from the top portion, a metal jacket in

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intimate contact with and covering the outer surfaces of the bosses and said top portion and said wall portion, each boss having an aperture extending axially there-through, a contact element secured in the boss and closing the aperture and extending into said space, conductors having a conductive outer shield and a terminal end portion for insertion into an aperture to be electrically connected to a contact element, a plurality of tubular adaptors of electrically conductive material, each adaptor comprising a reduced neck portion circumscribing a conductor and electrically engaging the outer shield thereof, and a skirt portion for circumscribing a boss, said adaptor being in frictional engagement with the outer surface of a boss and in conductive contact with the jacket thereon, and means for electrically grounding the jacket.

2. The combination of claim 1, in which the configuration of the outside of the boss and that of the inside of the skirt portion are frusto-conical whereby the adaptor may be releasably wedged tightly down over the boss.

3. The combination of claim 1, in which the skirt portion of each adaptor fits flush around the outside surface of its respective boss and said metal jacket extends over the outside surface of the skirt portion.

4. The combination of claim 1, in which each boss has a detent formed in the outside surface thereof and each adaptor has a detent formed on the inside of the skirt portion thereof for releasably mating with the detent on the boss.

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