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Falbet

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[54] **ELECTRIC SAFETY PLUGS AND SOCKETS**

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[51] **Int. Cl.**..... **H01r 3/06,** H01r 17/18

[58] **Field of Search**..... 339/14 R, 14 P, 182 R, 339/182 L, 182 T, 183, 211, 253 F, 253 L, 253 S, 254 R, 254 M, 255 R, 255 A, 255 B, 255 L, 255 P, 259 R, 259 F, 213

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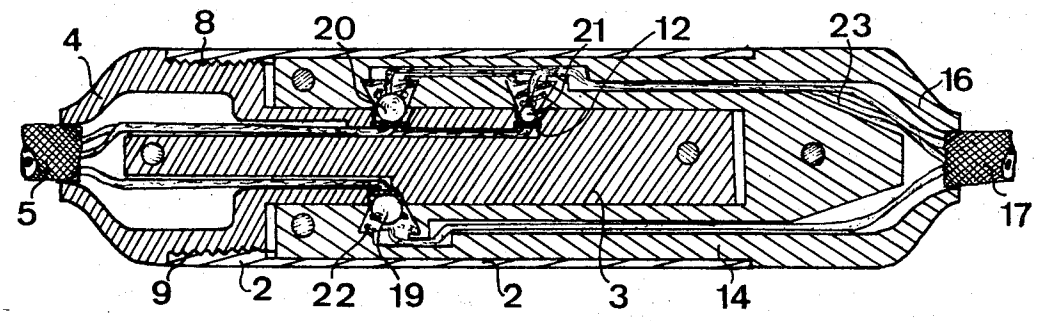
[57] **ABSTRACT**

An electrical connection device comprising at least two male and female plugs each constituted by a body of insulating material, the body of the male plug comprising a sleeve with a hollow core on the internal face of which are arranged at least two contacts mounted in slots on elastic means causing them to project from the internal face, while the body of the female plug comprises, at the front, an external tubular casing having an internal diameter equal, to within the necessary clearance, to the external diameter of the sleeve of the other plug, so as to permit the introduction of said sleeve into said tubular casing, and a cylindrical mandrel arranged axially inside the casing an having a diameter almost equal to the internal diameter of the sleeve of the other plug so as to fit into said sleeve, said mandrel being provided on its surface with at least two recesses intended to receive the projecting contacts of the other plug, and each containing a contact connected to one of the conductors terminating in said female plug.

2 Claims, 3 Drawing Figures



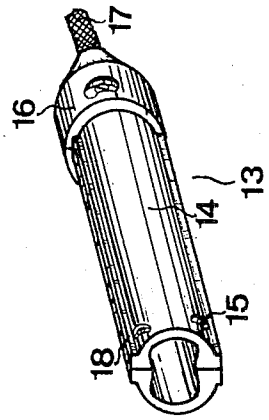
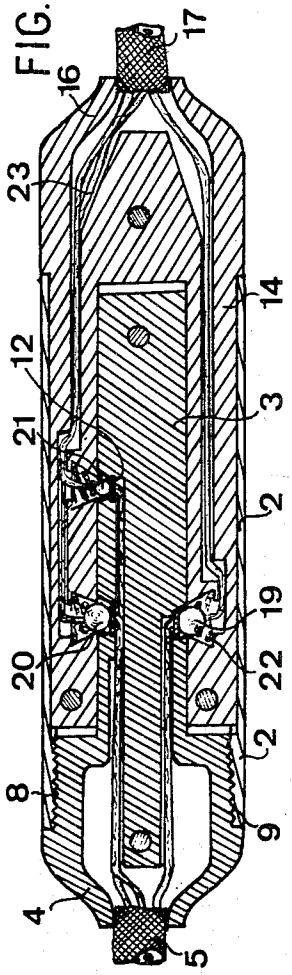


FIG. 2



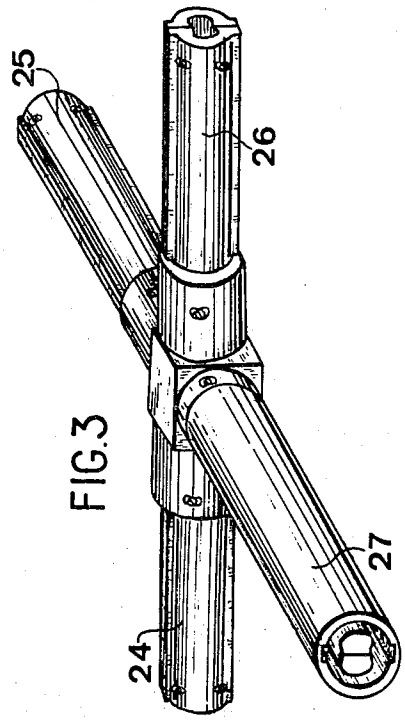


FIG. 3

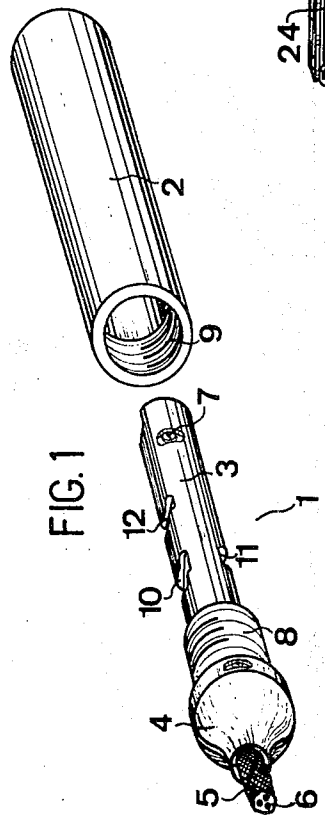


FIG. 1

ELECTRIC SAFETY PLUGS AND SOCKETS

The present invention relates to an electric connection device between two electric lines each comprising at least two conductors.

Conventional connection devices are usually composed of a male plug provided with at least two projecting metal pins and a female plug comprising two sockets with a hollow core, which are intended to receive the pins of the male plug during the coupling; the connection is simply effected by engagement of the pins of the male plug in the sockets of the female plug.

These connection plugs, at present widely used, do not offer very satisfactory conditions of safety for the user or for children who are always tempted to handle them. In fact, when the two plugs are engaged, it frequently happens that the male plugs are not fully pushed home into the corresponding sockets of the female plug, and that a portion of these latter remains visible. A person or a child handling plugs of this kind can catch or touch this portion, thus risking a more or less serious accident, depending on the nature of the current supplied to the plug. Furthermore, it is not infrequent for children to receive electric shocks by pushing into the sockets of female plugs under tension, elongated conducting objects such as knitting needles, pins, knife blades, etc.

In addition, it is clear that it is extremely dangerous to leave a conventional male plug under tension if it is not provided with a protection device covering the projecting pins.

The present invention is intended to overcome these drawbacks and to provide an electrical connection device having great safety in use. To this end, this device is composed of at least two plug members, male and female, intended to be coupled together and each formed by a body of insulating material, at the rear of which terminate the electrical conductors. According to the invention, the body of the male plug comprises at the front a sleeve with a hollow core, on the internal face of which are arranged two contacts mounted in slots on elastic means which cause them to project from this internal face, each contact being connected to one of the conductors which terminate at the said plug. As regards the female plug, this is provided at the front, on the one hand with a tubular external casing having an internal diameter equal to within the clearances, to the external diameter of the sleeve of the other plug so as to permit this latter to be introduced into this tubular casing, and on the other hand a cylindrical mandrel arranged axially inside the said casing and having a diameter equal, to within the clearances, to the internal diameter of the sleeve of the other plug so as to be capable of being housed in this latter. This mandrel comprises on its surface two recesses intended during coupling to receive the projecting contacts of the other plugs and each containing a fixed contact connected to one of the conductors terminating at the said female plug. With the exception of the contacts and of the conductors which terminate at the contacts, the male and female plugs are made of insulating material, for example of hard synthetic material.

The coupling together of the plugs according to the invention is effected by placing the plugs end to end and bringing the sleeve of the male plug into engagement so as to be housed in the space of the female plug comprised between the mandrel and the tubular casing

of the female plug. At the beginning of this introduction, each contact of the male plug, mounted on elastic means, is pushed back into its slot by the mandrel on the female plug. This contact then arrives at the level of the recess which is provided in the female plug and, by the effect of elastic means, is introduced into this recess and comes up against the contact of the female plug. In consequence, in this position, the electrical connection is effected by means of these pairs of contacts pressed one against the other.

The connection thus completed possesses remarkable consitions of safety. In fact, even if the male plug is not fully pushed into the female plug, no conductor under tension is visible and the user cannot in any case be subjected to an electric shock. Furthermore, no risk of electric shock is to be feared with respect to a female plug under tension; the contacts of this plug are housed in the bottom of a recess and are inaccessible even by means of long objects which, if introduced into the female plug, will pass over the recess in which the contact of this plug is housed, without reaching it. In addition, a male plug under tension does not constitute any particular danger since it does not comprise any projecting element capable, by accidental contact, either of causing a short-circuit or of resulting in corporal accident.

The sleeve of the male plug is advantageously provided on its external face with at least one rib intended to engage in a groove adapted and formed on the internal face of the casing of the female plug. This rib, engaged in the above-mentioned groove, will guide the introduction of this sleeve into the space of the female plug comprised between the mandrel and the external casing. The introduction of the male plug into the female plug can only be effected in a predetermined position, in which the rib of the male plug is arranged opposite the groove of the female plug; the contacts of each plug will be correspondingly located at the end of the introduction and will be placed naturally one on the other without trial and error.

In addition, the male plug may usefully be provided, at the level of the rear extremity of its sleeve, with an external shoulder against which the front edge of the casing of the female plug comes into abutment. This position of abutment defines the maximum position of engagement of the male plug into the female plug, which position corresponds to the engagement of the contacts of both plugs.

According to a particular form of embodiment, the contacts of the male plug are each constituted by a metal nipple of substantially hemispherical shape, fixed to one extremity of a spring, and capable by pushing of being retracted by passage into its slot. Each of these contacts may also be formed by a metal ball imprisoned in its slot and capable of projecting under the action of a spring.

The recesses of the female plug containing the contacts of this plug are preferably provided on their front edge with an inclined slope intended to facilitate the withdrawal of the contact of the male plug during the disconnection of the male plug.

The male and female plugs according to the invention are provided with a number of contacts suited to their utilization. They may each comprise two contacts which make them suitable for single-phase connections, for example for domestic purposes. They may also comprise an additional contact acting as an earth contact and connected to an earthed conductor. In this

latter case, the earth contact of the male plug may usefully be given smaller dimensions as compared with the other contacts, while the corresponding recess of the female plug, of smaller size as compared with the other recesses, is given dimensions suitable for this contact.

Thus, the phase contacts of larger size cannot become housed in this cavity during the introduction of the male plug into the female plug, thus preventing any undesired electrical contact. The female plug may be formed integrally with a casing containing the safety fuses and intended to be flush mounted in a wall. It will serve to distribute electrical energy by simply engaging a male plug. The female plug may also be fixed to the extremity of an electric wire or cable for the purpose of connecting this wire or cable to another wire or cable provided on a male plug.

In addition, the external casing of the female plug is preferably fixed to the body of this plug by screwing on to a threaded portion of this body. Thus, it is possible for the user to separate this casing from the unit, which will facilitate the placing in position of this plug at the extremity of the electric wire to be equipped and will permit the conductors to be connected without difficulty to the corresponding contacts.

Furthermore, the rear portions of the bodies of the female and male plugs are additionally provided with grooves permitting them to be gripped and easily handled.

Other characteristic features, objects and advantages of the invention will become apparent from the description which follows below with reference to the accompanying drawings, this description and drawings being given only by way of non-limitative example.

In these drawings:

FIG. 1 shows exploded perspective views of a female plug according to the invention, together with an oppositely arranged male plug;

FIG. 2 shows views in cross-section of a female plug and a male plug coupled together;

FIG. 3 is a multi-purpose plug with four pins.

A female plug 1 intended to effect an electrical connection is essentially composed of a substantially cylindrical casing 2, a mandrel 3 and a rear body 4 at which terminates the electric wire 5 comprising electric conductors such as 6. In the example shown, the wire 5 comprises an earth conductor and two phase conductors.

The mandrel 3 and the body 4 are made by moulding and are formed in two assembled halves fixed to each other by a screw 7. In addition, the body 4 comprises a threaded portion 8 which is intended to receive a threaded portion 9 of the tubular casing 2.

In addition, the mandrel 3 comprises on its surface three recesses 10, 11 and 12, in the bottoms of which are fixed metal blades connected to the conductors 6. The blades of the recesses 10 and 11 are connected to the phase conductors, while the blade of the recess 12 is connected to the earth conductor of the wire 5.

In addition, the external casing 2 is provided on its internal face with two grooves, the function of which will become apparent later.

On the other hand, a male plug 13 is essentially constituted by a sleeve 14 comprising two halves fixed to each other by means of screws such as 15. These half sleeves may be manufactured by moulding a hard synthetic material. The sleeve 14 is fixed by its rear portion to the body 16 of the plug, at which terminates an electric wire 17 containing electric conductors. At the junction of its two halves, the sleeve 14 is provided with two ribs such as 18, projecting from its outer face. The sleeve 14 is designed so as to be capable of being inserted, with a small clearance, in the casing 2 of the female plug.

The shape of the hollow core of this sleeve 14 is similar to that of the mandrel 3 of the female plug, so that this latter can be engaged and housed with a small clearance in this core. Furthermore, the sleeve 14 is provided on its internal face with three slots in which are imprisoned hollow metal balls 19, 20 and 21, each mounted on a spring such as 22 which urges them radially in the direction of the axis of the sleeve. These balls are connected through the intermediary of the spring which acts on them, to the conductors of the wire 17 by means of lengths of conducting wire such as 23, housed in grooves formed in the sleeve 14. These channels may be located at the junction of the two halves which form the sleeve 14 and are constituted by grooves arranged on each of these halves and coming opposite each other when the said halves are assembled together.

It can be seen from FIG. 2, representing in cross-section the plugs coupled together, that the mandrel 3 of the female plug has become housed inside the sleeve 14 of the male plug, which is in turn introduced into the casing 2 of the said female plug. In this coupled position, each ball 19, 20 or 21 comes opposite the corresponding recess 10, 11 and 12 and, under the action of its spring, becomes applied against the metal blade which lies on the bottom of each of the said recesses. Each conductor of the wire 5 is thus connected to a conductor of the wire 17.

It will furthermore be observed that the recess 12 corresponding to the earth conductor of the wire 5, and also the ball 21 corresponding to the earth conductor of the wire 17 are of small dimensions as compared with the other recesses or balls. This arrangement prevents the ball 20, when passing over the recess 12 during coupling, from establishing contact with the blade lying on the bottom of this recess 12. This ball has in fact too large a diameter to be able to pass into the recess 12 and to make contact with the blade of this recess. In addition, each recess 10, 11 or 12 is provided at its front with a small inclined ramp which enables the corresponding ball to be disengaged more easily at the moment of separation of the plug.

There will readily be appreciated the large degree of safety of use of the plugs such as described, in which no part under tension is visible. By this means all risks of electric shocks or short circuits are thus eliminated.

There has been shown in FIG. 3 a multi-connection plug falling within the scope of the present invention. The arms such as 24, 25, 26 and 27 of this multiple plug have structures similar to those described. The arms 24, 25 and 26 may for example be constituted by male plugs, while the arm 27 forms a female plug. Four plugs and sockets (one male and three female) may be coupled to this multiple unit, one of them being under tension; the multiple unit thus serves to distribute electrical power to the three others.

It will of course be understood that the present invention is not restricted to the terms of the description above, but on the contrary it comprises all the alternative forms within the scope of those skilled in the art. The plugs according to the invention may also be built

in; they may also be shielded or serve as electric couplings for power lines. Similarly, the multiple units may be provided with a number of arms different from that indicated by way of example.

When the plugs are not in use, they may be fitted with caps which close their front portion. The cap intended for the female plug has the form of a disc with a projecting ring on one face, this ring being intended to be housed, at the front of the female plug, between the casing **2** and the mandrel **3.** The cap of the male plug is constituted by a disc provided with a projecting nipple on one face, this nipple being intended to be housed, at the front of the male plug, in the sleeve **14.** Around this nipple, a projecting annular portion may be provided so as to cover the front extremity of the sleeve **14.**

Furthermore, certain alternative forms of the invention may be contemplated. Thus, the male plug may constitute a night light; a small bulb is mounted in the rear portion of the body and is electrically connected to the contacts. This rear portion, screwing on to the sleeve, is made of a translucent or transparent and coloured material.

I claim:

1. An electrical device for effecting connections between electric lines each having at least two conductors, said device comprising at least one male plug and one female socket mutually dimensioned to be coupled together; said plug and socket each comprising a body of insulating material through which the conductors extend; the body of the male plug comprising a sleeve with a hollow core having an internal wall; at least two contacts connected to the conductors extending into said plug and carried by said wall; the body of said female socket comprising an external tubular casing having an internal diameter substantially equal to the external diameter of the sleeve of the male plug to permit the introduction of said sleeve into said tubular casing; said body of the female socket further comprising a cylindrical mandrel disposed axially inside said casing and having a diameter substantially equal to the internal diameter of the sleeve of the male plug to fit in said sleeve; said wall of the sleeve of the male plug having slots; said contacts carried by the wall being retractively carried in the slots; elastic means in said slots and causing the contacts to project naturally from said wall into said hollow core; the mandrel of said female socket having on its surface at least two recesses; contacts respectively connected to the conductors and located within said recesses and completely within the outer surface of said mandrel whereby coupling of said plug and socket causes the male contacts to be biased into engagement with the female contacts located inside said recesses.

2. A connection device as claimed in claim **1,** in which said male plug and said female socket each comprise at least three contacts; one contact of each of the plug and socket being an earth contact; said earth contact of said male plug having smaller dimensions than the other contacts of the male plug; and said mandrel of the female socket having a recess of smaller size than said other recesses for its earth contact whereby the other contacts of said male plug are precluded from touching the earth contact of said socket.

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