Dec. 16, 1969 J. G. FANELLI 3,484,735

ELECTRIC TERMINAL ADAPTER

Filed Sept. 30, 1968

FIG.1

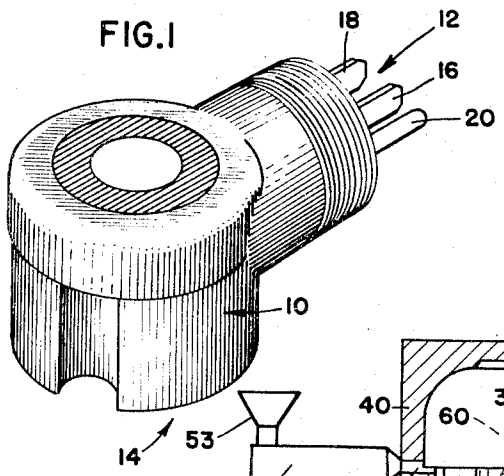


FIG.4

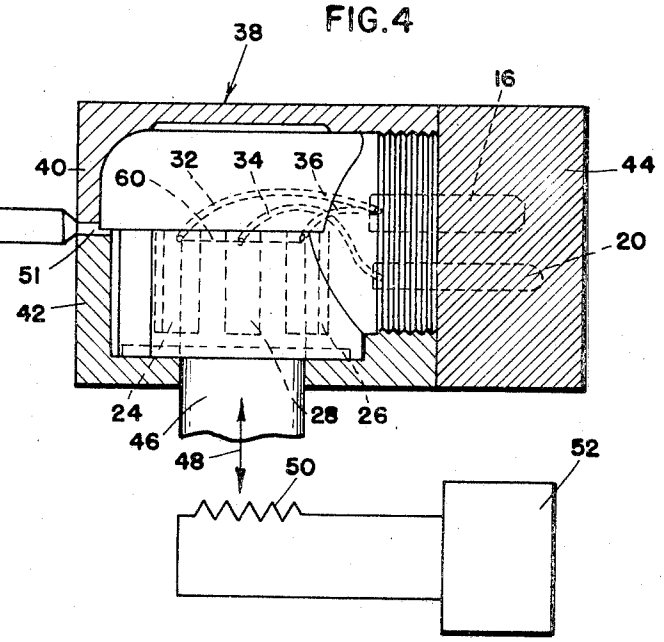


FIG.3

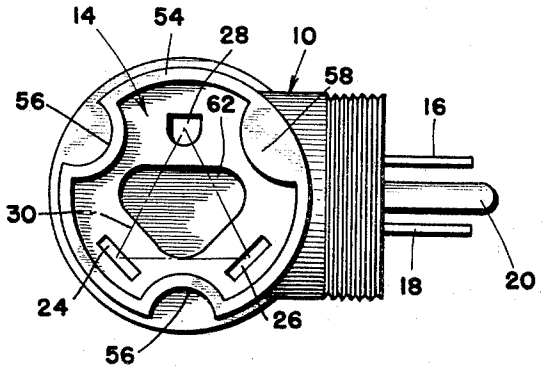
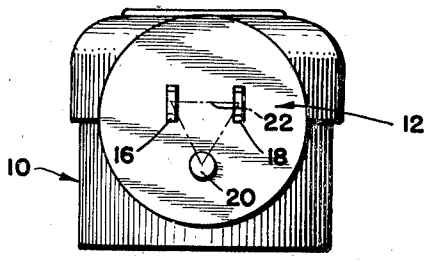


FIG.2



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ELECTRIC TERMINAL ADAPTER

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U.S. Cl. 339—14 6 Claims

ABSTRACT OF THE DISCLOSURE

An electrical connector for adapting a terminal of one, high current rated, contact configuration to a terminal of another, but lower current rated, contact configuration made from a unitary mass of molded plastic which provides the sole support for the conductive components therein.

The present invention relates to electrical connectors, and particularly to connectors for adapting a terminal of one physical configuration to a terminal of a different physical configuration to permit an electrical connection to be made therebetween.

In various applications requiring the connection of a relatively heavy-duty electrical cable to a standard or conventional electrical receptacle for obtaining power therefrom, it is the case that the terminal configuration of the cable plug will not mate with the receptacle to which connection is desired. This is generally intended to prevent inadvertent connection of apparatus to a source, where, for example, the apparatus requires a current greater than the rating of the source wiring, and the different connector configurations provide a measure of safety. However, it is sometimes desirable and advantageous to make such a connection on a temporary basis where it is certain that the application of power in this manner will not result in any harmful effects.

Generally, where special terminal configurations are employed for a source of high line voltage, say 220 volts, instead of the conventional line voltage of 110–125 volts, any connection made to an appliance not suitably rated would very likely harm the appliance. However, in certain instances where such different connector configurations are used, this is not necessarily the result, and it is to these instances or applications that the adapter of the present invention is directed.

More particularly, certain house-trailers are equipped with heavy-duty electrical cable rated at 30 amperes at 125 volts and have a plug connector at the end of the cable especially configured to preclude mating or connection with standard 15 ampere—125 volt receptacles. Although it might be desirable if the receptacles provided in all of the various trailer courts had this same special configuration and the wiring capability to supply or meet the 30 ampere ratings of the trailer wiring, not all trailer courts are so equipped or wired, and the electrical receptacles at each trailer station or location may not have the special configuration required to connect to such trailer cable plugs. Additionally, a good many trailers in existence, and especially those of somewhat older vintage, are equipped with cable connecting plugs of the standard parallel blade configuration and are wired for only 15 amperes for normal operation of the electrical appliances therewithin, and these trailers require a standard configuration 15 ampere-rated receptacle.

The more modern and larger trailers, because of the increased number of available electrical appliances which may be used, typically have the wiring capacity for 30 amperes, and thus employ the special configured terminal or plug which is so rated. Since there is a substantial

cost involved in the conversion or re-wiring of older trailer courts to be capable of meeting the high current capacity requirements of these modern trailers, and because of the great number of older trailers presently being used, some time lag will inevitably occur before all courts are so converted. Meanwhile, the owners of such modern trailers may require the use of trailer courts which have not yet been re-wired or converted to the increased electrical requirements, and the inability for such utilization of these trailer courts may significantly hamper the travel versatility for which these trailers were originally designed. Yet there need be no danger from the connection of such trailers to a 15 ampere-rated source, since the number of appliances in use may be limited, such as to lighting only, and/or the trailer may be suitably fused to limit the current draw to 15 amperes.

Accordingly, it is an object of the present invention to provide an electrical adapter for permitting the connection of electrical cables equipped with plugs having a special 30 ampere-rated configuration to receptacles having a standard 15 ampere-rated parallel blade configuration, whereby the above problems may be obviated in a manner resulting in a minimal risk for temporary use.

It is a further object of the present invention to provide such an adapter which is capable of use outdoors, being substantially weather-proof and of sturdy construction.

It is still another object of the invention to provide such an electrical adapter which may be constructed in an economical fashion for mass production manufacture, and which requires a minimum number of component parts.

These and other objects and advantages of the invention are more particularly set forth in the following detailed description, and in the accompanying drawings of which:

FIGURE 1 is a perspective view of the electrical adapter in accordance with the present embodiment of the invention;

FIGURE 2 is an orthogonal view in elevation of the adapter of FIGURE 1, showing the low current-rated terminal configuration;

FIGURE 3 is an orthogonal view in elevation of the adapter of FIGURE 1, showing the high current-rated terminal configuration; and

FIGURE 4 is a diagrammatic view, in section, showing the adapter of FIGURE 1 during a stage of manufacture.

Referring now to FIGURES 1, 2 and 3, there is shown an electrical connector in accordance with the present embodiment of the invention comprising a body portion **10**, and first and second terminal portions **12** and **14**, respectively. The first terminal portion **12** is best shown in FIGURE 2 and includes two elongated, generally flat contacts **16** and **18** in the form of prongs or blades and a third elongated contact **20** having a generally round transverse cross-section. Each of these contacts are spaced apart to form a generally triangular configuration, as indicated by the dotted lines **22**, with each contact at a vertex of the triangle and protruding from a face of the body portion **10** to form a plug or cap. The two flat contacts **16** and **18** form parallel, spaced-apart or mutually opposing planes, as shown. This first terminal portion **12** has the standard configuration for electrical plugs and outlets rated at 15 amperes—125 volts and having two current carrying terminals and one grounding terminal.

The second terminal portion **14** is best shown in FIGURE 3 and includes two elongated, generally flat clip-type contacts **24** and **26**, and a third hollow elongated contact **28** of generally round or D-shaped transverse cross-section. It is understood that the term "generally round" as used herein, includes all generally non-flat geometries, such as the D-shape shown in FIGURE 3 as well as polygonal shapes which can be considered to be

substantially or essentially round or an approximation thereto. Each of the contacts **24**, **26** and **28** are spaced apart to form a triangular configuration, as indicated by the dotted lines **30**, with each contact at a vertex at the triangle and recessed in the body portion **10** to form a receptacle in another face thereof. The two flat contacts **24** and **26** form mutually non-parallel planes, but have their respective longitudinal axes in parallel relation to each other; i.e., the longitudinal axes of each of the contacts **24** and **26**, extending normal to the plane of the drawing, are parallel, so that the planes of the contacts, if extended, would form a dihedral angle with each of the longitudinal axes parallel to the line of intersection of the planes.

The plug and receptacle terminal faces of the body **10** are disposed in mutually perpendicular planes. Discrete conducting means, illustrated as insulated leads or wires **32**, **34** and **36**, respectively interconnect each contact of the first terminal portion **12** to a corresponding contact of the second terminal portion **14**. Each of the leads **32**, **34** and **36** comprise a length of No. 14 A.W.G. stranded, bare copper wire, insulated with 1/32 inch polyvinyl chloride, and is suitably fastened to the internal ends of each of the contacts.

The body portion **10** of the connector is formed of a unitary and integral mass of insulating material, such as, for example, a 60° C. rated polyvinyl chloride compound, which constitutes the sole and entire support for each of the contacts and for the discrete conducting leads interconnecting them.

The connector, in accordance with the present embodiment of the invention, is manufactured economically and conveniently by means of a molding operation which is diagrammatically illustrated in FIGURE 4. As there shown, a steel mold **38** is provided having generally three separable sections **40**, **42** and **44**, and an ejector plunger or piston **46** which is movable in its longitudinal directions as indicated by arrow **48**. The molding operation, per se, comprises essentially conventional techniques, but is used to advantage to produce an improved structure suited for the purposes and requirements of the adapter device of the present invention.

In constructing the device, each of the contacts **24**, **26** and **28** of the 30 ampere-rated terminal, forming the receptacle portion, is supported in an upright position, as shown in FIGURE 4, within the lower portion **42** of the mold **38**, and arranged in the triangular configuration illustrated in FIGURE 3 which is necessary to the final product. These contacts may be supported by the use of any suitable means, such as for example, upright prongs or pins which are suitably shaped to mate with and adequately support each of the contacts. These pins or prongs may of course resemble the counter-part plug portion to which this terminal of the device is adapted for connection. The contacts **16**, **18** and **20** of the 15 ampere-rated terminal, forming the plug part of the device, are supported within sutiable slots or recesses in the mold end section **44** which are designed to receive each of these contacts over their length which is to protrude from the connector body **10**, thus leaving the remaining lengths of each of the contacts to extend into the mold and thus eventually to be in the body portion **10**.

Three short lengths of wire constituting the interconnecting leads **32**, **34** and **36** are then connected with their ends mechanically crimped to the internal or inner-extending ends of each of the contacts. Mechanical crimping of these connections is sufficient to make a satisfactory device since in the completed structure, no significant stresses or strains will be present on these leads and the entire support will be provided by the body portion of the device. However, other means of connection may, of course, be used if desired.

The cavity of the mold is then filled, through a suitable port **51**, with a plastic compound such as a 60° C. rated polyvinyl chloride compound having an organic peroxide catalyst and possibly other ingredients therein. This compound is in a solid pellet form at normal room temperatures and is liquified by the application of heat. Such molding compounds are generally commercially available and widely used in various molding operations. As diagrammatically shown in FIGURE 4, but not to scale, the pellets are placed into a hopper **53**, from which they are dropped into a heating tube **55** where the plastic is heated so that it will flow. The plastic in the tube is then driven by any suitable means, such as a ram or screw, into the mold **38**. After the mold has been filled, it is preferably heated by any suitable means, illustrated in FIGURE 4 as a resistance heater **50** connected to an appropriate source of electrical power and a suitable timer and control system **52**. The heat from the heater **50** causes the plastic compound within the mold to polymerize or set so that it becomes a solid which has a somewhat resilient characteristic in the nature of a relatively hard rubber. This characteristic provides a durable housing for the device since it will not break on impact, while at the same time it is sufficiently rigid to adequately support all of the components mounted therein. Additionally, the plastic material is inherently a good insulator, and in this regard, it is desirable that a minimum thickness of approximately 3/32 inch of the molded body be maintained from any live or conductive part therein. Also, the construction, as hereinafter described, results in a generally weather-proof device when it is in connected relation to the cable and receptacle for which it is desgined.

After the molded plastic has set, the mold **38** is opened, for example, by removing the upper portion **40**, and the ejector **48** is then moved upwardly (as shown in FIGURE 4) to eject the completed device from the lower portion **42** of the mold. The end portion **44** may also be removed, depending on the particular mold design employed. Various types of molds may, of course, be utilized in the manufacture of the device of the invention.

In the molding operation, a flange **54** is formed about the perimeter of the face of the 30 ampere-rated terminal **14** which extends from and is a unitary part of the body portion **10**. This flange serves as a weather seal when the connector is coupled to the 30 ampere-rated cable plug for which it was designed. Two semi-circular recesses or hollows **56** may be provided as shown in FIGURES 1 and 3 to mate with a complementary configuration on the cable plug. A boss **58** may also be molded as a unitary and integral portion of the body **10** on the face of the 30 ampere-rated terminal **14** to provide additional rigidity to the structure, and particularly to the weather-sealing flange.

During the molding operation, the ejector plunger **46** may normally extend approximately half-way or so into the mold cavity as indicated by dotted line **60** and thus forms a "mesa" or pedestal therewithin. Hence, this pedestal forms a hollow recess **62** in the completed device which extends therein a substantial distance of up to about half the total height. This recess **62** is conveniently formed within the triangular configuration **30** formed by the location of the contacts **24**, **26** and **28** so that a relatively uniform pressure is applied throughout the interface between the device and the mold to prevent snagging or binding on ejection. The particular configuration of the pedestal is not particularly critical so long as it sufficiently performs its intended function, and although a generally triangular configuration of the recess is shown in FIGURE 3, it may be circular or some other shape. Alternatively, a plurality of separate pedestals (and consequently recesses) may be provided which are desirably symmetrically arranged to provide a uniform ejection pressure on the device.

As has been described, the device in accordance with the present embodiment of the invention comprises two current carrying assemblies formed by the generally flat contacts of both the 15 ampere-rated and 30 ampere-rated

terminals and a grounding path formed by the generally rounded cross-section contacts of each respective terminal portion, and interconnecting insulated conductors which are all assembled and molded into a single unit. All of the metal or conductive components are preferably made of copper and/or brass and the plastic body portion is preferably molded from a polyvinyl chloride compound. The contacts are preferably brass, while the conductors may be copper. The construction is extremely economical to manufacture, has good electrical and physical properties for its intended use, and can withstand temporary overloading without any deleterious effects. The polymerized condition of the molded plastic body prevents it from softening or melting upon heating should the connector be subjected to greater than rated currents. Additionally, the direct and large area contact of the plastic body with the other components therein and the unitary nature of the plastic mass provide relatively good cooling, since there are no air-layer boundaries between the conductive parts and the external surfaces of the device. The additional surface areas provided by the plunger-formed recess **62** also increases the heat dissipating or cooling effects.

Plastics, rubber or rubber-like materials other than that specifically described may be employed for the body portion of the device. Although the right-angle configuration between the terminal faces, as illustrated, is advantageous in permitting greater ease of manufacture in the described molding and ejecting operations, other configurations, such as a straight-through form, may of course be employed. And although one embodiment of the invention has been herein described, various modifications will be apparent to those skilled in the art.

Various features of the invention are set forth in the following claims.

What is claimed is:

1. An electrical connector for adapting a terminal of one, high current rated, contact configuration to a terminal of another, but lower current rated, contact configuration, comprising a body portion and first and second terminal portions, said first and second terminal portions each including two elongated, generally flat contacts and a third contact of generally round transverse cross-section, each of the contacts of each terminal portion being spaced apart to form a triangular configuration with each contact at a vertex of the triangle, the two flat contacts of said first terminal portion forming opposing parallel planes and the two flat contacts of said second terminal portion forming mutually non-parallel planes but having their respective longitudinal axes in parallel relation, discrete conducting means interconnecting each contact of the first terminal portion to a corresponding contact of the second terminal portion, said body portion being formed of an integral mass of insulating material and constituting the sole support for each of said contacts and said discrete conducting means, said integral mass of insulating material of said body portion being composed of a molded plastic composition, said first terminal portion being disposed in one face of said body portion, said second terminal portion being disposed in another face of said body portion, and said body portion having a hollow recess devoid of any terminal portion extending therein from the surface of said another face.

2. The electrical connector of claim **1** wherein the three contacts of said first terminal portion protrude from said body portion to form a plug, and the three contacts of said second terminal portion are recessed in said body portion to form a socket, the two flat contacts of said first terminal portion each comprising prongs, the two flat contacts of said second terminal portion each comprising clips, and said contacts of round transverse cross-section being ground terminals.

3. The electrical connecter of claim **1** wherein the plastic composition is a heat setting polyvinyl chloride compound.

4. The electrical connector of claim **1** wherein said hollow recess is located within the triangle formed by the contacts of said second terminal portion.

5. The electrical connector of claim **1** wherein said body portion has a unitary weather-sealing flange extending about the perimeter of said another face.

6. The electrical connector of claim **1** wherein said one and another faces of the body portion are disposed in mutually perpendicular planes.

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U.S. Cl. X.R.

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