

Aug. 27, 1968

W. V. PAUZA ET AL

3,399,374

DISENGAGEABLE ELECTRICAL CONNECTIONS

Filed July 14, 1966

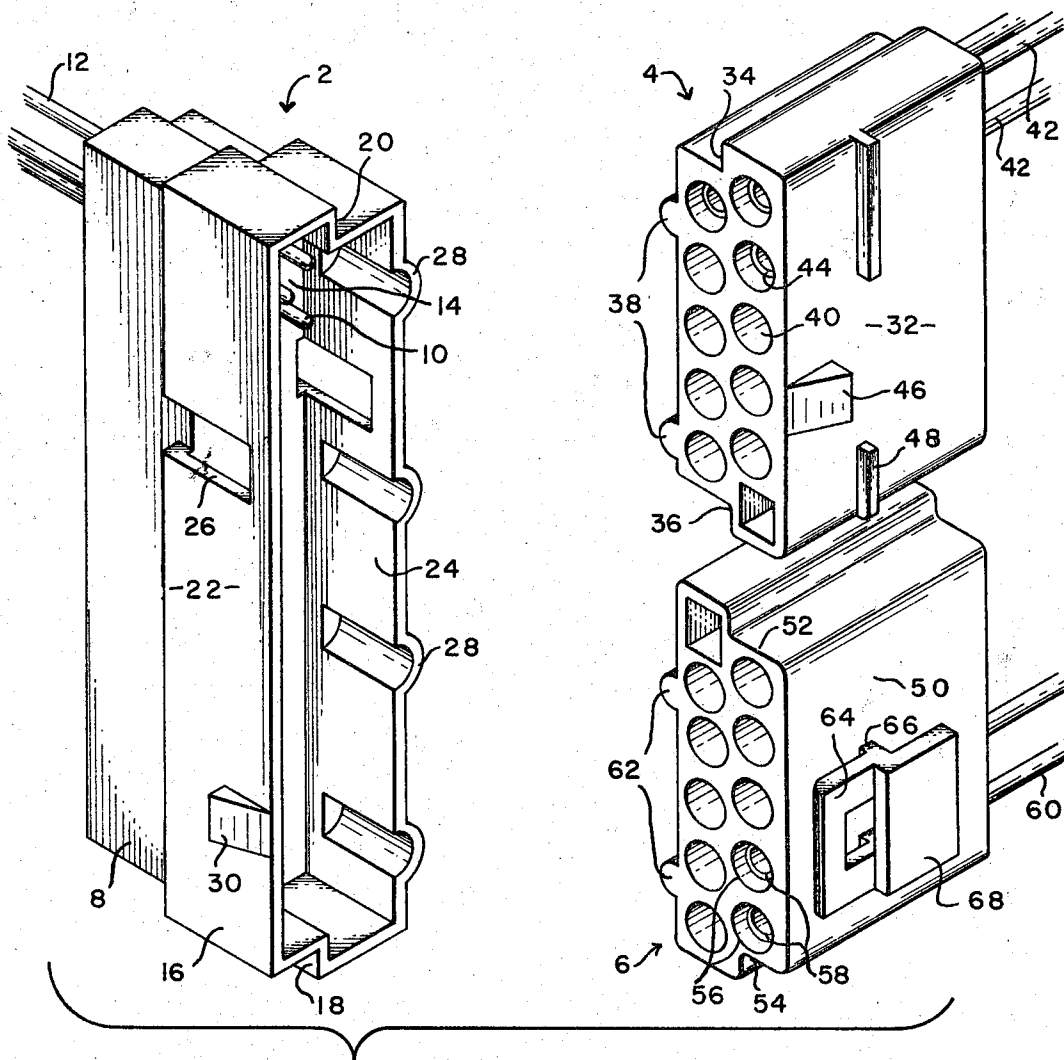


FIG. 1

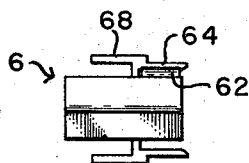


FIG. 2

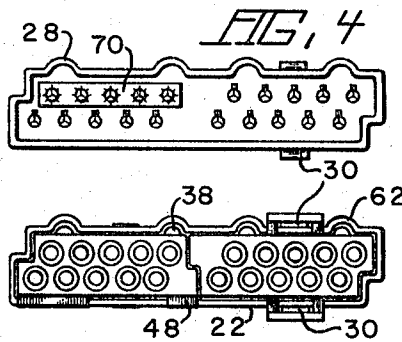


FIG. 3

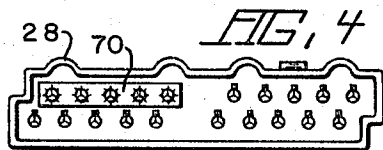


FIG. 4

1

3,399,374

DISENGAGEABLE ELECTRICAL CONNECTIONS
William Vito Pauza and John Philip Kunkle, Harrisburg,
Pa., assignors to AMP Incorporated, Harrisburg, Pa.
Filed July 14, 1966, Ser. No. 565,155
5 Claims. (Cl. 339-91)

ABSTRACT OF THE DISCLOSURE

Electrical connector comprises receptacle having hood portion and two plugs which are insertable into the hood in side-by-side relationship. Polarizing means effective between the receptacle and the plugs assure insertion of the plugs in predetermined positions. Disengageable locking means are provided on a first one of the plugs and the hood for securing the first plug semipermanently to the receptacle. Disengageable latching means are provided on the second plug and the hood for latching the second plug to the receptacle in a manner such that it can be easily removed. In use, power is transmitted through the connector by means of contacts in the second plug and the receptacle so that during servicing, second plug will logically be disengaged by the technician thereby to de-energize the equipment on which the connector is mounted.

This invention relates to multi-contact disengageable connecting devices of the type used for making disengageable connections among a plurality of conductors. The disclosed embodiment of the invention is particularly intended for use in appliance wiring although the principles of the invention are applicable to other uses.

When an electrical appliance, such as a washing machine or a refrigerator is assembled, the various electrical connections required are made by means of harnesses of wires having terminals and, in some instances, terminal housings on their ends. At the time of assembly, and after the motors, lights, electrically actuated timers, and similar devices have been mounted on the appliance, the terminals on the ends of the harnesses are connected to the electrical devices in the appliance at the appropriate locations. The present invention is particularly directed to the problem of providing a connecting means for such harnesses which will contain the power input for the appliance and which is constructed such that anyone working with the appliance to make repairs or adjustments will be required to first disengage the power input lines for the appliance and will thereby avoid any shock hazard while the repairs are being made.

It is an object of the invention to provide an improved electrical connector. A further object is to provide a connector having a single receptacle and having two or more plugs adapted to be mated with the receptacle. A still further object is to provide a connector having two plugs, one of which is semi-permanently coupled to the receptacle and the other of which can be disengaged from the receptacle with relative ease. It is a further object to provide an improved power distribution system in a disengageable electrical connector which is reliable and which is substantially foolproof particularly as regards shock hazard.

These and other objects of the invention are achieved in a preferred embodiment of a connector comprising a receptacle and two plugs. The receptacle has a hood extending from, and surrounding, its mating face, the plugs being insertable into this hood individually to com-

2

plete electrical circuits of the appliance. A semi-permanent locking means is provided on the receptacle and on one of the plug members, this locking means comprising a detent system which secures the parts together in a manner such that they can be disengaged only by using a suitable tool. The other plug member has a readily disengageable latch system cooperable with latching means on the receptacle so that this plug member can be easily removed from the receptacle without the aid of any tools. The power input conductors have terminals on their ends which are mounted in the readily disengageable plug and the power is distributed from these input terminals to other terminals in the receptacle by means of commoning bars. By virtue of this arrangement, anyone repairing or adjusting the appliance is encouraged to remove the readily disengageable plug from the receptacle when he first undertakes his task and in doing so, he will interrupt the flow of power to the electrical circuits of the appliance. He will thus protect himself against any shock hazard at the outset since after removal of this disengageable plug, none of the electrical lines in the appliance will be energized.

In the drawings:

FIGURE 1 is a perspective exploded view of an electrical connector assembly in accordance with the invention;

FIGURE 2 is a side view of one of the plugs forming part of the assembly of FIGURE 1;

FIGURE 3 is an end view of the plug side of the connector assembly with the two plugs coupled to the receptacle; and

FIGURE 4 is a plan view of the mating face of the receptacle portion of the connector and showing the manner in which commoning bars or strips are used to interconnect various conductors in the receptacle.

The disclosed embodiment comprises a receptacle 2 and a pair of plugs 4, 6 which are separately mateable with the receptacle. The receptacle comprises a block 8 of suitable insulating plastic such as nylon and has a plurality of cavities extending therethrough in which contact pins 10 are mounted. The conductors 12 secured to these contact pins extend from the rearward side of the block 8 and the pins 10 extend beyond the mating face 14 of the block. A hood generally indicated at 16 extends from the block 8 and entirely surrounds the contact pins 10. The narrow sides of this hood are stepped or offset as shown at 18 and 20 to prevent improper placement of the plugs 4, 6 when the parts are engaged with each other. The sides 22, 24 of the hood are provided with a rectangular opening 26 adjacent to their upper ends, as viewed in FIGURE 1, for cooperation with latching bosses on the plug 4 as will be explained below. The side 24 additionally is provided with a plurality of outwardly concave semi-cylindrical recesses 28 for cooperation with similarly shaped bosses on the plugs 4, 6. At their lower ends, as viewed in FIGURE 1, the sides 22, 24 are provided with inclined plane bosses 30 which slope rearwardly from the leading edges and which cooperate with latching hasps as will also be described below.

The plug 4 comprises a block 32 of insulating plastic and has a stepped side 34 which conforms to the step in the side 20 of the hood 16. The lower side 36, as viewed in FIGURE 1 of this block, is also stepped and conforms to a complementary step 52 of the plug 6. Semi-cylindrical bosses 38 are provided on the adjacent side of the

block which conform to the semi-cylindrical recesses 28, these bosses and recesses being located on the plugs 4, 6 in a manner which prevents mismatching or improper engagement of the plugs with the receptacle. The recesses 28 and bosses 38 thus constitute a polarizing means for the plug.

The block 32 has a plurality of contact-receiving cavities 40 therein for the reception of contact sockets 44 crimped or otherwise secured to wires 42. Inclined plane bosses 46 are provided on the sides of the block for cooperation with the openings 26 in the hood 16, the stiffness of this hood being such that after the plug 4 has been inserted into the hood and the bosses 46 engaged with the openings 26, decoupling or disengagement is virtually impossible unless a prying tool is used to wedge the hood away from the bosses. The plug 4 thus constitutes a more or less permanently coupled plug which is disengageably locked to the receptacle and cannot be easily removed from the receptacle after it has been coupled thereto.

The plug 6 comprises an insulating block 50 of plastic material also having stepped sides 52, 54 and having a plurality of cavities 56 extending therethrough. Socket terminals 58 on the ends of wires 60 are mounted in these cavities so that these wires will be coupled to contact pins in the lower portion of the block 8 when the plug 6 is inserted into the hood. Semi-cylindrical bosses 62 similar to the bosses 38 are also provided on the surface of the block 50 for cooperation with the two lower recesses 28 in the hood 16.

The block 50 is disengageably secured to the receptacle by means of hasps 64 integrally molded on the sides of the blocks and extending from columns 66 on the sides of the block. Each hasp has an integral rearwardly extending finger piece 68 which, when pressed, causes the hasp to be elevated above the surface of the block 50 to permit relatively easy disengagement of the parts. The plug 6 is coupled to the receptacle by merely pushing it into the hood until the hasps 64 snap over the rearwardly facing side of the inclined plane bosses 30.

The disclosed embodiment of the invention is intended for use in wiring of appliances such as refrigerators or washing machines. Such devices are ordinarily wired by means of harnesses; for example, the entire group of wires 12 (only some of which are shown) might constitute one harness while the groups 42 and 60 constitute second and third harnesses used to make the interconnections among the various electrical components of the appliance. In accordance with the present invention, the power input conductors have terminals mounted on their ends and form part of the harness 60 so that these terminals will be located in two of the cavities of the plug 6. Where it is necessary to conduct power from terminals in the plug 6 to conductors in the harness 42 or to conductors in the upper part of the receptacle, commoning bars as shown at 70 are mounted on the pins 10 in the receptacle. These commoning bars in the disclosed embodiment merely constitute strips of metal having openings therein through which the appropriate pins extend and which make electrical contact with the pins.

At the time of assembly of the apparatus, the plugs 4, 6 will be coupled to the receptacle and power will be supplied to the apparatus when the two wires of the harness 60 which constitute the power inputs are plugged into a wall outlet or the like.

In the event that the appliance requires servicing, the technician performing the work will be induced at the outset to disengage the plug 6 from the receptacle 2 because of the ease with which this plug can be decoupled from the receptacle. All the technician need do is squeeze the finger pieces of the hasps and remove the plug 6 from the receptacle to accomplish this decoupling operation. When he does so, he will have de-energized all of the circuits in the appliance and no shock hazard will exist. If he is required to decouple the plug 4 from the recepta-

cle 2, he can do so by inserting a screw driver beneath the hood 18 and wedging the hood outwardly from the bosses 46. However, he will not decouple the plug 4 from the receptacle as a first step because of the difficulty of doing so. It will be appreciated that if this plug 4 were first decoupled from the receptacle, the power input leads would still be connected to the conductors of the harness 12 and the possibility of the technician being shocked would remain.

Aside from the advantage of avoiding any possible shock hazard, the disclosed embodiment has the additional advantage of permitting the use of a single receptacle 2 where, under other circumstances, several receptacles would be required. It should be explained that where several contact terminals are provided in a connector, the force required to couple the two parts of the connector with each other will depend on the number of contact terminals and their size. This coupling force can become so high in large connectors having a large number of contacts that the coupling operation is rendered difficult. Since this coupling and decoupling operation must be carried out manually, there is thus a limit to the number of terminals which ordinarily can be provided in a single connector assembly. In the disclosed embodiment, however, the plugs 4, 6 can be made of a size such that they can be easily coupled or decoupled from the receptacle although if the same number of contacts as are contained in the plugs 4, 6 were provided in a single block, manual coupling and decoupling would be impossible. If desired, three or more plugs can be provided rather than two as in the disclosed embodiment.

We claim:

1. Electrical connector means comprising a receptacle and at least two plugs, said receptacle having a hood extending from the mating face thereof parallel to the axis of said connector, said plugs being insertable into said hood in a predetermined side-by-side relationship, polarizing means effective between said receptacle and said plugs for preventing improper insertion of said plugs into said board, whereby predetermined contact terminals in said plugs are coupled with predetermined terminals in said receptacle, disengageable locking means on a first one of said plugs and said hood for securing said first plug semi-permanently to said receptacle, and disengageable latching means on the second one of said plugs and said receptacle for disengageably latching said second plug to said receptacle, said latching means being more readily detachable than said locking means.

2. Electrical connector means as set forth in claim 1 wherein said hood has openings therein and said first plug has bosses thereon for cooperation with said openings, said openings and said bosses constituting said locking means.

3. Electrical connector means as set forth in claim 1 wherein said latching means comprises hasp means on said second plug and boss means on said hood.

4. Electrical connector means as set forth in claim 1 wherein said receptacle and said plug contains contact terminals, conductors secured to, and extending from said contact terminals, at least two of said conductors comprising power input conductors, said power input conductors being secured to terminals contained in said second plug whereby, upon decoupling of said second plug from said receptacle, the other ones of said conductors are de-energized.

5. Electrical connector means comprising a receptacle and at least two plugs, said receptacle having a hood extending from the mating face thereof parallel to the axis of said connector, said plugs and said receptacles having contact terminals therein, conductors secured to and extending from said contact terminals, said plugs being insertable into said hood in a predetermined side-by-side relationship whereby predetermined conductors secured to terminals in said plugs are electrically connected to predetermined conductors secured to terminals in said receptacle, disengageable locking means on a first one of

5

said plugs and said hood for securing said first plug permanently to said receptacle, and disengageable latching means on the second one of said plugs and said receptacle for disengageably latching said second plug to said receptacle, said latching means being more readily detachable than said locking means, two of said conductors constituting power supply conductors, the terminals on the ends of said two conductors being contained in said second plug whereby, all of said conductors can be de-energized by disengaging said second plug from said receptacle.

5

10

6

References Cited

UNITED STATES PATENTS

3,146,051	8/1964	Woofter et al.	339—91
3,146,052	8/1964	Burch et al.	
3,213,407	10/1965	Thomas et al.	339—192
3,255,330	6/1966	MacKenzie et al.	339—19

MARVIN A. CHAMPION, *Primary Examiner*.

J. H. McGLYNN, *Assistant Examiner*.