

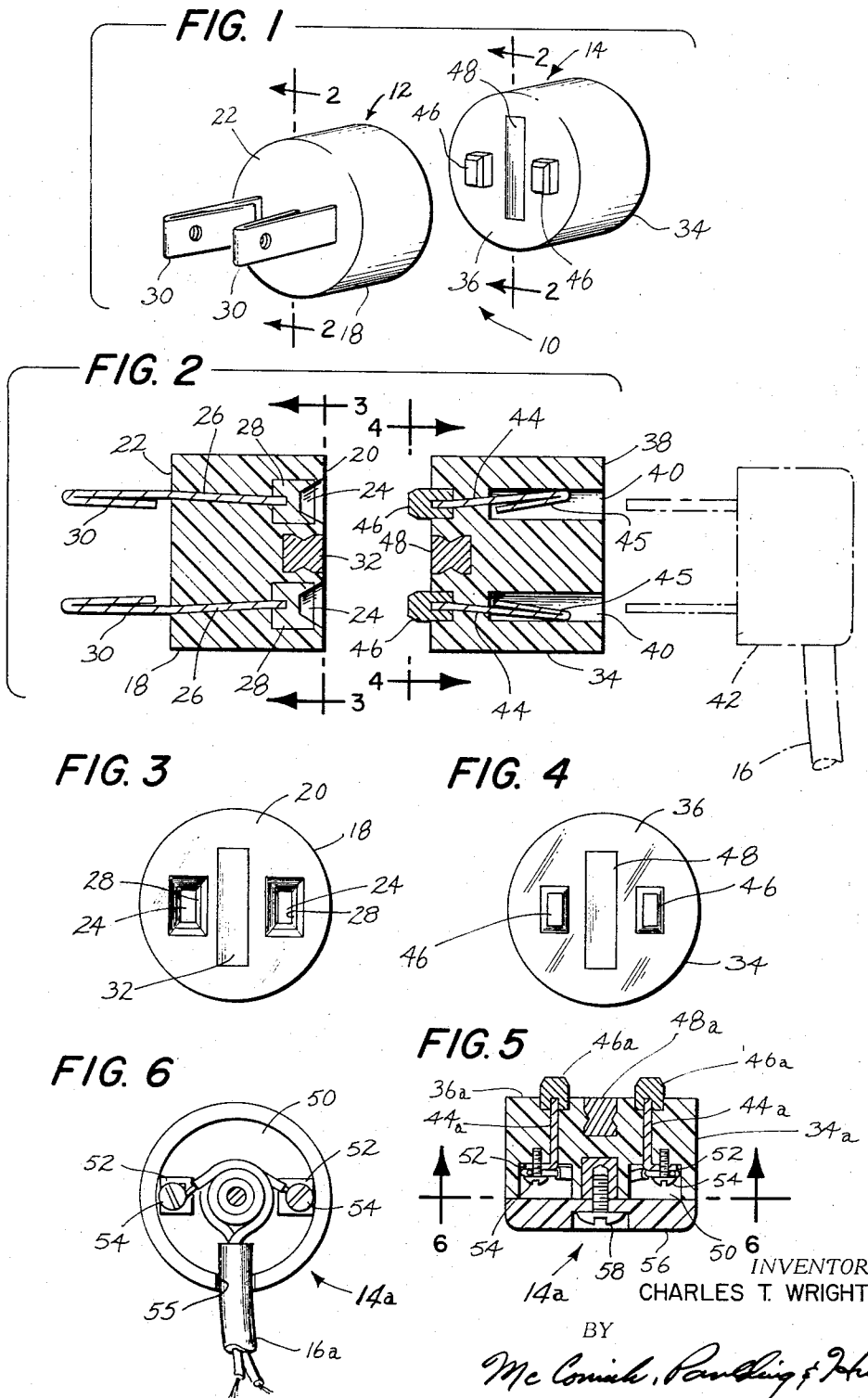
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MAGNETIC PLUG ADAPTER

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MAGNETIC PLUG ADAPTER

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ABSTRACT OF THE DISCLOSURE

An adapter having plugs at one end to be received in the conventional baseboard sockets is provided with socket terminals on the other end which taper to receive, in one embodiment, a second adapter having tapered contacts on one end and sockets on the other end to receive the prongs of a conventional plug. A magnet is disposed in each of the mating faces of the two adapters and the holding strength thereof is such as to permit separation between the adapters rather than between the first named adapter and the receptacle. Since the magnets are in the form of bars each having a north and a south pole the connection between the two adapters is polarized. In the second embodiment, a connection to the wires of a cable are substituted for the sockets of the second adapter. The material of the bodies of both adapters and of the plug may be of a non-conductive paramagnetic material.

This invention relates to improvements in electrical connectors and deals more particularly with novel break-away electrical connectors for coupling flexible electrical conductors with electrical socket elements.

Most detachable flexible conductor extension circuits employ connectors having diverse mating coupling parts such as a socket receptacle and a mating plugging element. Common among these connectors is the so-called baseboard outlet or socket and mating male spaced pronged plug. Connectors of this type are generally designed to detach or separate when a straight pull or force is exerted either directly upon the plug, or upon the flexible conductor associated with it. However, such connectors generally tend to hold fast when a pulling force, or thrust is exerted even slightly laterally relative to the plugging element.

The failure of such couplings to release upon the applications of a lateral force has been at least in part responsible for the injuries that frequently result from tripping accidents in both home and industry involving electrical extensions circuits. Often times a fall may be avoided or the severity of the resulting fall injury may be reduced if the electrical coupling releases when the individual's foot becomes caught upon the electrical extension.

The careless disconnecting of home electrical appliances is a frequent source of appliance failure. Many persons frequently resort to the simple expedient of pulling upon an appliance cord to disengage a plug from an electrical outlet. Such practice often results in damage to the appliance, or to the electrical outlet when the mating coupling parts fail to readily disengage.

Accordingly, it is the primary object of the present invention to provide a breakaway electrical connector for coupling a flexible electrical conductor with an electrical socket element which will readily disengage when a disengaging force is applied to the conductor in a direction generally away from the socket element.

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Another object of the invention is to provide a break-away adapter attachment for coupling an electrical extension circuit to an existing electrical socket element.

A further object of the invention is to provide a break-away adapter attachment for converting a conventional electrical coupling having diverse mating parts to a break-away coupling.

The drawing shows preferred embodiments of the invention and such embodiments will be described, but it will be understood that various changes may be made from the constructions disclosed, and that the drawing and description are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawing:

FIG. 1 is a perspective view of an electrical connector embodying the present invention, the adapter and attachment parts of the connector being shown spaced apart.

FIG. 2 is a sectional view of the connector of FIG. 1 taken along the lines 2-2 of FIG. 1 and showing the parts of the connector spaced apart, a conventional male plug being shown in phantom in position relative thereto.

FIG. 3 is an end view of the adapter part of the connector of FIG. 1 taken along the line 3-3 of FIG. 2.

FIG. 4 is an end view of the attachment part of FIG. 1 taken along the line 4-4 of FIG. 3.

FIG. 5 is a half-sectional view showing a modified form of the attachment part of FIG. 1 and FIG. 2.

FIG. 6 is a sectional view of the attachment part of FIG. 5 taken along the line 6-6 of FIG. 5.

Referring in detail to the drawings, and particularly to FIGS. 1 and 2, an electrical connector made in accordance with one form of the invention is illustrated and designated generally by the reference numeral 10. The connector 10 generally comprises a first component or adapter 12 for connection with an electrical socket element not shown and a second component or attachment 14 adapted for electrical connection with a flexible conductor 16. The adapter 12 and the attachment 14 are adapted for mutual engagement to provide a path of electrical current between the socket and the conductor or electrical cord 16. Engagement between the adapter 12 and the attachment 14 is maintained by a connecting means which is adapted to permit mutual separation therebetween when a disengaging force is applied to the conductor in any direction generally away from the socket. The disengaging force necessary to separate the attachment from the adapter is generally substantially less than the force necessary to separate the adapter from the socket element in which it is received.

The electrical connector of the present invention is particularly suited for use in coupling a flexible electrical conductor or cord with a conventional electrical outlet or socket of the so-called baseboard type which receives a mating two-pronged plug. The invention is illustrated with reference to such application, however, it will be apparent that it is also applicable for use with other electrical coupling arrangements, such as jack plugs and sockets and coaxial cable connections and the like, and such applications are contemplated within the scope of the invention.

To facilitate the provision of a breakaway electrical extension circuit in association with an existing electrical socket without the necessity of rewiring or otherwise ma-

terially altering the existing socket, the adapter 12 is provided. The adapter may be made to accommodate one or more electrical extension circuits, however, in the illustrated embodiment of the invention, the adapter is shown to comprise a body portion or housing 18 for accommodating a single electrical extension circuit. An electrically nonconductive material which is also preferably magnetically permeable is used to make the housing 18 for a reason that will be hereinafter apparent. The housing may be made in sections and may assume various forms but as shown it is a unitary structure molded from a suitable plastic material having a generally cylindrical form and including a first face 20 and a second face 22.

At least one recess 24 is defined within the housing 18 for receiving an electrical contact associated with the attachment 14 to be hereinafter described but preferably two relatively shallow spaced apart socket recesses 24, 24 are defined within the first face 20 generally diverging thereto.

For establishing electrical contact with the socket element or electrical outlet and for providing a path of electrical current through the housing 18, at least one conducting element 26 is provided. In the illustrated embodiment of the invention there are two conducting elements 26, 26 at least partially disposed within the housing 18. Each of the conducting elements 26 includes a terminal 28 preferably disposed within an associated recess 24, providing a means for establishing electrical contact with the attachment 14. Each of the conducting elements 26 further includes a prong 30 projecting outwardly from the second face 22. In the embodiment shown the spaced apart parallel aligned prongs 30, 30 are adapted to be received in the receptacle of a conventional socket element or electrical outlet.

A first magnet 32 is preferably disposed within the housing 18 proximate the first face 20 providing a means for maintaining engagement between the adapter 12 and the attachment 14 in a manner to be hereinafter further described.

To establish a path of electrical current between the adapter 12 and the conductor or electrical cord 16, the conductor attachment 14 is provided. The attachment is adapted for engagement with the adapter 12 and for electrical connection to the cord 16. The attachment 14 comprises a body portion or casing 34 having a configuration preferably generally similar to that of the housing 18. Like the housing 18 the casing 34 is made from an electrically nonconductive material which is also preferably magnetically permeable. The casing is preferably cylindrical and includes a third face 36 and a fourth face 38. At least one elongated inwardly extending receptacle 40 is defined by the casing 34 normal to the fourth face 38 for receiving a male plugging element associated with the cord 16. However, in the illustrated form of the invention two parallel aligned spaced apart female receptacles are provided for receiving the male prongs of a conventional plug 42 associated with the cord 16.

A path of electrical current between the plug 42 and the adapter 12 is established by at least one contacting element 44. But preferably and as shown, two such contacting elements are provided. Each of the contacting elements 44 is preferably formed from a flat strip of electrically conductive metal, such as a copper alloy and includes a generally U-shaped end portion disposed within an associated receptacle 40 and suitably bent to provide a leaf spring having a contact surface 45 for making electrical contact with an associated prong on the plug 42.

Preferably each of the contacting elements 44 further includes a contact 46 projecting outwardly from the third face 36. Each of the contacts is adapted to be received within an associated recess 24 in the housing 18 and to engage a respectively associated terminal 28 when the third face 36 is brought into engagement or near engagement with the first face 20. The projecting or terminal

end of each of the contacts 46 is chamfered to complement at least a portion of an associated recess 24 to facilitate ready removal therefrom for a reason that will be hereafter apparent. To assure positive electrical contact between the contacts 46, 46 and the respectively associated terminals 28, 28 allowance may be made for a slight clearance between the associated faces 20 and 36 when the contacts are in engagement with the terminals. It should be apparent from the foregoing description that each of the conducting elements 26 cooperates with a respectively associated contacting element 44 to form a conductive means for providing a path of electrical current between a respectively associated male element 30 and the conductor 16.

A second magnet 48 similar to the first magnet 32 is preferably disposed within the casing 34 proximate the third face 36.

Connecting or securing means for maintaining engagement between the adapter 12 and the attachment 14 is provided by the cooperation of the first magnet 32 and the second magnet 48. The connecting means may comprise one or more magnets and the configuration of the magnets may vary. However, in the illustrated embodiment of the invention a pair of bar magnets is shown.

The first magnet 32 and the second magnet 48 are respectively positioned within the adapter 12 and the attachment 14 so as to register when the attachment is brought into engagement with the adapter. The two magnets are further arranged so that their flux paths link for mutual magnetic attraction when the two parts of the device are brought into engagement. Thus, the magnetic field of the first magnet 32 coacts with the magnetic field of the second magnet 48 to mutually attract the adapter 12 and the attachment 14 with a force sufficient to maintain the two parts in engagement.

In the illustrated form of the invention, bar magnets are employed and are respectively positioned in longitudinal alignment with the first face 20 and the third face 36, as best shown in FIGS. 3-4. Since the mating faces 20 and 36 are symmetrical, it should be apparent that these faces may be brought into mutual engagement in one of two possible positions. It should be further apparent that bar magnets having opposite end poles arranged in the position shown will cause the faces to be attracted to one another when they are brought into close proximity in one possible assembly position and will cause repulsion therebetween when assembly in the opposite position is attempted. This magnet arrangement advantageously facilitates the rapid accurate connection of polarized electrical circuits.

It should be further apparent that if each magnet is positioned with a single pole thereof proximate a respectively associated face, the respective parts may be arranged for mutual attraction in either possible assembly position. Such arrangement would be preferable when circuit polarity is not a consideration.

A similar connection between the two parts of the coupling may be effected by utilizing a magnet disposed within either of the connector elements to attract a paramagnetic material disposed within the opposite element.

When a magnetic connecting means is employed, the force required to disengage or separate the attachment from the adapter will be dependent upon the strength of the magnetic field. Thus, a connecting means may be provided which permits the attachment to be separated from the adapter by an applied disengaging force substantially less than the force ordinarily necessary to separate the adapter male element from an associated socket or outlet.

As previously noted, the general configuration of the contacts 46, 46 and of the generally complementary contact-receiving recess facilitates ready removal of the contact from the respectively associated recesses. Thus, the two parts of the connector device are adapted to separate when a disengaging force is applied to the associated conductor in any angular or lateral direction generally away

from the socket or outlet receiving the adapter. It should be apparent that other arrangements are possible for establishing readily disengageable electrical contact between the two elements comprising the conductor without departing from the spirit of the invention.

In FIGS. 5-6, there is shown a modification of the attachment embodiment of FIGS. 1-2. The modified attachment indicated generally by the numeral 14a is shown to comprise a casing 34a made from a material similar to the casing 34 and including a third face 36a. Included within the casing 34a is at least one contacting element 44a but preferably, and as shown, two contacting elements 44a, 44a are provided. Each of the contacting elements includes a contact 46a projecting from the face 36a. A magnet 48a is disposed within the casing 34a proximate the face 36a. It will be noted that in all of the foregoing respects the connector attachment 14a is substantially identical to the connector attachment 14 previously described.

However, the attachment 14a of the modified form differs from the previously described attachment 14 in that the casing 34a preferably defines a cavity or annular recess 50 wherein direct electrical connection with the conductor is made.

Each of the conducting elements 44a includes a terminal end 52 disposed within the recess 50 and as shown is turned radially outwardly therein. Each of the terminal ends 52, 52 is preferably threaded to receive a terminal screw 54 for establishing electrical connection with an electrical conductor 16a. An opening 55 within the side of the casing 34a communicates with the annular recess 50 and receives the electrical conductor 16a. Thus, when the conductor is secured to the associated terminal ends 52, 52, a path of electrical current is provided between the conductor and the contacts 46a, 46a. A cover 56 engaging the casing 34a and secured thereto by a threaded fastener 58 provides a closure for the recess 50 to prevent accidental contact with the terminal ends.

The invention claimed is:

1. An electrical connector for providing a breakaway electrical coupling between a conductor and a socket having a receptacle, said connector comprising a first component having a male element adapted to be received in the receptacle to establish electrical connection with the socket, a second component adapted for electrical connection to the conductor, said first component and said second component being mutually engageable, conductive means for providing a path of electrical current between said male element and the conductor when said components are engaged and separate securing means for maintaining engagement between said components, said separate securing means being adapted to permit said components to mutually separate when a disengaging force is applied to the conductor in any direction generally away from the socket, and said separate securing means being adapted to separate under the influence of a disengaging force substantially less than the force necessary to separate said male element from the receptacle.

2. The combination defined in claim 1 wherein said conductive means comprises at least one conducting element associated with one component and having a terminal disposed within a recess defined by said one component, and a contacting element associated with the other component and having a contact outwardly projecting from said other component, said contact being received within said recess and engaging said terminal when said components are engaged.

3. The combination defined in claim 2 further characterized by said one component having at least one face, and said recess opening through said face and generally diverging thereto, at least a portion of said contact generally complementing an associated portion of said recess.

4. The combination defined in claim 1 wherein said separate securing means comprises two magnets, one of said magnets being associated with said first component

and the other of said magnets being associated with said second component, said magnets being magnetically coupled to maintain engagement between said first component and said second component.

5. The combination defined in claim 1 wherein said separate securing means comprises at least one magnet associated with one of said components, and a piece of paramagnetic material associated with the other of the said components, said magnet being arranged to magnetically attract said paramagnetic material for maintaining engagement between said adapter and said conductor attachment.

6. The combination defined in claim 1 wherein said separate securing means comprises two magnets, one of said magnets being associated with said first component and the other of said magnet being associated with said second component, said magnets being so arranged that the magnetic fields thereof coact to produce a condition of mutual magnetic attraction in a first angular position of the first component relative to the second component and a condition of mutual magnetic repulsion in a second angular position of the first component relative to the second component, whereby said components are maintained in engagement in said first position only.

7. The combination defined in claim 1 wherein the electrical conductor includes a plugging element, said combination further characterized by said second component defining at least one receptacle for receiving the plugging element.

8. The combination defined in claim 1 further characterized by fastener means associated with said second component for electrically connecting the conductor thereto.

9. In a breakaway electrical connector for coupling a flexible electrical conductor with a conventional electrical socket element, said connector comprising a male adapter having a magnetically permeable electrically nonconductive housing including a first face and a second face, said first face having therein defined at least one socket recess generally diverging to said first face, at least one conducting element, said conducting element having a terminal disposed within said recess and including a prong projecting outwardly from said second face for engaging the socket element to establish electrical connection therewith, an attachment having a magnetically permeable electrically nonconductive casing including a third face, at least one contacting element adapted for electrical connection to the conductor, said contacting element including a contact projecting from said third face, said adapter and said attachment being engageable with said third face in close proximity to said first face and with said contact engaging said terminal within said recess, and connecting means for maintaining engagement between said connector and said attachment, said connecting means being adapted to permit said connector and said attachment to separate when a disengaging force is applied to the conductor in any direction generally away from the socket element and said connecting means being adapted to separate under the influence of a disengaging force substantially less than the force necessary to separate said prong from the socket element.

10. The combination defined in claim 9 wherein said connecting means comprises a first magnet disposed within said housing proximate said first face, and a second magnet disposed within said casing proximate said third face, said magnets being so arranged that the magnetic fields thereof coact to produce a condition of mutual magnetic attraction in at least one angular position of said attachment relative to said connector.

11. The combination defined in claim 9 wherein the electrical conductor includes a plugging element, said combination further characterized by said casing including a fourth face and defining at least one receptacle opening therethrough for receiving said plugging element, at least

a portion of said contacting element being disposed within said receptacle for establishing electrical contact with the plugging element.

12. The combination defined in claim 9 further characterized by said casing defining a cavity, said contacting element including a terminal end disposed within said cavity, fastener means associated with said end for electrically connecting said conductor thereto, and a cover engaging said casing and secured thereto providing a closure for said cavity.

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