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M. J. TOLEGIAN
MAGNETIC ELECTRICAL COUPLING

3,144,527

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FIG. 1

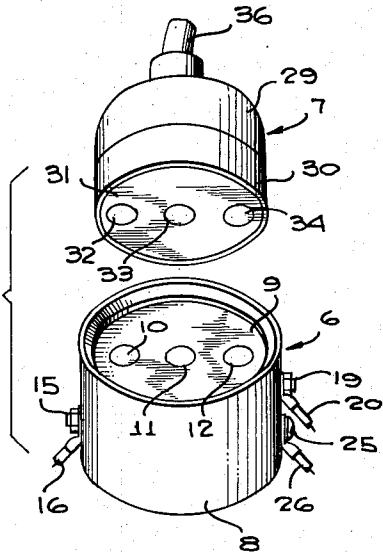


FIG. 4

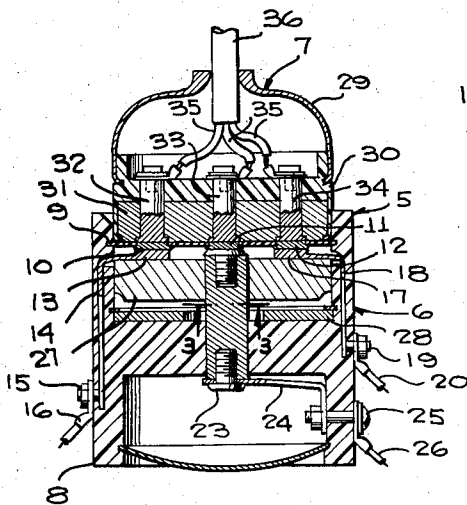
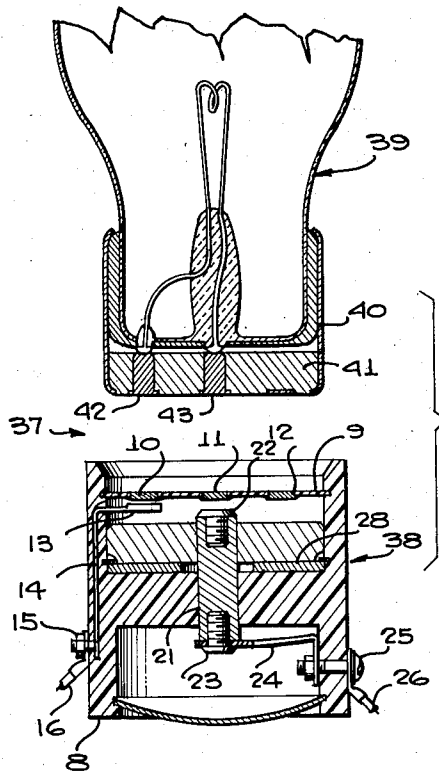
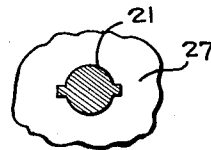


FIG. 2

FIG. 3



INVENTOR

MANUEL J. TOLEGIAN

Lowy & Linehart

BY

ATTORNEYS

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MAGNETIC ELECTRICAL COUPLING
Manuel J. Tolegian, 3960 Glenridge Drive,
Sherman Oaks, Calif.

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This invention relates in general to new and useful improvements in electrical fittings, and more specifically to a novel magnetic electrical connector.

This invention particularly relates to an electrical connector which is suitable for remote coupling. One of the major disadvantages of existing types of connectors is the fact that the connectors must be aligned in advance before they may be assembled. There are many places where it is difficult to accomplish this. This is particularly true in installations wherein the elements of a connector cannot be assembled by hand, but must be manipulated with mechanical devices. An example of this is radioactive rooms and the like.

In view of the foregoing, it is the primary object of this invention to provide an electrical connector which is of a construction wherein the two halves thereof are automatically alignable so that it is merely necessary to move the two halves into engagement with each other, at which time the halves align with each other and provide the necessary electrical connection.

Another object of this invention is to provide a novel electrical connector of the type wherein the connection between the receptacle and plug of the connector is accomplished by means of magnets, and the receptacle includes normally electrically isolated contacts, which contacts are recessed within the fitting of the receptacle so as to prevent accidental touching of the contacts.

Still another object of this invention is to provide an electrical connector of the type wherein magnets are employed for connecting together the two halves of the connector, the connector further utilizing one of the magnets for moving contacts into engagement with one another so as to energize normally electrically isolated contacts to complete the electric circuit as the two halves of the connector are moved together.

A further object of this invention is to provide a novel magnetic electrical connector wherein the receptacle and plug of the connector are provided with magnets, each of the magnets having a single north pole and a single south pole and the magnets being securely connected to the fittings thereof wherein the magnets are operable to align the plug and receptacle of which the magnets are parts to assure proper alignment of the contacts of the connector.

A still further object of this invention is to provide a novel magnetic electrical connector having safety features incorporated therein to prevent the accidental energization of exposed contacts, the receptacle of the connector including normally electrically isolated contacts and electrically energized contacts underlying the normally electrically isolated contacts for movement into engagement therewith, and a magnet operable to move the two sets of contacts into engagement with one another to complete the circuits between the sets of contacts, and there being a magnet attractive plate remote from the contacts normally holding the magnet in an inoperative position until the magnet is attracted to an operable position by a like magnet in the plug half of the electrical connector.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawing:

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In the drawing:

FIGURE 1 is a perspective view of an electrical connector in accordance with the invention, with the plug and receptacle thereof disassembled.

FIGURE 2 is an enlarged vertical sectional view taken through the electrical connector of FIGURE 1 and shows the specific details thereof.

FIGURE 3 is an enlarged fragmentary horizontal sectional view taken along the line 3—3 of FIGURE 2, and shows the specific mounting of the magnet of the receptacle to permit movement thereof without rotation.

FIGURE 4 is an enlarged fragmentary vertical sectional view of an electrical connector wherein the plug element is in the form of a light bulb, the two parts of the connector being separated.

Referring now to the drawings in detail, it will be seen that there is illustrated in FIGURES 1 and 2 the details of an electrical connector, generally referred to by the numeral 5, for the purpose of connecting together two cables. The electrical connector includes a receptacle, generally referred to by the numeral 6, and a plug, generally referred to by the numeral 7.

The receptacle 6 includes a fitting 8 which is illustrated as being formed of an insulating material, such as plastic. The upper end of the fitting 8, as illustrated in FIGURE 2, is of a tubular construction. A disk 9 of insulating material extends across the upper portion of the fitting 8 in recessed relation. The disk 9 carries a plurality of contacts 10, 11 and 12 which are disposed in insulated electrically isolated relation.

A contact 13 underlies the contact 10 and is intended to be engaged with the contact 10 to electrically connect the contact 10 in an electrical circuit of which the receptacle 6 is a part. The contact 13 is carried by a resilient conductor 14 which extends down through the fitting 8 and has a terminal 15 connected thereto. The terminal 15 serves to connect a conductor 16 of a cable (not shown) to the conductor 14 and the contact 13. Another conductor 17 underlies the contact 12 and is resiliently mounted for movement toward and away from the contact 12. The contact 17 is carried by a resilient conductor 18 which is embedded in the fitting 8 remote from the conductor 14 and which terminates in a terminal 19 to which a conductor 20 is connected. The conductor 20 is part of the same cable as the conductor 16.

A central rod 21 extends through the center of the fitting 8 and is vertically movable. The rod 21, as is best shown in FIGURE 3, is of a key construction so that rotation thereof is prevented. The upper end of the rod 21 is provided with a contact 22 which underlies the contact 11 and is movable into engagement therewith, as is shown in FIGURE 2. A fastener 23 connects the lower end of the rod 21 to a resilient conductor 24. The opposite end of the conductor 24 is provided with a terminal 25 to which there is connected a conductor 26. The conductor 26 is part of the same cable as are the conductors 16 and 20.

The contacts 13, 17 and 22 are normally spaced below the respective ones of the contacts 10, 11 and 12. A magnet 27 is carried by the upper part of the rod 21 and is vertically movable to move the rod 21 upwardly so that the contact 22 engages the contact 11. The upward movement of the magnet 27 also results in the upward movement of the contacts 13 and 17 to engage the contacts 10 and 12, respectively, as is shown in FIGURE 2.

The magnet 27 is normally in a retracted position with the result that the contacts 10, 11 and 12 are not engaged by other contacts and are electrically isolated. In order to assure the retracted position of the magnet 27 when the connector 5 is not assembled, a magnet attractive plate 28 is suitably mounted within the fitting 8

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beneath the magnet 27. In the unconnected condition of the coupling 8, the magnet 27 is attracted to the plate 28 and releases the contacts 13, 22 and 17 from their respective one of the isolated contacts 10, 11 and 12.

The plug 7 includes a housing 29 in which there is positioned a fitting 30 formed of electrically insulating material. A magnet 31 corresponding to the magnet 27 is positioned in the lower portion of the fitting 30. A plurality of contacts 32, 33 and 34 open through the bottom face of the magnet 31. Suitable conductors 35 of a cable 36 are connected to the contacts 32, 33 and 34.

In use, the plug 7 would normally be suspended by the cable 36. It is then merely necessary to manipulate the receptacle 6 so that it is generally aligned with the plug 7. Each of the magnets 27 and 31 has a single north pole and a single south pole. As the magnets 27 and 31 approach one another, the entire plug 29 will rotate about the axis of the cable 36 with the result that the plug 7 will be properly oriented with respect to the receptacle 6 so that the contacts 32, 33 and 34 will engage the contacts 10, 11 and 12, respectively. It will thus be seen that it is merely necessary to generally align the receptacle 6 in an axial direction with respect to the plug 7, at which time the plug 7 will be properly oriented with respect to the receptacle 6 and the two parts moved together by the attractive forces of the magnets 27 and 31. The two halves of the connector 5 will be retained in the assembled position of FIGURE 2 by the forces of the magnets 27 and 31.

It is to be understood that the magnets 27 and 31 are ceramic magnets and thus are formed of an insulating material.

In FIGURE 4, there is illustrated a modified form of connector, which is generally referred to by the numeral 37. The connector 37 includes a receptacle 38 which is identical with the receptacle 6 with the exception that the contact 17, the conductor 18, the terminal 19 and the conductor 20 are eliminated, only two wires being necessary for the receptacle 38.

The other part of the connector 37 is in the form of a light bulb 39 which includes a base 40 having a magnet 41 therein. The magnet 41 is provided with a pair of contacts 42 and 43 which are engageable with respective contacts of the receptacle 38. The operation of the connector 37 is identical with that of the connector 5 and need not be described in more detail.

From the foregoing, it will be apparent that there have been devised novel electrical connectors for accomplishing the desired end. Although only two embodiments of the invention have been illustrated, it is to be understood that other modifications may be made therein within the spirit and scope of the invention, as defined in the appended claims.

I claim:

1. An electrical connector of the two-part type, comprising a first connector fitting having a tubular body portion, an outwardly directed contact plate carried by said tubular body portion, said contact plate being of non-conductive material and having a plurality of electrically isolated current carrying first contacts extending therethrough, a plurality of electrically isolated second contacts positioned inwardly of said contact plate, each of said second contacts being in substantial alignment with one of said first contacts and being movable toward and away from said contact plate into and out of engagement with its corresponding first contact, each of said second contacts being adapted to be connected to an electrical conductor, a first magnet in said tubular body portion disposed inwardly of said plurality of said second contacts and movable toward and away from said contact plate, said second contacts being between said first magnet and

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said contact plate, whereby when said magnet is moved toward said contact plate, said second contacts will be moved into electrical engagement with said first contacts to energize the same, said first magnet having its magnetic axis extending transversely of the direction of movement of said second contacts and said first magnet, a second connector fitting engageable with the contact plate of said first fitting, said second connector fitting having a plurality of exposed contacts positioned for electrical engagement with said first contacts when said fittings are engaged, a second magnet carried by said second connector fitting, said second magnet having its magnetic axis disposed substantially parallel to the magnetic axis of said first magnet, and means for preventing the rotation of each of said magnets relative to its respective fitting.

2. An electrical connector of the two-part type comprising, a first connector fitting having a tubular body portion, an outwardly directed contact plate carried by said tubular body portion, said contact plate being of non-conductive material and having a plurality of electrically isolated current carrying first contacts extending therethrough, a plurality of electrically isolated second contacts positioned inwardly of said contact plate, each of said second contacts being in substantial alignment with one of said first contacts and being movable toward and away from said contact plate into and out of engagement with its corresponding first contact, each of said second contacts being adapted to be connected to an electrical conductor, a first magnet in said tubular body portion disposed inwardly of said plurality of said second contacts and movable toward and away from said contact plate, said second contacts being between said magnet and said contact plate, whereby when said first magnet is moved toward said contact plate, said second contacts will be moved into electrical engagement with said first contacts to energize the same, a magnetic attractive plate positioned in said tubular body inwardly of said first magnet to normally retain said first magnet in a retracted position to prevent the accidental energization of said first contacts, a second connector fitting engageable with the contact plate of said first fitting, said second connector fitting having a plurality of exposed contacts positioned for electrical engagement with said first contacts when said fittings are engaged, and a second magnet carried by said second connector fitting.

3. An electrical connector as set forth in claim 2, wherein said contact plate is recessed within said first connector fitting and the outer end of said second fitting is received in said recess in said first fitting.

4. An electrical connector as set forth in claim 2, wherein each of said first and second magnets has its magnetic axis extending transversely of the direction of movement of said second contacts and said first magnet, and wherein means is provided for preventing rotation of each of said magnets relative to its respective fitting.

5. An electrical connector as set forth in claim 1, wherein the exposed contacts of one of said fittings are disposed in a recess in said one of said fittings and the portion of said other of said fittings carrying its exposed contacts is received in said recess.

6. An electrical connector as set forth in claim 1, said first and second magnets being circular and of ceramic magnetic material.

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