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2,903,667

MAGNETIC CONNECTOR

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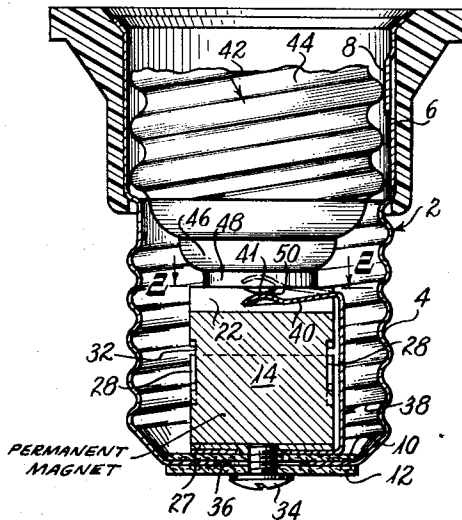


Fig. 1.

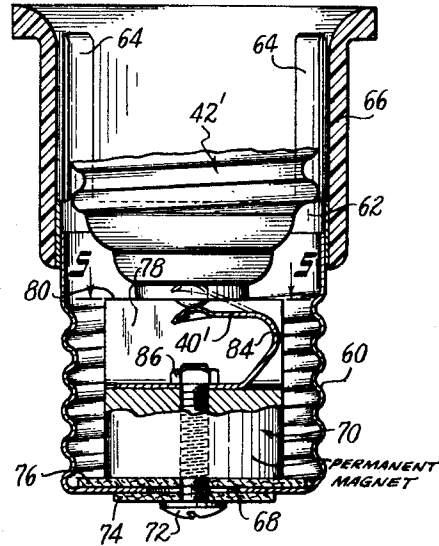


Fig. 4.

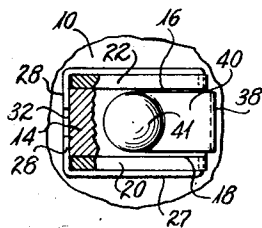


Fig. 2.

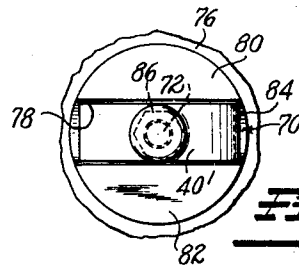


Fig. 5.

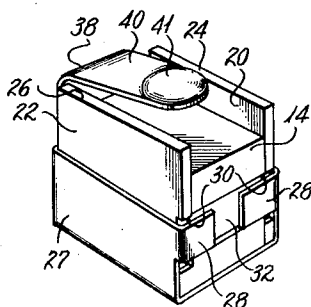


Fig. 3.

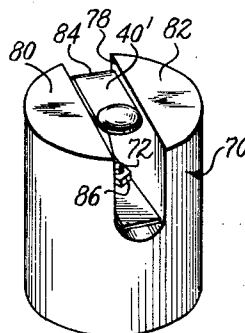


Fig. 6.

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MAGNETIC CONNECTOR

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3 Claims. (Cl. 339—12)

This invention relates to magnetic electrical connectors and constitutes an improvement on the magnetic connector described in the copending application of Adolph P. Buquor and John L. Buquor, Serial No. 65,562, filed December 16, 1948, for "Electrical Connector Having a Magnetic Contact," now Patent No. 2,788,501.

The magnetic connector described in said patent comprises a socket member and a plug member adapted to be placed in the socket, both members having side contacts arranged to slidably engage each other to complete one side of a circuit therethrough. The plug member has an end contact of paramagnetic material, preferably iron, and the socket is provided with a bottom contact comprising a permanent magnet arranged to attract and hold the end contact of the plug member to thus not only complete a circuit through the connector but to also hold the plug member in the socket without the necessity of employing screw threads, spring fingers, bayonet-slot connectors or the like. It has been found that permanent magnets of sufficient strength can be housed in the usual electrical socket to effectively maintain the plug and socket members in contact. The improvement of the present invention comprises the addition, to the structure of the copending application, of a resilient contact element positioned between the poles of the magnet in the base of the socket and made of a non-ferrous metal, such as brass or the like. A suitable screw extends through the resilient contact and serves to hold the magnet and resilient contact in assembled relation to the socket and also comprises a non-ferrous circuit whereby electrical energy does not have to pass through the pole faces of the magnet to complete a circuit. The arrangement is such that the plug member is provided with a central portion adapted to extend between the magnet pole faces, which may be of solder or the like, and comprises a non-ferrous contact element on the plug member for engagement with the resilient contact of the socket to thus permit completion of a circuit through the connector without the necessity of passing of the electrical current through the magnet poles or the paramagnetic material of the end contact on the plug member.

It is therefore an object of this invention to provide an improved magnetic socket of simple construction, economical to manufacture, and reliable and efficient in operation.

Another object of the invention is to provide a magnetic electrical connector wherein ferrous metals are not employed to complete an electrical circuit therethrough.

Further and additional objects and advantages will become apparent to those skilled in the art as the description proceeds in connection with the accompanying drawings, wherein:

Fig. 1 is a sectional view through an electrical connector embodying the improvement of this invention;

Fig. 2 is an end view of the magnet of Fig. 1 with certain parts shown in section, as viewed along the plane 2—2 of Fig. 1;

Fig. 3 is a perspective view of the magnet assembly of Figs. 1 and 2;

Fig. 4 is a vertical sectional view, similar to Fig. 1, of a modified form of magnetic electrical connector embodying the present invention;

Fig. 5 is an end view of the magnet of Fig. 4, as viewed from plane 5—5 of Fig. 4; and

Fig. 6 is a perspective view of the magnet assembly of Figs. 4 and 5.

Referring first to Fig. 1, the electrical connector is shown here, by way of illustration only, as an adapter socket having a shell 2 provided with screw threads 4 and adapted to be threaded into a conventional threaded socket as in use at the present time. The shell 2 is provided with an outer sheath 6 of insulating material around its open end portion, preferably a molded plastic, with one or more inwardly extruding resilient fingers 8 in the upper cylindrical portion of the shell 2. A pair of insulating discs 10 and 12 are placed on opposite faces of the bottom of the shell 2 and serve to support a magnet assembly, in a manner to be described.

The magnet assembly comprises a rectangular body 14 of ceramic magnetic material. Such magnets are well known and generally comprise a sintered body of magnetic iron oxide. In any event the body 14 is permanently magnetized and is substantially a non-conductor of electricity. The body 14 is so magnetized that the opposed faces 16 and 18 (see Fig. 2) constitute the opposite poles thereof. A pair of rectangular plates 20 and 22, of paramagnetic material such as iron, steel, or the like, are abutted against the pole faces of the magnet body 14 and extend upwardly therefrom a substantial distance, as shown. The plates 20 and 22 serve to conduct and concentrate magnetic flux from the magnet 14 to the edge faces 24 and 26 of the plates 20 and 22, respectively. The edge faces 24 and 26 thus constitute spaced pole faces of the magnet assembly. A clip 27 of sheet brass or other non-magnetic material formed to any suitable configuration is employed to hold the plates 20 and 22 in assembled relation to the magnet body 14 but preferably hold the parts somewhat loosely together so that the plates 20 and 22 may move slightly with respect to the body 14 to permit accommodation of the faces 24 and 26 to the end face of a plug member, as will be described. As shown, the clip member 27 comprises a generally U-shaped body portion extending under the magnet assembly and part way up the sides thereof and is provided with inturned ears 28 turned into notches 30 in the ends of the plates 20 and 22 and into an end notch 32 in the end of the magnet body 14. By this construction the magnet assembly is held in assembled relationship quite loosely but positively.

The magnet assembly thus described is held in the shell 2 by means of a screw 34 extending through the insulating discs 10 and 12 and through an enlarged opening 36 in the bottom of the shell 2. The screw 34 is threaded into the bottom portion of the clip 27 and thus holds the magnet assembly in fixed relation in the shell 2 and electrically insulated therefrom.

A generally U-shaped resilient contact member 38 is positioned with one leg thereof underlying the bottom of the magnet assembly and held clamped between the magnet assembly and the insulating discs 10 and 12, the screw 34 passing through an opening in that one leg. The other leg 40 of the resilient contact extends along the slot or groove defining the space between the pole faces 24 and 26. The free end of the leg 40 is preferably provided with a spherical crown 41 substantially at the center of the magnet assembly and is so biased by the normal resiliency of the leg 40 that it normally occupies the position shown in dotted line in Fig. 1. The screw 34 and the resilient contact 38 are

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preferably of brass or the like having low electrical resistance and it will be obvious that upon screwing the adapter of Fig. 1 into a conventional threaded socket, the screw 34 makes contact with the bottom contact of the threaded socket and the shell 2 becomes electrically connected to the threaded shell of the standard socket.

A plug member, indicated generally at 42, is shown in this instance as comprising the base of an electric light bulb and may be provided with a threaded metal shell portion 44 constituting a side contact thereon. The shell portion 44 need not be threaded for the purpose of the present invention but is illustrated in such form since such a plug member could then be selectively used in either the magnetic socket of the present invention or a standard threaded socket, interchangeably.

As is usual in electric light bulbs, a body of insulating material 46 is carried by the shell portion 44 and supports an end contact 48, electrically insulated from the shell portion 44.

The end contact member 48 is a paramagnetic material, that is, a material that will be attracted to and held by a permanent magnet. The member 48 further must be of sufficient mass that it will accommodate a sufficiently large amount of magnetic flux, before saturation, to develop the required holding force between the magnet and the plug. Numeral 50 indicates a central portion of the end contact 48 on the plug member and may be a droplet of solder or the like, customarily employed to electrically connect a filament (not shown) of the electric lamp bulb to the end contact 48.

As shown in Fig. 1, the mere sliding of the plug member 42 into the socket shown effects electrical connection between the shell 44 and the spring fingers 8. The paramagnetic member 48 spans the pole faces 24 and 26 thereby completing a magnetic circuit and creating a very substantial holding force holding the plug member 42 in the socket. At the same time the central portion 50 of the end contact on the plug engages the end 41 of the leg 40 of the resilient contact member 38 to complete an electrical connection from, for example, the filament of the lamp bulb to the screw 34 without employing ferrous metal as a necessary part of the circuit.

The resilience of the leg 40 is such that it normally occupies the position shown in dotted line in Fig. 1 but may be readily displaced to the full line position to exert firm contact against the portion 50 without exerting sufficient upward thrust to materially diminish the holding force of the magnet. Obviously the plug member 42 may be very easily and readily either withdrawn from or placed in the socket and the electrical circuits there-through are completed without the necessity of performing any further manipulations. It has been found that the parts can be held in such firm contact that a very substantial pull is necessary to disconnect the plug from the socket.

In the event that the bottom face of member 48 is not a true planar surface, or in the event that the magnet assembly is slightly "cocked" in the socket, the plates 20 and 22 may shift slightly with respect to each other so that the pole faces 24 and 26 make snug surface contact with the member 48.

While the socket member is shown in the drawings and described herein as an "adapter" to be screwed into a conventional threaded socket, such illustration is by way of example only. It is to be understood that the invention disclosed herein is not to be limited to an adapter but may be incorporated in a complete socket connected directly to wire conductors or the like or permanently mounted in or on a wall or other support. Furthermore, the plug member 42 has been described as being an electric light bulb but it is to be understood that the invention is of sufficient breadth to include plug members connected directly to electric wires or the like and need not be in the form of a light bulb. For example, the plug and socket connector of this invention

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could be employed to connect an extension cord to the cord of an appliance or in many other similar manners, all as will be obvious to those skilled in the art.

Referring now to Fig. 4, which is a vertical section through a modified form of electrical connector, the socket again is illustrated, by way of example only, as an adapter for mounting in a conventional threaded socket and comprises a threaded shell portion 60 secured in any suitable manner to an upper ring 62 having upwardly extending spring fingers 64. A plastic or the like shell 66 of insulating material surrounds the ring 62 and spring fingers 64 and defines the upper portion of the socket of the present invention. The shell 60 is provided with an enlarged central opening 68 in its bottom wall. A permanent magnet 70 is secured in the socket shell 60 by a screw or bolt 72 extending through insulating discs 74 and 76 serving to electrically insulate the magnet 70 from the shell 60. The magnet 70 is an integral one-piece metal permanent magnet, which may be of the type generally known as "Alnico" magnets and is provided with a transverse groove 78 thereacross defining a space between pole faces 80 and 82. A resilient contact member 84, of generally U-shape, is positioned in the groove 78 with one leg thereof resting on the bottom of the groove and through which the bolt 72 passes. A nut 86 is shown as securing the resilient contact 84 to the magnet 70 and in turn securing the magnet 70 to the shell 60 in insulated relation thereto. The upper leg 40' of the resilient contact 84 is identical to the upper leg 40 described in connection with Figs. 1 through 3. In like manner the plug member 42' may be identical to the plug member 42 described in connection with Figs. 1 to 3.

It will be obvious that in both modifications described herein the basic structure and manner of use is the same in that a plug member having a paramagnetic end contact is provided with a central end contact portion of non-ferrous metal adapted to electrically engage a resilient contact of non-ferrous metal in the socket and a permanent magnet in the socket engages the paramagnetic portion of the plug end contact to hold the socket and plug in assembled relation and to complete an electrical circuit through the connector.

By the employment of the resilient contact as shown and described herein, applicant has taken advantage of the novel features of the electrical connector claimed in the aforementioned patent but at the same time has provided for completing an electrical circuit through the connector without resorting to ferrous or the like metals as part of the circuit. By employing the non-ferrous resilient contact described herein, substantially no current flows between the magnet pole faces and the paramagnetic member 48 and thus there is no tendency for the pole faces to become pock-marked or to erode as a result of the passage of electric current thereacross.

While a limited number of specific embodiments of the invention are shown and described herein, it is to be understood that they are merely illustrative, that the invention is of a scope to encompass all forms and modifications falling within the terms of the appended claims.

I claim:

1. A socket member for a detachable electrical connector, comprising; a socket member having an opening therein, a first side contact on at least one side of said opening, a permanent bipolar magnet in said opening and having transversely spaced pole faces lying in substantially a single plane extending transversely across said opening and defining the bottom thereof, contact element mounted in said socket member, electrically insulated from said side contact, and having a resilient contact portion in the space between said pole faces, said contact portion being normally outwardly of the plane defined by said pole faces but easily resiliently deformable to move inwardly, between said pole faces, to a position inwardly of said plane, and low-resistance non-ferrous means electrically connecting said resilient contact portion to a further con-

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tact on the exterior of said socket independently of said magnet.

2. A socket as defined in claim 1, wherein said magnet is a unitary metal magnet having a groove across one face defining the space between said poles, said resilient contact comprising a generally U-shaped member having one leg thereof lying along the bottom of said groove and the other leg thereof defining said contact portion, and fastening means extending through said one leg and said magnet and serving to electrically connect said resilient contact to a conductor externally of said socket member and holding said resilient contact, magnet and socket member in assembled relation.

3. A socket as defined in claim 1, wherein said magnet comprises a ceramic magnet member having opposed polar faces, paramagnetic pole members engaging said polar faces and extending outwardly therefrom, the extending portions of said pole members having edge surfaces defining said spaced pole faces, said resilient contact comprising a generally U-shaped member having one leg

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thereof extending between the extending portions of said pole member and defining said contact portion, the other leg of said U-shaped member extending under said magnet member, holding means holding said pole members to said magnet member to form an assembled magnet, and fastening means holding said assembled magnet, resilient contact and socket member in assembled relation and serving to connect said resilient contact to a conductor externally of said socket.

References Cited in the file of this patent

UNITED STATES PATENTS

961,600	Freeman	June 14, 1910
1,982,627	Baum	Dec. 4, 1934
2,429,526	Savon	Oct. 21, 1947
2,738,476	Buquor	Mar. 13, 1956
2,788,501	Buquor et al.	Apr. 9, 1957

FOREIGN PATENTS

552,378	Great Britain	Apr. 5, 1943
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