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(54) **SELF-LOCKING ELECTRIC PLUG.**

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Description

Technical Field

This invention relates to electric plugs and, more particularly, to low profile, self-locking plugs for insertion into recessed sockets of electric wall receptacles.

Background of the Invention

It has been common in many places to provide electric plugs for connecting electric cords to electric wall receptacles with a cylindrical head portion which extends into a wall receptacle with a recessed socket, and a face portion including a mechanism for grasping the plug for insertion and withdrawal from the recessed socket. Typical of this prior art is German Patent (Auslegeschrift) 1,107,757, issued May 31, 1961. In such arrangements, a ground connection can be supplied, in a first embodiment, by an electric pin extending outward from the base of the recessed socket to engage a registering recess in the head portion of the plug to make the required ground connection. In another embodiment, sliding electric contacts along the periphery of the head portion of the plug engage registering electric contacts on the inner surface of the recessed socket to make the ground connection.

In electrical plugs and receptacles such as those described above, the pins are smooth and round and thus provide little friction for holding the plug in position in the socket, particularly for plugs without grounding connectors. It is therefore often the case that small, inadvertent forces on the plug or the attached electric cord are able to dislodge the plug from the socket when such dislodgement is not desired.

Such electric plugs often include a head portion which extends at right angles substantial away from the wall receptacle, to facilitate grasping the plug, and a connected electric cord also extending perpendicularly to the wall. Such plug heads and electric cords aggravate the problem of inadvertent dislodgement due to the high likelihood of inadvertently striking or snagging such a plug or cord.

Summary of the Invention

In accordance with the illustrative embodiment of the present invention, the cylindrical head portion of an electric plug intended for insertion into a recessed socket is fabricated of an insulating material such as rubber or plastic with at least one elastic axially disposed peripheral friction rib which provides controlled friction between the plug head and the recessed socket. More particularly, such friction ribs extend axially on the outer surface of the cylindrical head of the plug to engage the inner surface of the recessed socket. Each such friction rib has two parallel axial re-

cesses in the cylindrical head, one on each side of and immediately next to the friction rib. Such recesses allow the friction rib to deform into the space of such recesses when the friction ribs engage the inner surface of the socket recess. This deformation of the elastic material of the friction rib causes a restoring force which is exerted outwardly against the inner surface of the socket, increasing the friction with the socket surface and making the socket more difficult to withdraw from the socket. The thickness of the friction rib, and the radial extension of the friction rib beyond the cylindrical surface of the plug head, can both be adjusted to provide precisely the amount of retentive friction required to prevent accidental dislodgement of the plug from the socket in a particular application. At the same time, the amount of retentive friction can be kept at a reasonable level which permits deliberate removal of the plug when desired without undue exertion. Friction ribs with a thickness of one millimeter extending 0.4 millimeters from the outer surface of the plug head have been found to be adequate for many normal applications. High vibration or other unusual environments may, of course, require greater friction to retain the plug in the socket.

In accordance with one feature of the present invention, the open face or end of the cylindrical head which is inserted into the recessed socket is beveled to facilitate easy insertion of the head into the socket. The head can therefore be readily registered with the recessed socket in spite of the presence of the protruding friction ribs.

In accordance with another feature of the present invention, the face portion of the electric plug, facing away from the recessed socket has a very low profile, extending away from the wall only a few millimeters (e.g. six millimeters), to minimize the likelihood of inadvertent pulls or snags on the plug which might accidentally dislodge the plug from the socket. Moreover, the electrical cord can exit from the plug face parallel to the wall rather than perpendicular to the wall, also minimizing the likelihood of inadvertent dislodgement. This low profile plug face has the further advantage of permitting furniture to be placed in close proximity to the wall without interfering with the electric plug, thus eliminating or reducing the open slot behind the piece of furniture which all too often becomes the undesired depository for small articles, papers and other objects placed on the upper surface of the furniture.

Brief Description of the Drawings

A complete understanding of the present invention may be gained by considering the following detailed description in conjunction with the accompanying drawings, in which:

FIG. 1 shows a perspective view of an electric plug and a portion of a mating wall receptacle

showing the friction ribs in accordance with the present invention;

FIG. 2 shows an end view of the electric plug shown in FIG. 1;

FIG. 3 shows a side elevation view of the electric plug shown in FIG. 1;

FIG. 4 shows a partial sectional view of the plug and socket shown in FIG. 1 illustrating the relative dispositions of the plug, the socket and a friction rib before the plug is inserted into the socket; and FIG. 5 shows a partial sectional view of the plug and socket shown in FIG. 1 illustrating the relative dispositions of the plug, the socket and a friction rib after the plug is inserted into the socket.

To facilitate reader understanding, identical reference numerals are used to designate elements common to the figures.

Detailed Description

In FIG. 1 there is shown a perspective view of an electric plug 10 and, in schematic form, a mating electric socket 11. Electric plug 10 comprises a face portion 12, facing outwardly from the electric wall receptacle, and a cylindrical head portion 13 for insertion into socket 11 of the electric wall receptacle. Head portion 13 includes a face 14 from which two smooth cylindrical electric contact pins 15 and 16 extend for insertion into mating holes 17 and 18, respectively, of wall socket 11. Optionally, face 14 of head portion 13 also includes a cylindrical recess 19 into which a mating electric pin 20 is inserted when head 13 is inserted into socket 11. Recess 19 and pin 20, when present, provide a ground connection for appliances connected to electric plug 10. Alternatively, recesses 33 and 34 on opposite sides of cylindrical head 13 may contain sliding electrical contacts which mate with electrical contacts on the inner surface of socket 11 to provide a ground connection.

In accordance with the present invention, the cylindrical head portion 13 of plug 10 includes one or more friction ribs to control the friction between plug head 13 and socket 11 when head 13 is inserted into socket 11. In FIG. 1, four friction ribs 21, 22, 23 and 24 lie axially on the cylindrical outer surface of head 13 and extend radially from the outer surface of head 13 by an amount which insures contact of the friction ribs 21-24 with the inner cylindrical surface of socket 11. Axial recesses 25-32 along each side of each of the friction ribs 21-24 provide space for the friction ribs 21-24 to deform under the force of being inserted into socket 11. The circular face 14 of cylindrical head 13 includes a bevel 35 to facilitate the insertion of cylindrical head 13 into socket 11 by registering the head 13 axially with the socket 11.

Although four friction ribs 21-24 are shown in FIG. 1, it is clear that only one such rib is essential to provide the appropriate frictional forces. Moreover,

when more than one friction rib is used, it is advantageous to dispose such friction ribs diagonally opposite each other on the surface of head 13 to equalize the frictional forces exerted on the different sides of head 13. Finally, more than four friction ribs can be used if the coefficient of friction of the material of head 13 is too low to provide the required frictional forces with fewer friction ribs.

An end view of the electric plug 10 of FIG. 1 is shown in FIG. 2, where identical reference numerals are used to identify the common elements in the figures. Thus the plug 10 comprises a face portion 12 and a cylindrical head portion 13. As can be better seen in FIG. 2, face portion 12 is octagonal in outline and a sleeve 40 exits from one side of the octagon in the same plane as face 12. Sleeve 40 terminates in the electric cord 41 to which an electric appliance may be connected. Sleeve 40 serves to absorb much of the forces exerted by pulls on the cord 41 thereby preventing such forces from being transmitted to the electric pins 15 and 16 to damage those pins. This sleeve technique and the flat octagonal plug face are disclosed in U. S. patent 4,927,376 granted May 22, 1990 to the present applicant.

Cylindrical head 13 in FIG. 2 includes electric contact pins 15 and 16 and recess 19 for receiving a ground pin. Friction ribs 21-24 are flanked by expansion recesses 31-32, 25-26, 27-28 and 29-30, respectively. Recesses 33 and 34 serve to contain sliding ground contacts while ridges 42 and 43 assist in registering head 13 in socket 11 of FIG. 1. Bevel 35 assists in starting head 13 into socket 11 in the presence of friction ribs 21-24. A cutout 44 in one octagonal side of face 12 facilitates the grasping of a pull-out ring (not shown) attached to face 12 used to remove plug 10 from the socket 11. Such a pull-out ring is shown in detail in the aforementioned U. S. patent.

In FIG. 3 there is shown a side elevation view of the electrical plug 10 of FIGS. 1 and 2 comprising a face portion 12 and a cylindrical head portion 13. Head portion 12 includes a sleeve 40 from which an electric cord 41 exits to connect an electric appliance to the plug 10. Head 12 includes a cutout 44 to facilitate grasping a pullout ring, not illustrated, which lies in grooves 45 and 46 when not in use. Head portion 13 includes friction ribs 21 and 22 flanked by expansion grooves 31-32 and 25-26, respectively. Electric pin 15 mates with a cylindrical recess 17 (FIG. 1) in the mating socket while ridge 42 engages a slot in the inner surface of the mating socket to register the proper orientation of the electric pins 15 and 16. Bevel 35 facilitates the entry of head 13 into the socket 11.

In FIG. 4 there is shown an expanded partial cross-section of the head 13 and socket 11 to show the details of the friction rib 22 before the head 13 is inserted into socket 11. As can be seen in FIG. 4, friction rib 22 extends slightly beyond the inner surface of socket 11 and is flanked on each side by an expan-

sion recess 25 or 26. In FIG. 5 there is shown another expanded partial cross-section of the head 13 and socket 11 to show the details of friction rib 22 after the head 13 is inserted into socket 11. As can be seen in FIG. 5, friction rib 22 is compressed by contact with the inner surface of socket 11 and distorted so as to expand into the expansion recesses 25 and 26. This distortion of friction rib 22 creates an elastic restoration force which is exerted against the inner surface of socket 11. The increase friction between the head 13 and the socket 11 caused by the force of friction rib 22 against socket 11 is sufficiently great to keep plug 10 in socket 11 in the presence of significant inadvertent forces on plug 10, but is small enough to be overcome by a deliberate exertion of force on face 12 tending to remove the plug such as might be exerted by pulling on a pull ring attached to face 12. Indeed, the thickness of rib 22 and the amount which rib 22 extends beyond the inner surface of socket 11 can be adjusted to provide precisely the friction force desired for a particular application. It will be apparent that an environment having extremely high vibration will require a greater friction force than more standard environments. A thickness of one millimeter and an extension beyond socket 11 of 0.4 millimeters have been found to provide the appropriate friction forces for normal household environments.

Claims

1. An electric plug having a cylindrical head portion for insertion into a mating socket characterized by
 - at least one friction rib (22) formed on said cylindrical head portion and extending outward beyond said cylindrical head portion to engage said mating socket to provide increased friction tending to hold said head portion in said socket, and
 - said cylindrical head portion and said at least one friction rib being made of elastic insulating material.
2. The electric plug according to claim 1 further characterized by
 - expansion recesses (24) extending along each side of said friction rib to permit distortion of said friction rib into said expansion recesses.
3. The electric plug according to claim 1 further characterized by
 - at least one pair of said friction ribs (22) are disposed on opposite sides of said head portion to equalize the frictional forces.

Patentansprüche

1. Elektrischer Stecker mit einem zylindrischen Kopfabschnitt zur Einführung in eine passende Steckdose, dadurch gekennzeichnet, daß
 - zumindest eine Reibungsrippe (22) auf dem zylindrischen Kopfabschnitt ausgebildet ist und sich nach außen hin über den zylindrischen Kopfabschnitt hinaus erstreckt, um mit der passenden Steckdose in Eingriff zu kommen, um für eine erhöhte Reibung zu sorgen, die dazu dient, den Kopfabschnitt in der Steckdose zu halten, und dadurch, daß
 - der zylindrische Kopfabschnitt und die zumindest eine Reibungsrippe aus einem elastischen Isoliermaterial bestehen.
2. Elektrischer Stecker nach Anspruch 1, der weiterhin dadurch gekennzeichnet ist, daß
 - sich Dehnungsaussparungen (24) entlang jeder Seite der Reibungsrippe erstrecken, um eine Verformung der Reibungsrippe in die Dehnungsaussparung hinein zu ermöglichen.
3. Elektrischer Stecker nach Anspruch 1, der weiterhin dadurch gekennzeichnet ist, daß
 - zumindest ein Paar Reibungsrippen (22) auf gegenüberliegenden Seiten des Kopfabschnitts angeordnet sind, um die Reibungskräfte gleichmäßig zu verteilen.

Revendications

1. Fiche électrique comportant une partie de tête cylindrique destinée à être insérée dans une douille de connexion, caractérisée par :
 - au moins une nervure de friction (22) formée sur ladite partie de tête cylindrique et s'étendant vers l'extérieur au-delà de ladite partie de tête cylindrique pour s'engager dans ladite douille de connexion afin d'apporter une friction accrue tendant à maintenir ladite partie de tête dans ladite douille, et
 - ladite partie de tête cylindrique et la(les) nervure(s) de friction étant réalisée(s) en un matériau isolant élastique.
2. Fiche électrique selon la revendication 1, caractérisée de plus par :
 - des rainures d'expansion (24) s'étendant le long de chaque côté de ladite nervure de friction pour permettre une déformation de ladite nervure de friction dans lesdites rainures d'expansion.
3. Fiche électrique selon la revendication 1, caractérisée de plus par :

au moins une paire de dites rainures de friction (22) qui sont disposées sur les côtés opposés de ladite partie de tête afin d'équilibrer les forces de friction.

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FIG. 1

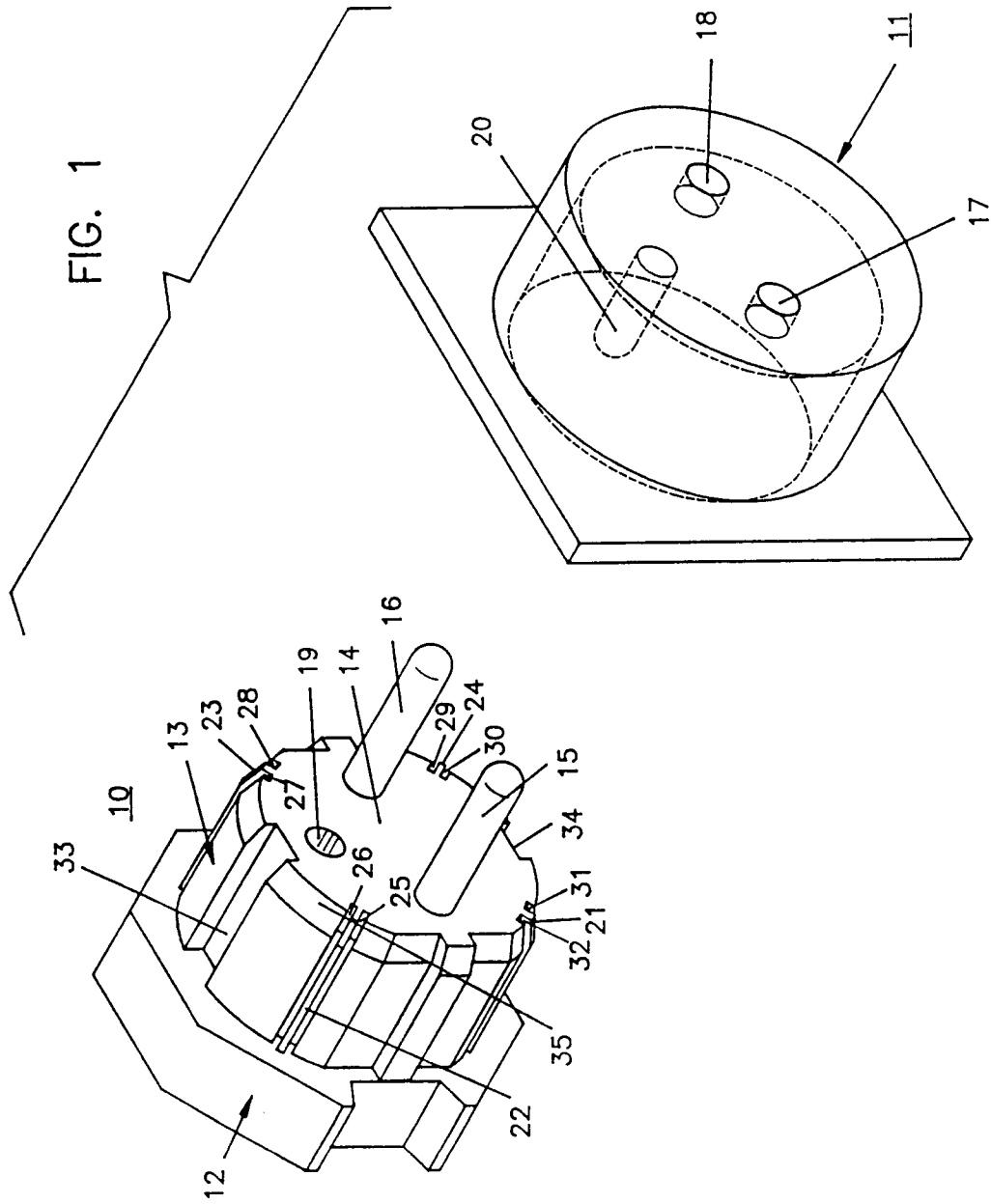


FIG. 2

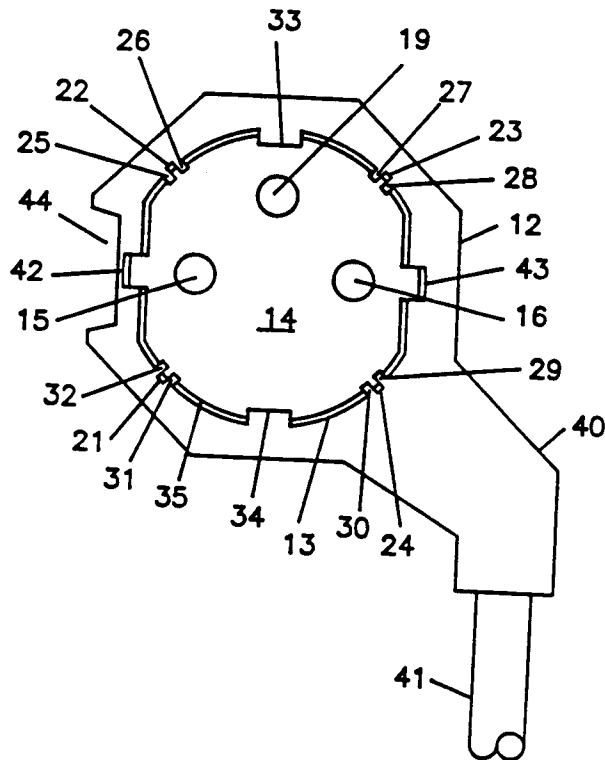


FIG. 3

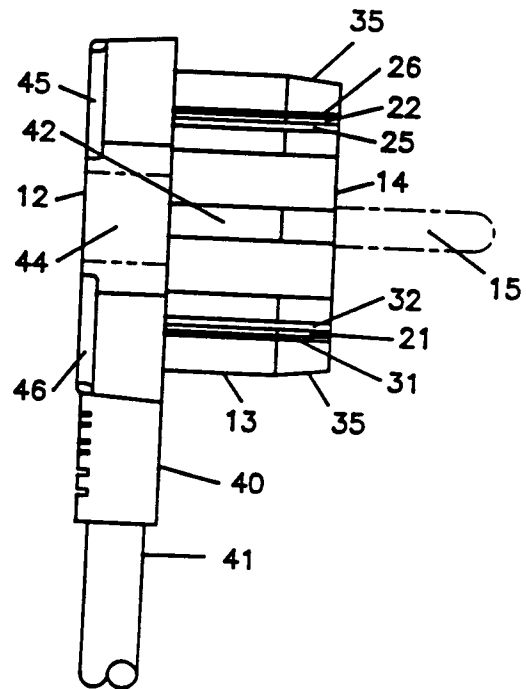


FIG. 4

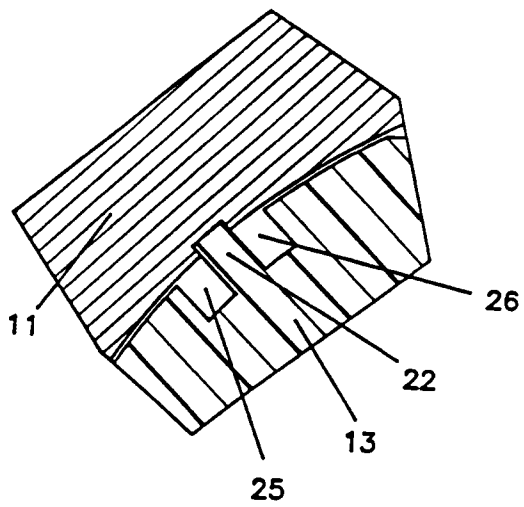


FIG. 5

