

PATENT SPECIFICATION

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- (21) Application No. 10737/75 (22) Filed 14 Mar. 1975
 (31) Convention Application No. 451647 (32) Filed 15 Mar. 1974 in
 (33) United States of America (US)
 (44) Complete Specification published 12 Apr. 1978 (Printed Late)
 (51) INT. CL.² H01R 35/00
 (52) Index at acceptance
 H2E 223 23 45C1A
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(54) "SWIVELLING CONNECTION FOR ELECTRICAL APPLIANCES"

(71) We, BRISTOL-MYERS COMPANY, a Corporation organised and existing under the laws of the State of Delaware, United States of America, having offices located at 345 Park Avenue, New York, 10022, New York, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:-

The present invention is directed to an electrical appliance including a swivel electrical connection and plugs for use therein. More particularly, the present invention is directed to a swivel electrical connection between an electrical appliance and a power cord.

Many electrical appliances, especially grooming appliances such as hair curlers, hair dryers, etc., are connected by flexible electrical power cords to power sockets. Since the appliances must often be manipulated and moved in a rather random fashion, stress is placed on the cord and the electrical connection between the cord and the appliance. This stress is perhaps most pronounced at the junction between the appliance and the cord. In prior art devices, there was therefore a tendency for electrical conductor leads carried by the cord to break which, of course, renders the associated appliance both unuseable and unsafe. In addition, there is a tendency in many prior art devices for tensional stresses on the cord to damage the electrical connection between the cord and the appliance.

These problems are recognized by the prior art and many attempts have been made to provide solutions thereto. However, none of the solutions is readily adaptable to modern handheld appliances which must be relatively inexpensive, light in weight, and generally uncomplicated.

Numerous existing patents disclose elect-

rical connections which, among other things, attempt to deal with this problem of stress. Examples of such patents are United States Letters Patent Nos. 1,743,118; 1,765,330; 2,257,506; 2,459,118; 2,941,177; 3,321,728; 3,336,559; 3,387,250; 3,437,976; 3,521,220; 3,585,564 and 3,629,784. All of the connectors disclosed by these patents are relatively heavy, complicated devices which are not suitable for light-weight, relatively inexpensive, hand-held devices.

The present invention provides an electrical appliance including a housing, said appliance being provided with a power cord connected thereto by means of a swivel electrical connection, said swivel electrical connection comprising first and second connectors, said first connector comprising an insulating body rotatably supported in an aperture in the housing and mounting an axial contact member and at least one contact member disposed substantially concentrically relative to said axial contact member, said contact members being connected to the power cord and mounted by said insulating body in contact with cooperating contact members mounted by said second connector in said housing, which cooperating contact members and said contact member of the first connector are resiliently urged into contact with one another, said insulating body having a shoulder engaged or engageable with said housing for preventing axial displacement of said first connector away from said second connector and a support in said housing spaced from said aperture for additionally rotatably supporting the first connector whereby said appliance and the power cord are rotatable relative to one another whilst electrical connection therebetween is maintained.

Preferably said cooperating contact members are resiliently urged into contact with the contact members of the first connector.

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The invention also provides a first connector for the swivel electrical connection of an appliance according to the present invention wherein the first connection has the general configuration of a plug which comprises an axial contact member having a contact area for establishing electrical contact with a first one of said cooperating contact members of the second connector of said swivel electrical connection which has the general configuration of a socket, said axial contact member also having a junction portion attached to one of the conductor leads of the power cord; a concentric contact member having a contact area thereon for establishing electrical contact with a second one of said cooperating contact members of the socket and having a junction portion to which a second one of the conductor leads of the power cord is attached; and an integrally formed insulating body of elastomeric material surrounding and in contact with the insulation surrounding said conductor leads, which insulating body of elastomeric material surrounding and in contact with the insulation surrounding said conductor leads, which insulating body comprises a first portion disposed between and in contact with said axial contact member and said concentric contact member, said first portion holding said axial contact member in spaced coaxial relation to said concentric contact member; a second portion surrounding and in contact with the junction between the axial contact member and said one of the conductor leads and the concentric contact member and said second one of the conductor leads, whilst exposing the contact area of said concentric contact member for electrical connection to the second connector; and a third portion extending from said second portion surrounding and in contact with the insulation surrounding said leads, said third portion having an axial portion extending axially from said first and second portions and terminating in an inclined portion extending at an angle to the general axial extent of said plug and said first and second portions and being more flexible than the axial portion.

The present invention in a further aspect provides a first connector for the swivel electrical connection of an appliance as defined in the first statement of invention herein which has the general configuration of a plug which comprises an axial contact member having a contact area for establishing electrical contact with a first one of said cooperating contact members of the second connector of said swivel connection which has the general configuration of a socket, said axial contact member also having a junction portion attached to one of the conductor leads of the power cord; a concentric contact member having a contact

area thereon for establishing electrical contact with a second one of said cooperating contact members of the socket and having a junction portion to which a second one of said conductor leads of the power cord is attached; and an integrally formed insulating body of elastomeric material surrounding and in contact with the insulation surrounding said conductor leads, which insulating body comprises: a first portion disposed between and in contact with said axial contact member and said concentric contact member, said first portion holding said axial contact member in spaced coaxial relation to said concentric contact member; a second portion surrounding and in contact with the junctions between the axial contact member and said one of the conductor leads and the concentric contact member and said second one of the conductor leads, whilst exposing the contact area of said concentric contact member for electrical connection to the second connector; a third portion extending from said second portion surrounding and in contact with the insulation surrounding said leads, said third portion having at least one axial portion extending axially from said first and second portions and having a cylindrical bushing surrounding said axial portion and being restrained from axial movement relative to said axial portion said bushing having a shoulder extending therearound for engagement with the periphery of an opening in the end of the housing and serving as a bearing to allow said plug to swivel with respect to said housing.

The first contact member in the plug may be in a pin, adapted to mate with a female contact member in the second connector socket, or alternatively the first contact member may be a female member which mates with a pin provided in the socket.

Preferably, the electrical connection is between a power cord and an appliance, the socket being housed within the appliance. In order to allow the plug to swivel relative to the housing, a stiff bushing or bearing is preferably provided around the plug insulation to engage a circular aperture in the end of the housing. The bushing has a flange therearound which engages the inner wall of the housing around said aperture in the housing so that tension applied along the cord will be transmitted to the housing instead of to the contacts of the connector.

Preferably, as the plug insulation extends along the cord, it is bent at an angle to the axis around which the plug rotates so that the cord will hang naturally from the appliance with the bent portion thereof reinforced by a relatively thick layer of insulation so that there is minimal flexure of the cord at the bend thereof.

In order that the invention may be better

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understood, a preferred embodiment thereof will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a side view showing part of an electrical appliance such as a hair curler, hair dryer or the like, which is electrically connected to a power cord by a preferred swivel electrical connection in accordance with the present invention;

Figure 2 is an enlarged top view, partially in section, of the swivel electrical connection shown in Figure 1, illustrating how the contacts of the connection are engaged and how a first connector constituted by a plug which forms one part of the connection is journaled within the housing of the appliance;

Figure 3 is a side view, in section, taken along lines 3-3 of Figure 2, illustrating the interior structure of the plug and further showing the relationship between the plug and the housing;

Figure 4 is a sectional plan view of the plug, showing how conductors of the cord are attached to a pin contact and sleeve contact of the plug;

Figure 5 is a side view showing the general structure of the plug, cord and a conventional American power plug located at the opposite end of the cord; and

Figure 6 is a perspective view of a concentric contact member of the plug.

Referring now to Figure 1, there is shown an electrical appliance, generally designated by the numeral 11, which is electrically connected to an attached power cord, designated generally by the numeral 12, by a swivel electrical connection, generally designated by the numeral 13. The appliance 11 may be any type of hand-held appliance, such as a hair dryer, hair curler, hedge trimmer, or the like. More particularly, the appliance 11 may be a steam curling iron, such as that described and claimed in our U.K. Patent Specification No. 1,423,501 and our U.S. Patent Specification No. 3,835,292.

In the present invention, the swivel electrical connection 13 provided, as will be hereinafter described, a rotatable or swivelling connection between the appliance 11 and the power cord 12 while having respective parts fixed to the cord 12 and the appliance 11. In addition, the connection 13 has an inclined portion 14 which extends at an angle to the axis of rotation of the connection 13 so that the cord 12 generally extends from the appliance 11 at an angle to the general longitudinal axis of the appliance, which also generally corresponds to the axis of rotation of the connection 13. Consequently, as the appliance 11 is manipulated while curling the hair or performing some other function, the cord 12 is not twisted as the appliance 11 is rotated

about its axis since the connection 13 allows the appliance to rotate relative to the cord. Since an appliance such as a hair dryer is probably more often held in a horizontal position with its power cord extending from one end and its operating portion disposed at the other end, the power cord in most instances will extend downwardly from the appliance due to gravity regardless of the location of the wall socket in which its opposite end is inserted. In the present invention, the necessary tendency for the cord 12 to assume this angular orientation with reference to the longitudinal axis of the appliance 11 is accommodated by the inclined portion 14 of the electrical connection 13. As will be hereinafter explained, the inclined portion 14 is restrained in its flexure by yieldable insulation which constitutes part of the connection 13, thereby drastically reducing fatigue imparted to the cord as the appliance 11 is manipulated.

Referring now to Figures 2 and 3 wherein the appliance 11 is shown with the housing 16 thereof in section, it is seen that the swivel electrical connection 13 has two portions; i.e., a first connector which has the general configuration of a plug, generally designated by the numeral 20, and a second connector which has a generally female configuration and function insofar as it receives embracingly the plug 20, and is referred to hereinafter as a socket, generally designated by the numeral 21. The socket 21 has in this embodiment a pair of resilient contacts consisting of a first contact 22 and a second contact 23 which are mounted on an insulating board 24. The first contact 22 has a pair of leads 26-26 which extend to the operating portion (not shown) of the appliance 11, while the second contact 23 has a pair of leads 27-27 which also extend to the operating portion of the appliance. The insulating board 24 is held within the housing 16 by flanges 29, 31 which are spaced apart to define a slot 32 therebetween in which the board 24 nests. The board 24 is thereby rigidly held within the housing 16.

The first and second contacts 22 and 23, of the socket 21, are conveniently attached to the board 24 by rivets 33 (only one visible) and have contact portions 35 and 36 thereon which are respectively resiliently urged into contact with an axial contact member constituted by a contact pin 38 and a concentric contact member constituted by a contact sleeve 39 of the plug 20. The pin 38 conveniently extends through a bore 41 through the insulating board 24, serving to rotatably support the pin 38, to engage the contact portion 35 of the cooperating first contact 22 while the sleeve 39 is circumferentially engaged by the cooperating second contact 23.

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The structure of the plug 20 is perhaps best seen in Figures 3 and 4, which show that the contact pin 38 and the contact sleeve 39 (which may be split as shown in Figure 6) are fixed in concentric relationship relative to one another in a moulded insulating body 42 of the plug or, if desired, by a separate insulating body piece separating them. The general configuration i.e. three dimensional shape of the first and second connectors and their general function as the male and female components of the swivel electrical connection, is interchangeable. Thus the second connector 21 can be formed as the male component of the connection and the first connector 20 can be formed as the female component. Also the cooperating contacts 22, 23 could be relatively rigidly held while the axial and concentric contact members 38 and 39, respectively, were arranged to be resiliently urged into contact with the former. Prior to moulding the insulating body 42 about the contact pin 38 and the contact sleeve 39, conductor leads 43 and 44 (see Figure 4) of the power cord 12 are secured to the pin and sleeve. This may be accomplished in any convenient manner, but in the preferred embodiment is accomplished by crimping junction portions 45 and 46 of the pin 38 and sleeve 39 about the respective conductor leads 43 and 44. To conveniently perform this crimping, the pin 38 may be hollow so as to receive the conductor 43, while the sleeve 39 may have a tab 48 (see Figure 6) projecting therefrom which is deformed around the conductor 44. If desired, the junction 45 and 46 may also utilize solder, or welding either in lieu of or in combination with crimping to secure the conductor leads 43 and 44. In place of tab 48, sleeve 39 may have a flange extending radially from said sleeve and having a flat portion to which conductor 44 is attached by soldering or welding. If the insulating board 21 carries pin 38 and plug 20 has a cooperating tubular contact member, connection can be made by soldering or welding.

As is seen in Figure 4, the power cord 12 has its conductor leads 43 and 44 disposed parallel to one another and joined by a web portion 49 which is integral with the insulation 50 of the cord. Since the cord is configured in this way, it will bend more easily in a direction transverse to the lay of the conductors than in a direction parallel to the lay of the conductors. Accordingly, the inclined portion 14 of the plug 20 is disposed to hold the cord 12 bent in a plane transverse to the lay of the conductor leads 43 and 44.

As seen in Figure 3, the inclined portion 14 of the plug encases the cord 12 about the bend in the cord so that the cord is discouraged from flexing at the bend. Consequently, the conductor leads 43 and 44 (see Figure 4) will not be subject to fatigue

where they are bent but, rather, fatigue causing stresses will be distributed over the entire portion of the conductor leads encased in the insulating body 42 of the plug 20.

In order to allow limited flexure in the inclined portion 14, the inclined portion 14 is provided with a series of parallel slots or grooves 51-51 extending transversely of the axis of the connection 13 which provide stress relief along the inclined portion 14. Furthermore, the inclined portion 14 is tapered, as seen in Figures 1, 3 and 5, so that flexibility is gradually increased from the bend in the cord 12 to the point at which the cord 12 emerges from the inclined portion 14. By synthesizing this taper with the grooves 51-51, abrupt changes in flexibility of the cord 12 are avoided, thereby avoiding stress concentration at any single location along the cord 12 within the inclined portion 14. By the time the cord 12 emerges from the inclined portion 14, the cross-section of the inclined portion 14 is such that very little flexure resistance is encountered by the cord 12 as it attempts to bend. In this way, stress concentration at one point is avoided, thus affording a safer, more long-lived connection between the appliance 11 and the cord 12.

As mentioned earlier in this description, the swivel connection 13 allows the appliance 11 to rotate relative to the power cord 12. This feature cooperates with the above described stress relief system effected by the tapered, grooved, inclined portion 14 to relieve the cord 12 of torsional stresses as far as possible. In order to allow the plug 20 to rotate relative to the appliance 11, the plug 20 is equipped with the above described coaxial contact members 38 and 39 which remain in contact with the cooperating contact members 22 and 23 while the plug rotates. To facilitate rotation of the plug 20 relative to the appliance 11, the housing 16 has a circular aperture 53 in one end thereof through which the plug 20 passes, while the plug 20 has a rigid or semi-rigid bushing 54 which forms a bearing that is journaled within the aperture 53. In addition the bushing 54 has an annular flange 55 extending therefrom, which flange engages the housing 16 around the aperture 53, the shoulder engaging the rear inner wall 57 of the housing 16 when the plug 20 is seated in place to keep the plug from sliding out of the housing and prevent axial movement of the plug away from the socket. The bushing 54 is preferably made of a self lubricating or low friction plastics, such as an acetal resin, so that it will readily rotate within the housing 16 which is also made of plastics.

In the illustrated embodiment, the insulating body 42, is bonded to the insulation 50 of the conductor leads 43 and 44, forming a jacket around said conductor leads 43 and 44, while the bushing 54 is retained within a

circular groove 56 formed in the insulating body 42 of the plug 20, so that the bushing 54 cannot reciprocate longitudinally with relation to the plug. By using this configuration, tensional stress applied along the cord 12 is absorbed by the housing 16 since the shoulder of the flange 55 is simply pulled back against the rear wall 57 of the housing 16 upon the application of stress. The contact members 22 and 23 of the socket 21 and the coaxial contact members 38 and 39 of the plug 20 are therefore unaffected by tension on the cord 12.

In assembling the plug 20 to the appliance 11 in which the socket 21 is already seated, the housing 16 is separated into upper and lower halves 16a and 16b, respectively. Before assembling the upper half 16a of the housing with the lower half 16b, the plug 20 is inserted at an angle into the housing with the contact pin 38 directed into the bore 41. The contact portion 35 of the contact member 22 lies across the bore 41, engages the contact pin 38 and urges the plug 20 back toward the rear wall 57 of the housing 16 so that the shoulder of the flange 55 abuts the rear wall 57. The top half 16a is then placed over the lower half 16b and a screw 58 unites the two halves of the housing.

In forming the plug 20, the most convenient procedure is to slide the bushing 54 over the cord 12 and then crimp the contact pin 38 and the contact sleeve 39 to the conductor leads 43 and 44, respectively, of the cord. This assembly is then placed in a mould (not shown) which, in a conventional way, holds the contact pin 38, contact sleeve 39, bushing 54 and cord 12 in proper relation, and is then filled with an elastomeric compound such as PVC. The PVC fills all of the voids between the component parts, forming the insulating body 42 of the resulting plug 20, the insulation 50 of the conductor leads 43 and 44 of the cord 12 being bonded to said insulating body. By this procedure a slightly flexible plug 20 is conveniently and inexpensively formed.

The elastomeric insulating body 42 of the plug 20 may be conveniently described as having three portions. A first portion 61 separates the contact pin 38 from the contact sleeve 39, while leaving the sleeve exposed and holding the central contact in coaxial and projecting relation with respect to the sleeve. A second portion 62 of the insulating body surrounds the junctions between the conductor leads 43 and 44 and the junction portions 45 and 46 of the contact pin 38 and contact sleeve 39, while slightly overlapping a portion of the contact sleeve. A third portion 63 of the insulating body has an axial portion which extends for a distance along the axis of rotation of the plug 20 from the first and second portions and then, terminates in an inclined portion 14 extend-

ing at an angle to the general axial extent of the plug and said first and second portions. As previously described, the inclined portion 14 holds the cord 12 in the inclined configuration shown in Figures 1, 3 and 5, while the axial portion provides the groove 56 which retains the bushing 54.

The embodiment of the invention described above provides a new and improved swivel electrical connection between a cord and an appliance, wherein stress between the cord and the appliance is transferred to the housing of the appliance instead of through the electrical contact members of the connection. The connection allows for the natural tendency of the cord to extend downwardly from the appliance while the appliance is being used, minimizes tensional and torsional stresses between the cord and the appliance, and so distributes bending stresses in the cord that they are not concentrated at any one section of the cord.

The connection is relatively inexpensive to manufacture, and is light in weight, so that it is particularly suitable for use between a cord and a hand-held appliance.

WHAT WE CLAIM IS:

1. An electrical appliance including a housing, said appliance being provided with a power cord connected thereto by means of a swivel electrical connection, said swivel electrical connection comprising first and second connectors, said first connector comprising an insulating body rotatably supported in an aperture in the housing and mounting an axial contact member and at least one contact member disposed substantially concentrically relative to said axial contact member, said contact members being connected to the power cord and mounted by said insulating body in contact with cooperating contact members mounted by said second connector in said housing, which cooperating contact members and said contact member of the first connector are resiliently urged into contact with one another, said insulating body having a shoulder engaged or engageable with said housing for preventing axial displacement of said first connector away from said second connector and a support in said housing spaced from said aperture for additionally rotatably supporting the first connector whereby said appliance and the power cord are rotatable relative to one another whilst electrical connection therebetween is maintained.

2. An appliance as claimed in claim 1, wherein said cooperating contact members are resiliently urged into contact with the contact members of the first connector.

3. An appliance as claimed in claim 1 or claim 2 wherein said insulating body of the first connector has a portion extending externally of the housing and formed at an



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5 circular groove 56 formed in the insulating body 42 of the plug 20, so that the bushing 54 cannot reciprocate longitudinally with relation to the plug. By using this configuration, tensional stress applied along the cord 12 is absorbed by the housing 16 since the shoulder of the flange 55 is simply pulled back against the rear wall 57 of the housing 16 upon the application of stress. The contact members 22 and 23 of the socket 21 and the coaxial contact members 38 and 39 of the plug 20 are therefore unaffected by tension on the cord 12.

15 In assembling the plug 20 to the appliance 11 in which the socket 21 is already seated, the housing 16 is separated into upper and lower halves 16a and 16b, respectively. Before assembling the upper half 16a of the housing with the lower half 16b, the plug 20 is inserted at an angle into the housing with the contact pin 38 directed into the bore 41. The contact portion 35 of the contact member 22 lies across the bore 41, engages the contact pin 38 and urges the plug 20 back toward the rear wall 57 of the housing 16 so that the shoulder of the flange 55 abuts the rear wall 57. The top half 16a is then placed over the lower half 16b and a screw 58 unites the two halves of the housing.

30 In forming the plug 20, the most convenient procedure is to slide the bushing 54 over the cord 12 and then crimp the contact pin 38 and the contact sleeve 39 to the conductor leads 43 and 44, respectively, of the cord. This assembly is then placed in a mould (not shown) which, in a conventional way, holds the contact pin 38, contact sleeve 39, bushing 54 and cord 12 in proper relation, and is then filled with an elastomeric compound such as PVC. The PVC fills all of the voids between the component parts, forming the insulating body 42 of the resulting plug 20, the insulation 50 of the conductor leads 43 and 44 of the cord 12 being bonded to said insulating body. By this procedure a slightly flexible plug 20 is conveniently and inexpensively formed.

50 The elastomeric insulating body 42 of the plug 20 may be conveniently described as having three portions. A first portion 61 separates the contact pin 38 from the contact sleeve 39, while leaving the sleeve exposed and holding the central contact in coaxial and projecting relation with respect to the sleeve. A second portion 62 of the insulating body surrounds the junctions between the conductor leads 43 and 44 and the junction portions 45 and 46 of the contact pin 38 and contact sleeve 39, while slightly overlapping a portion of the contact sleeve. A third portion 63 of the insulating body has an axial portion which extends for a distance along the axis of rotation of the plug 20 from the first and second portions and then, 65 terminates in an inclined portion 14 extend-

ing at an angle to the general axial extent of the plug and said first and second portions. As previously described, the inclined portion 14 holds the cord 12 in the inclined configuration shown in Figures 1, 3 and 5, while the axial portion provides the groove 56 which retains the bushing 54.

The embodiment of the invention described above provides a new and improved swivel electrical connection between a cord and an appliance, wherein stress between the cord and the appliance is transferred to the housing of the appliance instead of through the electrical contact members of the connection. The connection allows for the natural tendency of the cord to extend downwardly from the appliance while the appliance is being used, minimizes tensional and torsional stresses between the cord and the appliance, and so distributes bending stresses in the cord that they are not concentrated at any one section of the cord.

The connection is relatively inexpensive to manufacture, and is light in weight, so that it is particularly suitable for use between a cord and a hand-held appliance.

WHAT WE CLAIM IS:

1. An electrical appliance including a housing, said appliance being provided with a power cord connected thereto by means of a swivel electrical connection, said swivel electrical connection comprising first and second connectors, said first connector comprising an insulating body rotatably supported in an aperture in the housing and mounting an axial contact member and at least one contact member disposed substantially concentrically relative to said axial contact member, said contact members being connected to the power cord and mounted by said insulating body in contact with cooperating contact members mounted by said second connector in said housing, which cooperating contact members and said contact member of the first connector are resiliently urged into contact with one another, said insulating body having a shoulder engaged or engageable with said housing for preventing axial displacement of said first connector away from said second connector and a support in said housing spaced from said aperture for additionally rotatably supporting the first connector whereby said appliance and the power cord are rotatable relative to one another whilst electrical connection therebetween is maintained.

2. An appliance as claimed in claim 1, wherein said cooperating contact members are resiliently urged into contact with the contact members of the first connector.

3. An appliance as claimed in claim 1 or claim 2 wherein said insulating body of the first connector has a portion extending externally of the housing and formed at an

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- angle to the axis of rotation of the first connector.
4. An appliance as claimed in claim 3, wherein said portion of the first connector is provided with a plurality of transversely extending grooves.
5. An appliance as claimed in claim 3 or claim 4 wherein said portion of the first connector has a tapered cross-section reducing towards its free end.
6. An appliance as claimed in any of claims 1 to 5, wherein the insulating body is provided with a support bushing, by means of which bushing the body is rotatably supported in the housing.
7. An appliance as claimed in claim 6 wherein said support bushing is mounted on said insulating body so as to be axially substantially immovable and the shoulder is part of an annular flange on the support bushing, said shoulder engaging the inner wall of the end of the housing around said aperture in the housing.
8. An appliance as claimed in claim 6 wherein said support bushing is mounted on said insulating body so as to be axially substantially immovable and the shoulder is part of an annular flange on the support bushing, which flange engages the end wall of the housing around said aperture in the housing.
9. An appliance as claimed in claim 7 or 8, wherein the support bushing is made of low-friction material.
10. An appliance as claimed in any of claims 1 to 9, wherein the insulating body is integrally formed with the contact members, the conductor leads of the cord connected thereto being cast into it.
11. An appliance as claimed in any of claims 1 to 10 wherein said support in said housing for rotatably supporting the first connector comprises a plate of insulating material having a bore and the axial contact member of the first connector is in the form of a pin which extends through said bore, said cooperating contact members of the second connector being attached to said plate of insulating material.
12. An appliance as claimed in claim 11 wherein the contact member of the second connector contacted by the axial contact member is arranged on a first side of the plate opposite to that side of the plate on which the first connector is substantially located.
13. An appliance as claimed in any of claims 1 to 12 wherein said axial contact member is a metallic pin and said at least one concentric contact member is a metallic sleeve.
14. A first connector for the swivel electrical connection of an appliance according to claim 1 which first connector is as defined in any one of claims 3 to 5, 10 or 13 and which has the general configuration of a plug which comprises an axial contact member having a contact area for establishing electrical contact with a first one of said cooperating contact members of the second connector of said swivel electrical connection which has the general configuration of a socket, said axial contact member also having a junction portion attached to one of the conductor leads of the power cord; a concentric contact member having a contact area thereon for establishing electrical contact with a second one of said cooperating contact members of the socket and having a junction portion to which a second one of the conductor leads of the power cord is attached; and an integrally formed insulating body of elastomeric material surrounding and in contact with the insulation surrounding said conductor leads, which insulating body comprises a first portion disposed between and in contact with
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5 said axial contact member and said concentric contact member; said first portion holding said axial contact member in spaced coaxial relation to said concentric contact member; a second portion surrounding and in contact with the junctions between the axial contact member and said one of the conductor leads and the concentric contact member and said second one of the conductor leads, whilst exposing the contact area of said concentric contact member for electrical connection to the second connector; a third portion extending from said second portion surrounding and in contact with the insulation surrounding said leads, said third portion having at least one axial portion extending axially from said first and second portions and having a cylindrical bushing surrounding said axial portion and being restrained from axial movement relative to said axial portion, said bushing having a shoulder extending therearound for engagement with the periphery of an opening in the end of the housing and serving as a bearing to allow said plug to swivel with respect to said housing.

10 16. A plug according to claim 14 wherein the conductor leads are retained by the inclined portion to extend in the same direction as the inclined portion while held parallel to one another.

15 17. A plug according to claim 16 wherein the inclined portion has grooves therein which extend parallel to one another trans-

versely to the direction in which the conductor leads extend while in said inclined portion so that the inclined portion and lead portions therein tend to bend towards the axis of the first and second portions of the insulating body rather than twisting about said axis.

18. An electrical appliance according to claim 1 substantially as described hereinbefore with particular reference to the accompanying drawings.

19. A first connector which has the general configuration of a plug, for the swivel electrical connection of an electrical appliance according to claim 1, substantially as described hereinbefore with particular reference to the accompanying drawings.

20. A second connector which has the general configuration of a socket, for the swivel electrical connection of an electrical appliance as defined in claim 1, substantially as described hereinbefore with particular reference to the accompanying drawings.

21. A swivel electrical connection for connecting a power cord to an electrical appliance wherein the swivel electrical connection is as defined in any of claims 1 to 13 or 18.

For the Applicants

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