

OMNI-DIRECTIONAL POWER OUTLET COVER

FIELD OF THE INVENTION

[0001] The present invention relates to power socket/plug. In particular, the invention relates to a rotatable power socket/plug.

BACKGROUND

[0002] For a conventional power plug, the power cable is fixed thereto and extended from the power plug in one direction. When the power plug is plugged on a power socket, the power cable is stressed when it is bent to other directions. Over time, it may damage the power plug or the power cable. In some cases, over stressing the power cable may further cause the power plug to be unplug from the power socket unintentionally. Therefore, it is preferred that the power cable is kept integral with the connectors as much as possible. However, this may not be always possible, especially for the household electrical apparatus that often requires frequent movement, such as vacuum cleaner.

[0003] In addition, the power sockets that are fixed on wall are often placed with a distance above the ground to accommodate space for power cable of the power plug that extends generally downward from the power plug. However, when the space provided is obstructed by other objects, there may be problem of plugging the power plug thereon. In such circumstances, a separate/extra adapter may be required to change the orientation of the power socket.

SUMMARY

[0004] According to one aspect, the present invention provides a rotatable power socket comprising a socket panel having three terminals for receiving pins of an electrical plug through apertures defined on the socket panel; a contact pin attaching to the socket panel is electrically in contact with one of the three terminals; a contact assembly mounting at the center of the socket panel, the contact assembly having an inner ring, an insulation ring and an outer ring fitting together concentrically with the insulation ring placed between the inner ring and the outer ring, wherein the inner ring

and the outer ring are in contact with the other two terminals respectively; a housing adapted for coupling with the socket panel and supporting it thereon, the housing having terminal connectors for receiving power cables; a pin track mounting within the housing; and a coupling assembly adapted for coupling with the contact assembly, said coupling assembly having a contact ring and a connector pin mounted concentrically at the center of the housing. When the socket panel is coupled with the housing, the contact pin is fitted to the inner ring and the contact ring is fitted with the outer ring, and the connector pin is in contact with the pin track, thereby when the socket panel is rotating relative to the housing, the contact assembly and the contact pin remains in contact electrically with the coupling assembly and the pin track respectively.

[0005] According to one embodiment, the rotatable power socket may further comprise a socket cover having a center opening adapted for rotatably supporting the socket panel on the housing.

[0006] According to yet another embodiment, wherein the contact ring may be adapted to have a diameter larger than that of the outer ring for fitting the outer ring. Further, the housing terminal connectors may be adapted for receiving power cables. It is possible that the terminal connectors are connecting electrically with the connector pin, the contact ring and the pin track respectively.

[0007] According to another embodiment, the pin track may be a circular track mounted within the housing. Yet, it is also possible that one of the terminal connectors is connected to a fuse and a switch in series.

Brief Description of the Drawings

[0008] This invention will be described by way of non-limiting embodiments of the present invention, with reference to the accompanying drawings, in which:

[0009] FIG. 1 shows an exploded view of components of a rotatable power socket in accordance with one embodiment of the present invention;

[0010] FIG. 2a shows a perspective front view of a socket cover of FIG. 1 in accordance with one embodiment of the present invention;

[0011] FIG. 2b shows a perspective rear view of the socket cover of FIG. 2a;

[0012] FIG. 3a shows a perspective rear view of a socket panel of FIG. 1 in accordance with one embodiment of the present invention;

[0013] FIG. 3b shows a perspective front view of the socket panel of FIG. 3a;

[0014] FIG. 3c shows an exploded view of the socket panel of FIG 3a;

[0015] FIG. 4a shows a perspective rear view of a panel housing of FIG. 1 in accordance with one embodiment of the present invention;

[0016] FIG. 4b shows a perspective front view of the panel housing of FIG. 4a;
and

[0017] FIG. 4c shows an exploded view of the panel housing of FIG. 4a.

DETAILED DESCRIPTION

[0018] In line with the above summary, the following description of a number of specific and alternative embodiments are provided to understand the inventive features of the present invention. It shall be apparent to one skilled in the art, however that this invention may be practised without such specific details. Some of the details may not be described at length so as not to obscure the invention. For ease of reference, common reference numerals will be used throughout the figures when referring to the same or similar features common to the figures.

[0019] In accordance with one embodiment, a rotatable power socket having socket terminals is provided. The rotatable socket comprises a rotatable assembly that maintains electrical connections for each socket terminal while rotating the power socket. Specifically, the rotatable assembly provides dynamic contacts between the socket terminals and power inlet terminals. The dynamic contacts are separated from each other electrically.

[0020] FIG. 1 illustrates an exploded view of components of a rotatable power socket **100** in accordance with one embodiment of the present invention. The rotatable power socket **100** is adapted for fitting to a concealed receptacle (not shown) for any power plugs or wall outlets. The rotatable power socket **100** comprises a socket cover **110**, a socket panel **120** and a panel housing **130**. The socket cover **110** defines a round opening **111** at a center of a major surface **114** of the socket cover **110**. A mechanical switch **116** is provided at a top right corner of the major surface **114**. The mechanical switch **116** is a standard type of two-way switch for switching between on and off for the rotatable power socket **100**. The socket panel **120** is a round panel **122** having three socket apertures **126** defining at a front side and components mounted behind the round panel **122**. The round panel **122** has a size that fits to the round opening **111**. The socket apertures **126** in the present embodiment are for adapted to a Type-G (British 3-pins) plug adapted for receiving a BS1363 plugs (not shown). The socket apertures **126** are rectangular in shape and are arranged in a triangular orientation with two horizontal rectangular apertures positioned below a vertical rectangular aperture. The horizontal aperture on the right is for live terminal and the horizontal aperture on the

left is for neutral terminal. The vertical rectangular aperture is for earth terminal. The socket panel 120 may provide a shutter (not shown in FIG. 1) beneath the apertures for safety purpose. The socket panel 120 further defines a flange 124 along a perimeter of the round panel 122, whereby when the round panel 122 is fitted on the round opening 112 of the socket cover 110, the flange 124 keeps the socket panel 120 under the socket cover 110. Details of the components behind the socket panel 120 will be described later in details below. The panel housing 130 has a cylinder body 132 with one end 134 opened. Two cover lugs 136 are extended at an opposing side of the round surface 112 of the cylinder body 132, where the cylinder body 132 can be secured on the socket cover 110. The opening of the cylinder body is adapted to hold the socket panel 120 on the socket cover 110.

[0021] Still referring to FIG. 1, to assemble the rotatable power socket 100, the socket panel 120 is fitted to the socket cover 110 with the round panel 122 of the socket panel 120 fits in to the round opening 112 of the socket cover 110. The panel housing 130 is then mounted over the socket panel 120 covering the components of the socket panel 120 and attached to the socket cover 110 via the lugs. When the panel housing 130 is attached to the socket cover 110, the mouth of the opening end 132 of the panel housing 130 holds the socket panel 120 against the socket cover 110, while still allowing the socket panel 120 to rotate about the round opening 112. Once the rotatable power socket 100 is assembled, power cables can be connected thereto via the panel housing 130 and the rotatable power socket 100 can be plugged with power plugs for transmitting power. The power plugs that are plugged on the rotatable power socket 100 are rotatable about the round opening 112.

[0022] FIG. 2a and 2b illustrate perspective front and rear views of the socket cover 110 of FIG. 1 respectively in accordance with one embodiment of the present invention. Viewing at the rear side of the socket cover 110, two switch terminals 216 of the mechanical switch 116 can be seen. A fuse socket 202 is mounted on the back of the socket cover 110 by the mechanical switch 116 for holding a fuse (not shown) for the rotatable power socket 100. The fuse socket 202 defines two apertures at each end for receiving jumper cables. One jumper cable will be connected to a switch terminal 216 and another will be connected to live terminal. Also from the rear view, the round

opening 112 defined a step ring 212 having a diameter bigger than that of the round opening 112 for fitting in the flange 124. Two bumps are provided at each side of the round opening 112. The bumps correspond to the lugs 136 of the panel housing 130 for fastening the panel housing on the socket cover 110.

[0023] FIGs. 3a and 3b illustrate perspective rear and front views of the socket panel 120 of FIG. 1 respectively in accordance with one embodiment of the present invention. Viewing at the rear side of the socket panel 120, the components of the socket panel 120 can be seen. The components include a first terminal 310, a second terminal 320, a third terminal 330, a contact pin 340 and a contact assembly 350. The first terminal 310, the second terminal 320 and the third terminal 330 are made in conductor materials formed in a U-shape with one end extended side way as a lug for allowing the terminals to be fastened on the socket panel 120. The terminals are attached on the socket panel 120 oriented for receiving plug pins inserted from the front of the socket panel 120. First terminal 310, second terminal 320 and the third terminal 330 are dedicated as earth terminal, live terminal and the neutral terminal respectively. The contact pin 340 is a conductor mounts, off center, on the socket panel 120 near the first terminal 310. The contact pin 340 is mounted over the first terminal 310 electrically connecting with the first terminal 310. The contact assembly 350 is mounted at the center of the socket panel 120 where the second terminal 320 and the third terminal 330 are electrically connected thereto.

[0024] FIG. 3c illustrates an exploded view of the socket panel 120 in a accordance with one embodiment of the present invention. The socket panel 120 has a terminal platform 371 provided for mounting the components. The terminal platform 371 is shaped around the socket apertures 126 while providing mounts for supporting components thereon. The first terminal 310 and the contact pin 340 are for mounting directly on the terminal platform 371. A sub-platform 372 is provided for attaching to the terminal platform 371 at the center of the socket panel 120. A small knot 374 is defined at a middle of the sub-platform 372 (also the center of the socket panel 120), where the contact assembly 350 can be mounted thereon. The contact assembly 350 comprises an inner ring 352, an outer ring 354 and an insulation ring 356. The inner and outer ring 352 and 354 are made of conductive material. The three rings are fitted

together concentrically with the insulation ring 356 fitted in the middle to separate the inner ring 352 from the outer ring 356 electrically. The inner ring 352 defines a terminal lug 358 for allowing it to be fastened on the sub-platform 372. The outer ring 354 too defines a terminal lug 359 for allowing it to be fastened on the sub-platform 372. The insulation ring 356 and the outer ring 354 further define a cut caters for the terminal lug 358 of the inner ring 352 when the three rings are assembled. The cut on the outer ring 356 is larger than that of the insulation ring 356 so that the outer ring 354 and the inner ring 352 remains electrically non-contacting when they are mounted on the sub-platform 372.

[0025] Still referring to FIG. 3c, in assembling the socket panel 120, the first terminal 310 together with the contact pin 340, and the sub-platform 372 are mounted on the platform 371 respectively. The first terminal 310 is electrically connected to the contact pin 340. The contact assembly 350 (i.e. the assembled three rings 352, 356 and 354) is then mounted on the sub-platform 372 with the inner ring 352 fitted on the small knot 374 and the terminal lugs 358 and 359 fastened on each end of the sub-platform 372. The second terminal 320 is fastened to the terminal lug 359 and the third terminal 330 is fastened to the terminal lug 358 so that the second terminal 320 and the third terminal 330 are electrically in contact with the outer ring 354 and inner ring 352 respectively. The assembled socket panel 120 are as shown in FIG. 3a.

[0026] FIGs. 4a and 4b illustrate perspective rear and front views of the panel housing 130 of FIG. 1 respectively in accordance with one embodiment of the present invention. Viewing from the rear side of the panel housing 130, there is provided a terminal block 402 having two connectors for connecting to the earth line and neutral line respectively. The terminal block 402 provides two terminals that are provided for earth and neutral line respectively. A live terminal 403 is provided beside the terminal block 402 for connecting to the live line. As mentioned, the fuse 202 and the switch 116 are connected between the live terminal 403 and the live line in series. From the front side, an inner space or cavity of the cylinder body 132 can be seen. The cylinder body 132 comprises a pin track 410, a spacer 420 and a coupling assembly 450 are mounted in the inner space on a closed end of the cylinder body 132. The pin track 410 is a circular track adapted to provide an electrical connection track for the contact pin

340 for earth line. The coupling assembly 450 is adapted to couple with the contact assembly 350 to provide electrical connection from the terminals 402 and 403, and it is located at the center of the cylinder body 132. The spacer 420 is mounted over the pin track 410 and the coupling assembly 450. It is an insulation panel having a collar 425 at the center surrounding the coupling assembly 450.

[0027] FIG. 4c illustrates an exploded view of the panel housing 130 in accordance with one embodiment of the present invention. At the inner bottom surface of the cylinder body 132, two cylindrical apertures 405 and 404 bored into the terminal block 402 are provided for receiving connectors 414 and 454 respectively. The connectors 414 and 454 are conductive block that adapted to receive and secure power cable thereon. The pin track 410 is a flat ring panel having an outer diameter substantially the same as the inner diameter of the cylinder body 132. A track lug 412, extended from the inner diameter of the pin track 410 is provided for attaching to the connector 414. The coupling assembly 350 is adapted includes a coupling ring 452 and a connector pin 456. The coupling ring 452 has a lug 452 for allowing the coupling ring 452 for attaching on the panel housing 130. The size of the coupling ring 452 is adapted to fit onto the outer ring 354 of the socket panel 120 so that they are electrically in contact at all time when fitted. The connector pin 456 is formed on the connector 454, wherein the connector pin 456 is disposed outside the cylindrical aperture 404 when the connector 454 is inserted therein. The size of the connector pin is adapted to fit into the inner ring 352 of the socket panel 120 so that they are electrically in contact in all time when fitted. The spacer 420 is sized to be smaller than that of the outer diameter of pin track. The collar 425 is sized to be slightly bigger than the coupling ring 452.

[0028] Still referring to FIG. 4c, in assembling the panel housing 130, the connector 454 is inserted to the cylindrical aperture 404. The connector 414 is also inserted to the cylindrical aperture 402 with the pin track 410 attached thereto. The coupling ring 452 is then attached to the panel housing 130 having the connector pin 456 surrounding there between but not in contact electrically. The spacer 420 is the placed on top with the collar 425 surrounding the coupling assembly 450. As the diameter size of the spacer 420 is smaller than that of at least the outer diameter of the

pin track 410, the pin track 410 is predisposed for contacting with the contact pin 340. The assembled panel housing 130 is as shown in FIG. 4b.

[0029] When the assembled socket panel 120 is coupled to the assembled panel housing 130, the contact assembly 350 is fitted with the coupling assembly 450, and the contact pin 340 is in contact with the pin track 410. A center axis is formed at the center of the contact assembly 350 and the coupling assembly 450. Specifically, the coupling ring 452 is in contact electrically with the outer ring 354, and the connector pin 456 is in contact electrically with the inner ring 352. That allows the socket panel 120 to rotate relative to the panel housing 130 about the center axis while maintaining internal electrical connections for live, neutral and earth terminals.

[0030] The socket described above is based on a Type-G (British 3-pins) power socket. It is understood to the skilled person that the present invention is applicable to the power socket of other standard in accordance with another embodiment of the present invention.

[0031] While specific embodiments have been described and illustrated, it is understood that many changes, modifications, variations and combinations thereof could be made to the present invention without departing from the scope of the invention. For example, the similar configuration can be applied to a power plug.

Claims

1. A rotatable power socket comprising:
 - a socket panel having three terminals for receiving pins of an electrical plug through apertures defined on the socket panel;
 - a contact pin attaching to the socket panel, the contact pin is electrically in contact with one of the three terminals;
 - a contact assembly mounting at the center of the socket panel, the contact assembly having a inner ring, an insulation ring and an outer ring fitting together concentrically with the insulation ring placed between the inner ring and the outer ring, wherein the inner ring and the outer ring is in contact with the other two terminals respectively;
 - a housing adapted for coupling with the socket panel and supporting it thereon, the housing having terminal connectors for receiving power cables;
 - a pin track mounting within the housing; and
 - a coupling assembly adapted for coupling with the contact assembly, said coupling assembly having a contact ring and a connector pin mounted concentrically at a center of the housing,wherein when the socket panel is coupled with the housing, the contact pin is fitted to the inner ring and the contact ring is fitted with the outer ring, and the connector pin is in contact with the pin track, thereby when the socket panel is rotating relative to the housing, the contact assembly and the contact pin remains in contact electrically with the coupling assembly and the pin track respectively.
2. The rotatable power socket according to claim 1, further comprising a socket cover having a center opening adapted for rotatably supporting the socket panel on the housing.
3. The rotatable power socket according to claim 1 or 2, wherein the contact ring is adapted to have a diameter larger than that of the outer ring for fitting the outer ring therein.

4. The rotatable power socket according to any one of the preceding claims, wherein the housing terminal connectors are adapted for receiving power cables.
5. The rotatable power socket according to claim 4, wherein the terminal connectors are connecting electrically with the connector pin, the contact ring and the pin track respectively.
6. The rotatable power socket according to any one of the preceding claims, wherein the pin track is a circular track mounted within the housing.
7. The rotatable power socket according to any one of the preceding claims, wherein the one of the terminal connector is connected to a fuse and a switch in series.