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(54) Title: IMPROVEMENTS IN ADAPTERS FOR ELECTRICAL PLUGS

(57) Abstract

The invention concerns an adapter capable of retaining a moulded plug (8) within itself. The adapter comprises first (1) and second (2) portions removably attached to one another and between which the plug (8) is retained. Various safely features and improvements are disclosed which: (a) permit insertion of the plug when the first and second portions are secured to one another but its removal only when they are separated; (b) only complete the electrical circuit when the portions are so secured; (c) only permit separation of the portions when the adapter is not plugged into a socket; or (d) only permit removal of the moulded plug when the adapter is not plugged into a socket.

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Improvements in Adapters for Electrical Plugs

This invention relates to adapters for moulded or other electrical plugs of the type which enable moulded or other plugs having a pin arrangement incompatible with that of a mains electricity socket, such as two-pin shaver plugs, to be connected to the mains.

In particular, this invention relates to an adapter, such as is disclosed in EP-A-342942, which is capable of retaining a moulded or other plug within itself comprising: an upper and a lower portion; a plurality of mains pins extending below the lower portion for connecting the adapter to the mains; means for securing a moulded plug, having at least two pins, within the adapter; means for effecting electrical contact between respective plug pins and mains pins; and means for movably securing the upper portion to the lower portion. Such adapters shall hereinafter be referred to as "relevant adapters".

Unless otherwise indicated, references herein to a relevant adapter are to such an adapter in which the moulded plug can be retained in any orientation, in which the upper and lower portions may be completely separable or may be hingedly, slidably, rotatably or otherwise movably attached, and which may also include a middle portion retainable between the upper and lower portions. Additionally, the lower portion may comprise a box or frame into which the upper portion is slidable.

According to a first aspect of the invention, there is provided a relevant adapter, wherein the means for securing a moulded plug within the adapter comprise retaining means adapted to co-operate with features of relief of the moulded plug.

The retaining means may comprise a moulded recess in either the upper or the lower portion of the adapter. Where a

moulded recess is provided, it is envisaged that the mass of material, preferably plastics material, in which the recess may be provided may be finned, or comprise a plurality of projecting pegs, with the edges of the fins, or the ends of the pegs, defining the contours of the recess. This arrangement has the attendant advantage of a reduction in the quantity of material required for the moulding.

The features of relief may comprise projections or indentations in a shoulder portion, a body portion, a pin or pins or a tail portion of the moulded plug, in which case the retaining means may also comprise corresponding indentations or projections. Advantageously, the positioning of the features of relief and of the corresponding retaining means may be dependent upon the fuse rating required by the appliance to which the moulded plug is connected and the rating of the fuse carried by the adapter respectively.

Alternatively, the retaining means may comprise means adapted to receive and locate at least one pin of the moulded plug. Preferably the retaining means include a hole in, or a groove in an edge of, an internal wall of the plug and conveniently there is one such hole for each pin. The internal wall may be integrally formed with the upper or the lower portion of the adapter, or may be part of a separate internal portion which is retained by the upper and lower portions. The internal wall may be provided with a further hole for passage of a fuse.

Additionally, the retaining means may also include an exit hole or slot in either the upper or lower portion of the adapter which is sufficiently large to permit passage of the cable to which the moulded plug is attached but is not large enough to accommodate any part of the moulded plug. In this way, the moulded plug may be retained between the internal wall and the portion of the adapter surrounding the exit hole or slot.

A further alternative is that the retaining means may comprise a key lockable, for example by rotation, in a recess in the moulded plug. Preferably, operating means for engaging and disengaging the key are provided on the underside of the lower portion of the adapter. This ensures that the moulded plug can only be disconnected etc. when the adapter is removed from a mains socket.

According to a second aspect of the invention, there is provided a relevant adapter wherein the means for securing a moulded plug within the adapter are such as to permit insertion of a moulded plug when the upper and lower portions are secured to one another but to permit its removal only when the upper and lower portions are separated.

For example, the means for securing a moulded plug may include one or more inwardly opening flaps in the upper or lower portion movable between a closed and an inwardly opened position. Preferably the flap or flaps are biassed towards the closed position, for example by a spring or springs.

One disadvantage of the relevant adapters disclosed in EP-A-342942 is that it is possible to remove the upper portion of the adapter, plug the lower portion into a socket and interchange moulded plugs while the contacts in the lower portion remain live. It is an object of this invention to provide a relevant adapter wherein such interchange is prevented, or at least where such interchange does not involve a user's fingers being in the proximity of exposed live contacts.

According to a third aspect of the invention, there is provided a relevant adapter wherein the means for effecting electrical contact between respective plug pins and mains pins comprise contact means whereby such contact is effected upon securement of the upper portion of the adapter to the

lower portion.

The contact means may comprise first contact means in the upper portion for receiving the plug pins in electrical contact and second contact means in the lower portion for effecting electrical contact between the first contact means and the mains pins on securement of the upper portion of the adapter to the lower portion.

Alternatively, the contact means may comprise means for retaining a fuse or conductor in the upper portion of the adapter and a pair of contacts in the lower portion, the fuse or conductor bridging the pair of contacts on securement of the upper to the lower portion. In the case of a conductor, the pair of contacts may include a moulded plug pin, or one end of a fuse, or both.

A further alternative is that the contact means comprises a switch, preferably in the live pin circuit, in the lower portion of the adapter, biassed into an open position, but which is closed by closing means on the upper portion upon securement of the upper portion to the lower.

The switch may comprise a reed switch and the closing means may comprise a magnet for closing the reed switch on securement of the upper to the lower portion. The reed switch may be incorporated into a fuse. An advantage of this alternative is that the circuitry between the reed switch/fuse and the live pin may be completely enclosed in the lower portion.

Otherwise, the switch may comprise a pair of contacts located adjacent, but biassed away from, one another and the closing means comprises a projecting wedge or pin which moves one contact such that it touches the other. An advantage of this arrangement is that most of the live pin circuitry can be enclosed, and there need only be an opening in the lower portion sufficiently large to permit passage of

the pin or wedge. In the case of a pin, the live contact may be disposed further from the opening than the remaining contact, and the exposed contact may be covered with an insulation material, thus further reducing any associated risks.

Fourth and fifth aspects of this invention will now be described which relate to relevant adapters which are such that the upper and lower portions cannot be separated while the adapter remains plugged into a socket.

According to a fourth aspect of the invention, there is provided a relevant adapter including release means disposed on the lower surface of the lower portion of the adapter operable to permit release of the upper portion from the lower portion. As can readily be seen, in order to release the upper portion from the lower, the adapter must be removed from a socket in order for access to the release means to be obtained.

In a case where the upper and lower portions are slidably or rotatably attached to one another, the release means may comprise a pin located in one portion and biassed into engagement with a hole or recess in the other portion, the pin being movable out of engagement with the hole or recess.

Alternatively, the release means may comprise a cam rotatable to release the upper and lower portions of the adapter from one another. Preferably the cam is biassed into a position in which the two portions are secured to each other.

Preferably, in a case where the upper and lower portions are hingedly, slidably, rotatably or otherwise movably attached and movable between a closed and an open position, the release means is movable between a first, locking position and a second, releasing position wherein it projects below the lower surface of the lower portion, and is capable of

adopting the locking position only when the upper and lower portions are in the closed position.

Possibly, the release means comprises a pin, screw or the like withdrawable from the lower surface of the lower portion but including check means to prevent it from being completely withdrawn and the upper portion is provided with a recess for receiving the pin, screw or the like, the recess only being in alignment with the pin, screw or the like when the upper and lower portions are in the closed position.

Alternatively, the release means may comprise a lever provided on the lower portion and pivotable between a locking position flush with the lower surface of the lower portion and a release position. The end of the lever remote from its free end may be provided with a pinion for co-operating with a rack on the upper portion or may be provided with a cam for co-operating with a recess therein.

According to the fifth aspect of the invention, there is provided a relevant adapter wherein the upper and lower portions are movable between a closed position wherein the adapter is compatible with, and may be plugged into, a mains socket and an open position wherein the adapter is incompatible with, and cannot be plugged into, the socket. For example, one mains pin, preferably the earth pin, may constitute a release means movable between a first, locking, socket-compatible position and a second, releasing, socket-incompatible position. The pin may be rotatable, or may form a lever, possibly provided with a pinion or cam as aforesaid.

Alternatively, one mains pin may be retractable within the adapter and include an internal head portion for contacting the moulded plug. When the upper and lower portions are in the closed position, and the moulded plug therefore secured, the mains pin cannot retract within the adapter. However,

when the upper and lower portions are in the open position, any effort to insert the adapter into a socket will result in the pin being pushed into the adapter, thereby displacing the moulded plug from its retained position.

Alternatively, the upper portion of the adapter may carry at least one of the mains pins and the lower portion the remaining mains pins. Preferably, the upper portion carries the earth pin and the lower portion the remaining pins. In this way, when the upper and lower portions are released from one another, the mains pins are no longer configured to correspond with a mains socket.

A further alternative, is that when the upper and lower portions are in the open position, at least a part of the upper portion projects below the lower surface of the lower portion. This prevents the adapter being re-inserted into a socket until the upper and lower portions return to the closed position.

The upper and lower portions may, for example, be hingedly connected, or slidably connected by means of arcuate sliding surfaces, e.g. an arcuate groove in one portion co-operating with an arcuate ridge or bead on the other portion.

A sixth aspect of the invention will now be described which relates to relevant adapters which are such that the adapter and a moulded plug retained therein cannot be separated while the adapter remains plugged into a socket.

According to the sixth aspect of the invention, there is provided a relevant adapter which is such that, during insertion of a moulded plug, at least a portion of the moulded plug projects below the lower surface of the lower portion.

Advantages of this arrangement are clear, the principal advantages being that the adapter must be removed from a

socket in order to enable the moulded plug to be interchanged. In this way, it is ensured that no live contacts are exposed during the normal process of inserting or removing a moulded plug into or from the adapter.

In a preferred embodiment of adapter according to the sixth aspect of the invention, at least the lower surface of the lower portion is provided with an access aperture through which the moulded plug may be inserted or removed. With this arrangement, since the lower surface of the lower portion lies flush with a socket when the adapter is plugged in, the adapter must be unplugged before access can be had to the access aperture.

The access aperture may be so dimensioned as to conform with the shape of the moulded plug, or may be larger than the plug.

Advantageously, the adapter may also accord with the fourth or fifth aspect of the invention, thereby requiring removal from a socket not only for change of plug, but also for separation of the upper and lower portions.

In any of the aforesaid aspects of the invention one or more of the following improvements may be incorporated.

The upper portion may be provided with the gripping handle in order for it more easily to be used by individuals whose grip, for example because of disease, is relatively weak.

The mains pins and the means for effecting electrical contact between the mains and plug pins may comprise a mains pin, connecting track and plug pin receiver integrally formed from stamped copper sheet or other conductive sheet material.

Where a metal track connects a mains pin to a plug pin, it is preferred that the track comprises at least a partial

twist to allow for relative movement of the plug and mains pins.

The upper and lower portions, when moveable between a closed and an open position may be biassed, for example by a spring, towards the closed position. This ensures that the adapter cannot be left unattended with its terminals exposed.

The adapter may be provided with an internal flap movable between an inwardly swung, closed position and an outwardly swung, open position, and covering the opening through which the moulded plug or its cable passes. This prevents anything being inserted into the adapter without the upper and lower portions first being separated or opened.

The various aspects of the invention shall now be described with reference to figs. 1-35 of the accompanying schematic drawings, wherein:

figs. 1-5 illustrate various basic embodiments of a relevant adapter to which this invention may be applied;

figs. 6-12 illustrate embodiments of a relevant adapter according to the first aspect of the invention;

fig. 13 illustrates an embodiment of a relevant adapter according to the second aspect of the invention;

figs. 14-24b illustrate embodiments of a relevant adapter according to the third aspect of the invention;

figs. 25-27b illustrate embodiments of a relevant adapter according to the fourth aspect of the invention;

figs. 28-30 illustrate embodiments of a relevant adapter according to the fifth aspect of the invention;

figs. 36 and 37 illustrate an embodiment of an adapter according to the sixth aspect of the invention; and

figs. 31-35 illustrate various improvements which may be applied to an embodiment of a relevant adapter according to any aspect of the invention.

Referring now to fig. 1, there is shown a lower portion (2) of a relevant adapter, provided with mains pins (3, 4). Mains pin (4) is connected via a conductive track (10) to a plug pin receiver (5). This embodiment includes a middle portion (6) which is retained in the lower portion (2) by means of barbs (11) and which includes a moulded recess (not shown) for receiving a moulded plug. The middle portion may also be retained by means of ultrasonic welding or by adhesive.

Fig. 2 shows a relevant adapter whose upper portion (1) forms a partial lid. The remainder of the upper surface of the adapter is provided by a part of the lower portion (2). Once again, mains pins (3, 4) are provided.

This arrangement is advantageous in that the plug pin receivers (not shown) may be hidden beneath that part of the lower portion (2) which provides an upper surface.

Figs. 3a and 3b show relevant adapters having upper and lower portions slidably connected. Fig. 3a shows an upper portion (1) inset into recesses (12) in a lower portion (2). This ensures that all handling stresses are placed on the lower portion (2). Although fig. 3a shows an inset sliding upper portion, it is also envisaged that other forms of attachment are applicable. Fig. 3b shows an upper (1) and a lower (2) portion slidably connected and prevented from being separated by barbs (13a, 13b).

Fig. 4 shows a relevant adapter wherein the edges of a plug (8) having pins (9, 19) project from between the upper (1)

and lower (2) portions. Fig. 5 shows an adapter wherein the plug (8) is retained at an angle. Also shown is a fuse (14).

Referring now to fig. 6, there is shown an embodiment of a relevant adapter according to the first aspect of the invention comprising upper (1) and lower (2) portions and mains pins (3, 4, 7). Both the upper (1) and lower (2) portions are provided with a moulded recess (15) which is so shaped as to co-operate with features of relief of the moulded plug. However, it is envisaged that the moulded recess may be provided in only one of the upper (1) or lower (2) portions.

Figs. 7a-7d show a number of moulded plugs (8) having pins (9, 19) and various features of relief (21, 18, 17, 22) with which a moulded recess in a relevant adapter may co-operate. Fig. 7a shows various positions in which recesses (21) may be located in the body of the moulded plug. Figs. 7b and 7c show shoulder regions (18, 17) which may co-operate with a moulded recess in the adapter. Fig. 7d shows a groove (22) formed between a pin (19) and an insulating sleeve (16). Any of these features may co-operate with a moulded recess in an adapter to retain the plug (8).

Fig. 8 shows a lower portion (2) of a relevant adapter having mains pins (3, 4, 7). In this embodiment, the contours of a recess (15) are defined by the edges of fins (23).

Figs. 9a, 9b, 9c and 9d show embodiments of a relevant adapter provided with an internal wall (24) having holes (25a, 25b) for receiving the pins (9, 19) of a moulded plug (8). In the embodiment of figs. 9a and 9b, the internal wall is integrally formed with the lower portion (2).

The embodiment of fig. 9c is one in which a part of the upper surface is provided by the lower portion. The pins

(9, 19) of a moulded plug pass through holes (25a, 25b) into contact with receivers (5) joined to their respective pins (4) by means of conducting tracks (10). An advantage of this embodiment is that the tracks (10) and plug pin receivers (5) can be almost completely enclosed, the only communication with the surroundings being via the holes (25a, 25b).

The embodiment of fig. 9d is similar to that of fig. 9c, but includes an upper portion (1) which takes the form of a clamp which retains the moulded plug by clamping its tail portion to the lower portion (2) of the adapter. The upper portion (1) may comprise a conventional cable clamp, e.g. a strip of flexible material retained by a screw at either end.

Fig. 10 also shows a lower portion (2) of a relevant adapter having an internal wall (24). In addition to holes (25a, 25b) for the plug pins, there is also a hole (26) for passage of a fuse.

Fig. 11 shows a lower portion (2) of a relevant adapter having an internal wall (24) with holes (25a, 25b) for retaining the pins (9, 19) of a moulded plug (8). Also provided is an exit hole (28) for the cable (27) from the plug (8). In this embodiment, the plug (8) is retained between the internal wall (24) and the surrounds of the exit hole (28). The exit hole is shown chamfered to prevent chafing of the cable (27).

In fig. 12 there is shown a lower portion (2) of a relevant adapter having an internal wall (24) through which the pins (9, 19) of a moulded plug (8) pass. Also provided is a key (29) rotatable within a recess (30) in the plug body (8) to secure the plug (8) in the lower portion (2).

Fig. 13 shows an embodiment of a relevant adapter according to the second aspect of the invention having upper (1) and

lower (2) portions and mains pins (3, 4). The adapter is provided with inwardly opening flaps (31, 32) which are biassed into a closed position shown in the figure.

Fig. 14 shows an embodiment of a relevant adapter according to the third aspect of the invention having upper (1) and lower (2) portions slidably attached to one another. The lower portion (2) includes tracks (10) communicating the mains pins (4) with plug pin receivers (5). The upper portion (1) includes a moulded recess for a plug (8). Only when the upper (1) and lower (2) portions are slid into their closed position do the plug pins (19) make contact with the plug pin receivers (5).

Fig. 15 shows an adapter in which the upper portion (1) includes plug pin receivers (5), and lower portion (2) includes contacts (31) which are in contact with the mains pins (4, 7) and come into contact with the plug pin receivers (5) on securement of the upper portion (1) to the lower (2).

Figs. 16a and 16b show a relevant adapter wherein the lower portion (2) forms a box or frame for receipt therein of the upper portion (1). In this embodiment, the upper portion (1) includes plug pin receivers (5) and contacts (31) for contacting the mains pins (4, 7). Fig. 17 shows a relevant adapter in which the upper (1) and lower (2) portions are rotatably connected. The upper portion (1) carries the plug (8), plug pin receivers (5) and contacts (31); the lower portion (2) carries the mains pins (3, 4, 7).

Figs. 18a and 18b show other examples of relevant adapters wherein the upper (1) and lower (2) portions are rotatably connected. In these cases, there is also provided a locking assembly (32) for preventing relative rotation of the upper (1) and lower (2) portions. The locking assembly is illustrated in figs. 18c-18e and comprises inner (33) and outer (34) cylinders and a locking clip (35). The locking

clip (35) is movable between a locking position (as shown) and a releasing position, and is positively located in these positions by means of resilient lugs (36). Relative rotation of the inner (33) and outer (34) cylinders is permitted only when the locking clip (35) is in its releasing position.

Fig. 19 shows a relevant adapter wherein a fuse (14) is contained in the upper portion (1) and bridges contacts (37) in the lower portion (2) upon securement of the portions together.

Fig. 20a shows an adapter wherein the upper portion (1) carries a fuse (14) and the moulded plug (8). The lower portion (2) includes a generally w-shaped contact (40) which makes contact between the fuse (14) and plug pin (9) on securement of the two portions to each other. Alternatively, the fuse (14) and plug (8) may be carried by the lower portion (2), and a w-shaped contact (40) by the upper portion (1).

Fig. 20b shows an arrangement of a fuse (14), plug pin (9) and generally u-shaped contact (40'). Such an arrangement is suitable for use in, for example, an adapter wherein the moulded plug is carried by the upper portion and the fuse (14) and u-shaped contact (40') by the lower portion.

Fig. 21 shows an adapter having a magnet (43) in the upper portion (1), and a fuse (14'), having a reed switch (42) and fuse wire (41), in the lower portion (2). Electrical contact is completed by bringing the magnet (43) close to the reed switch (42) which closes the reed switch (42).

Fig. 22 shows a relevant adapter wherein a track (10) joining a mains pin (4) to a plug pin receiver (5) is broken and provided with contacts (45) and insulation (46). This arrangement is located in the lower portion (2). In the upper portion (1) is located a pin (44) which moves one

contact (45) so as to touch the other upon securement of the upper (1) to the lower (2) portion. As can be seen, much of this circuitry can be enclosed.

Fig. 23 shows an arrangement equivalent to that of fig. 22 except that it includes a fuse (14) in the broken track (10).

Figs. 24a and 24b show relevant adapters wherein the upper (1) and lower (2) portions are slidably connected to one another. Each upper portion is provided at its forward end with a wedge (146) which, in the case of fig. 24a, raises a plug pin receiver (5) into contact with a plug pin (9) or, in the case of fig. 24b, raises a contact (47) on a track (10) leading from a mains pin (7) so as to touch a contact (47) on a plug pin receiver (5). Once again, almost all of the circuitry can be enclosed.

Figs. 25a, 25b and 25c show embodiments of a relevant adapter according to the fourth aspect of the invention. Fig. 25a shows upper (1) and lower (2) portions, the upper portion (1) having a recess (52) with a pin (50) mounted therein and biassed outwardly by means of a spring (51). The pin engages with a hole in the lower portion (2), but may be disengaged therefrom against the bias of the spring (51) to permit release of the two portions (1; 2), for example by sliding or rotation, etc.

Fig. 25b shows a pin (50) mounted in a recess (53) in the lower portion (2) and extending therethrough. The pin is biassed into engagement with a hole in the upper portion (1) by means of a spring (51), but may be withdrawn therefrom against the bias to permit separation of the portions (1, 2).

Fig. 25c shows a lower portion (2) having a cam (54) biassed into a locking position by means of a spring (51) and rotatable against the bias to release an upper portion (not

shown) from the lower (2).

Fig. 26 shows an adapter having a bolt (60) withdrawable from the lower surface of the lower portion (2) and including an enlarged head (62) to prevent its complete withdrawal. The upper portion (1) has a recess (61) alignable with the enlarged head (62) of the bolt (60) only when the upper (1) and lower (2) portions are in a closed position.

Figs. 27a and 27b show lower portions (2) of relevant adapters provided with levers (63). In fig. 27a, the pivoted end of the lever has a pinion (64) for co-operation with a rack (65) on the upper portion (1); in fig 27b, that end of the lever is provided with a cam (66) for co-operation with a recess (67). In either case, the lever can only be returned to a position flush with the lower surface of the lower portion (2) when the upper (1) and lower (2) portions are in a closed position, and therefore prevents insertion of the adapter into a socket when the upper and lower portions are in an open position.

Fig. 28a shows a relevant adapter in which the earth mains pin (3) must be rotated by 90° to allow the upper and lower portions to be separated. Once the pin is rotated, a cam (68) becomes aligned with a groove (69), allowing the two portions to slide relative to one another. Naturally, other embodiments can be envisaged in which the pin may be rotated by angles other than 90°, e.g. 80° or 100° etc.

Fig 28b shows a relevant adapter incorporating a retractable pin (4) having a shaped head (4') for contacting a moulded plug (8). As can be seen, any attempt to insert the adapter into a socket without the upper portion (not shown) in place will result in the pin (4), preferably the live pin, being pushed into the adapter, and displacing plug pin (19) from its contact.

Fig. 29 shows an adapter in which the upper (1) and lower (2) portions are slidingly connected and in which the lower portion (2) carries two mains pins (4, 7), and the upper portion (1) carries another (3).

Fig. 30 shows an adapter in which the upper (1) and lower (2) portions are arcuately slidable relative to one another. The adapter is shown in its open position wherein a part of the upper portion (1) extends or projects below the lower surface of the lower portion (2), thereby preventing insertion into an electrical socket.

Fig. 36 shows a longitudinal section through a relevant adapter according to the sixth aspect of the invention during insertion of a moulded plug (8) which is not shown in section. The particular embodiment shown includes a lower portion (2), to which is attached an upper portion (1) at a hinge (96). The lower portion carries the usual mains pins (3, 4) and includes an access aperture (90, 92).

The access aperture consists essentially of two parts: a first part (90) in the lower surface of the lower portion (2) through which the body of the moulded plug (8) is inserted; and a second part (92) in the rear wall of the lower portion (2) through which the moulded plug cable passes once the plug is secured within the adapter. A shoulder (94) on the rear of the plug is retained against the surround of the second part (92) of the access aperture to help secure the plug in position.

Of course, it is perfectly possible for the second part of the access aperture to be large enough to accommodate the rear of the tail portion of the moulded plug, the shape of the plug preventing it from moving out any further.

Similarly, it may be that the first part of the access aperture extends to the rear wall of the lower portion, so long as the aperture is closed at its upper extremity by a

bridge of material to prevent the moulded plug from being inserted from above.

The adapter of fig. 36, with a plug retained therein is shown from below in fig. 37. In this embodiment, the access hole is somewhat larger than the moulded plug since the plug must be inserted at an angle. However, this need not be the case, for example if the upper portion (1) were coextensive with the lower portion (2).

Figs. 31a and 31b show relevant adapters wherein the upper portions (1) are provided with handles (70).

Fig. 32a shows a typical sheet stamping from which a pin (4), track (10) and plug pin receiver (5) or pin (4), track (10) and fuse receiver (75) as shown in figs. 32b and 32c respectively, may be constructed. Fig. 33 shows a track (10) including a 180° twist to allow for movement of a plug pin retainer (5) relative to a mains pin (not shown).

Fig. 34 shows an adapter in which the first (1) and second (2) portions are hingedly mounted on one another, and biassed into a closed position (as shown) by a spring (80).

Fig. 35 shows an adapter provided with an internal flap (82) biassed into an inwardly swung, closed position (as shown) to prevent foreign objects being inserted. The flap is movable to an outwardly swung, open position only upon separation of the upper (1) and lower (2) portions.

It will, of course, be understood that the invention has been described above purely by way of example and that modifications of detail and combinations of features can be made without departing from its scope.

CLAIMS

1. An adapter which is capable of retaining a moulded or other plug within itself comprising: an upper and a lower portion; a plurality of mains pins extending below the lower portion for connecting the adapter to the mains; means for securing a moulded plug, having at least two pins, within the adapter; means for effecting electrical contact between respective plug pins and mains pins; and means for movably securing the upper portion to the lower portion.

2. An adapter according to claim 1 such that the upper and lower portions cannot be separated while the adapter remains plugged into a socket.

3. An adapter according to claim 2 including release means disposed on the lower surface of the lower portion of the adapter operable to permit release of the upper portion from the lower portion.

4. An adapter according to claim 3 wherein the upper and lower portions are slidably or rotatably attached to one another, and the release means comprises a pin located in one portion and biassed into engagement with a hole or recess in the other portion, the pin being movable out of engagement with the hole or recess.

5. An adapter according to claim 3 wherein the upper and lower portions are slidably or rotatably attached to on another, and the release means comprises a cam rotatable to release the upper and lower portions of the adapter from one another.

6. An adapter according to claim 3 wherein the upper and lower portions are hingedly, slidably, rotatably or otherwise movably attached and movable between a closed and an open position, and the release means is movable between a first, locking position and a second, releasing position

wherein it projects below the lower surface of the lower portion, and is capable of adopting the locking position only when the upper and lower portions are in the closed position.

7. An adapter according to claim 6 wherein the release means comprises a pin, screw or the like withdrawable from the lower surface of the lower portion but including check means to prevent it from being completely withdrawn and the upper portion is provided with a recess for receiving the pin, screw or the like, the recess only being in alignment with the pin, screw or the like when the upper and lower portions are in the closed position.

8. An adapter according to claim 6 wherein the release means comprises a lever provided on the lower portion and pivotable between a locking position flush with the lower surface of the lower portion and a release position.

9. An adapter according to claim 2 wherein the upper and lower portions are movable between a closed position wherein the adapter is compatible with, and may be plugged into, a mains socket and an open position wherein the adapter is incompatible with, and cannot be plugged into, the socket.

10. An adapter according to claim 9 wherein one mains pin, preferably the earth pin, constitutes a release means movable between a first, locking, socket-compatible position and a second, releasing, socket-incompatible position.

11. An adapter according to claim 9 wherein one mains pin is retractable within the adapter and include an internal head portion for contacting the moulded plug.

12. An adapter according to claim 9 wherein the upper portion of the adapter carries at least one of the mains pins and the lower portion the remaining mains pins.

13. An adapter according to claim 12 in which the upper portion carries the earth pin and the lower portion the remaining pins.

14. An adapter according to claim 9 wherein, when the upper and lower portions are in the open position, at least a part of the upper portion projects below the lower surface of the lower portion.

15. An adapter according to claim 14 wherein the upper and lower portions are slidably connected by means of arcuate sliding surfaces, e.g. an arcuate groove in one portion co-operating with an arcuate ridge or bead on the other portion.

16. An adapter according to claim 1 wherein the means for securing a moulded plug within the adapter comprise retaining means adapted to co-operate with features of relief of the moulded plug.

17. An adapter according to claim 16 wherein the retaining means comprise a moulded recess in either the upper or the lower portion of the adapter.

18. An adapter according to claim 17 wherein the mass of material, preferably plastics material, in which the recess is provided is finned, or comprises a plurality of projecting pegs, with the edges of the fins, or the ends of the pegs, defining the contours of the recess.

19. An adapter according to any one of claims 16-18 in which the features of relief comprise projections or indentations in a shoulder portion, a body portion, a pin or pins or a tail portion of the moulded plug, and the retaining means comprises corresponding indentations or projections.

20. An adapter according to claim 16 in which the retaining means comprises means adapted to receive and locate at least

one pin of the moulded plug.

21. An adapter according to claim 20 wherein the retaining means includes a hole in, or a groove in an edge of, an internal wall of the plug.

22. An adapter according to any one of claims 16-21 wherein the retaining means includes an exit hole or slot in either the upper or lower portion of the adapter which is sufficiently large to permit passage of the cable to which the moulded plug is attached but is not large enough to accommodate any part of the moulded plug.

23. An adapter according to claim 16 wherein the retaining means comprises a key lockable, for example by rotation, in a recess in the moulded plug.

24. An adapter according to claim 23 wherein operating means for engaging and disengaging the key are provided on the underside of the lower portion of the adapter.

25. An adapter according to claim 1 wherein the means for securing a moulded plug within the adapter are such as to permit insertion of a moulded plug when the upper and lower portions are secured to one another but to permit its removal only when the upper and lower portions are separated.

26. An adapter according to claim 25 in which the means for securing a moulded plug includes one or more inwardly opening flaps in the upper or lower portion movable between a closed and an inwardly opened position.

27. An adapter according to claim 26 in which the flap or flaps are biassed towards the closed position, for example by a spring or springs.

28. An adapter according to claim 1 wherein the means for

effecting electrical contact between respective plug pins and mains pins comprise contact means whereby such contact is effected upon securement of the upper portion of the adapter to the lower portion.

29. An adapter according to claim 28 wherein the contact means comprises first contact means in the upper portion for receiving the plug pins in electrical contact and second contact means in the lower portion for effecting electrical contact between the first contact means and the mains pins on securement of the upper portion of the adapter to the lower portion.

30. An adapter according to claim 28 wherein the contact means comprises means for retaining a fuse or conductor in the upper portion of the adapter and a pair of contacts in the lower portion, the fuse or conductor bridging the pair of contacts on securement of the upper to the lower portion.

31. An adapter according to claim 28 wherein the contact means comprises a switch, preferably in the live pin circuit, in the lower portion of the adapter, biassed into an open position, but which is closed by closing means on the upper portion upon securement of the upper portion to the lower.

32. An adapter according to claim 31 wherein the switch comprises a reed switch and the closing means comprises a magnet for closing the reed switch on securement of the upper to the lower portion.

33. An adapter according to claim 31 wherein the switch comprises a pair of contacts located adjacent, but biassed away from, one another and the closing means comprises a projecting wedge or pin adapted to move one contact such that it touches the other.

34. An adapter according to claim 1 such that the adapter

and a plug secured therein cannot be separated when the adapter is plugged into a socket.

35. An adapter according to claim 34 such that, during insertion of a moulded plug, at least a portion of the moulded plug projects below the lower surface of the lower portion.

36. An adapter according to claim 35 wherein at least the lower surface of the lower portion is provided with an access aperture through which the moulded plug may be inserted or removed.

37. An adapter according to claim 34 and claim 20.

38. An adapter according to any preceding claim in which the upper portion is provided with a gripping handle.

39. An adapter according to any preceding claim in which the mains pins and the means for effecting electrical contact between the mains and plug pins comprise a mains pin, connecting track and plug pin receiver integrally formed from stamped copper sheet or other conductive sheet material.

40. An adapter according to any preceding claim wherein a metal track connects a mains pin to a plug pin receiver and comprises at least a partial twist to allow for relative movement of the plug and mains pins.

41. An adapter according to any preceding claim wherein the upper and lower portions are moveable between a closed and an open position and are biassed, for example by a spring, towards the closed position.

42. An adapter according to any preceding claim provided with an internal flap movable between an inwardly swung, closed position and an outwardly swung, open position, and

covering the opening through which the moulded plug or its cable passes.

43. An adapter substantially as described herein with reference to any one of figs. 1-37 of the accompanying drawings.

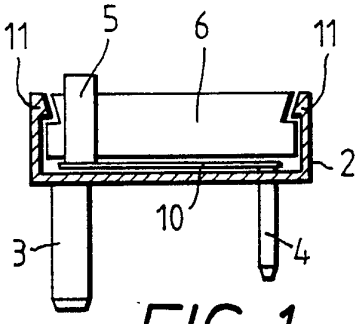


FIG. 1

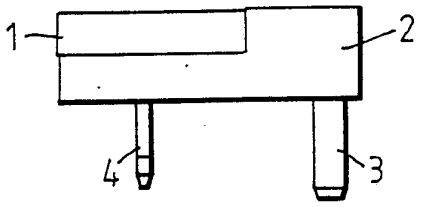


FIG. 2

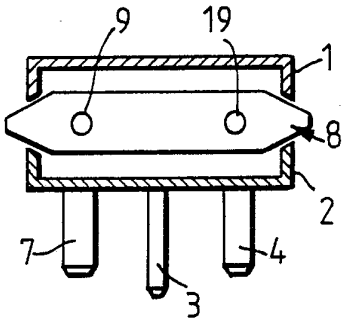


FIG. 4

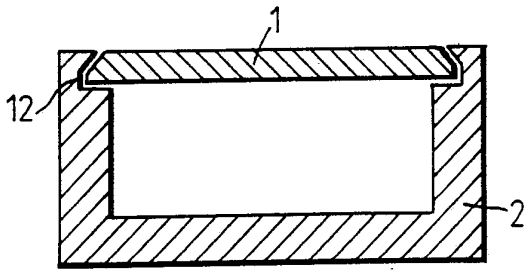


FIG. 3a

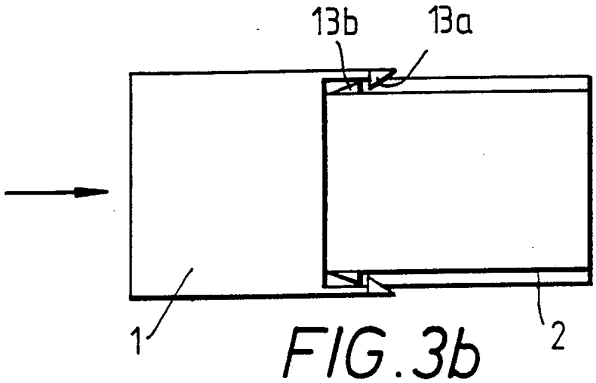
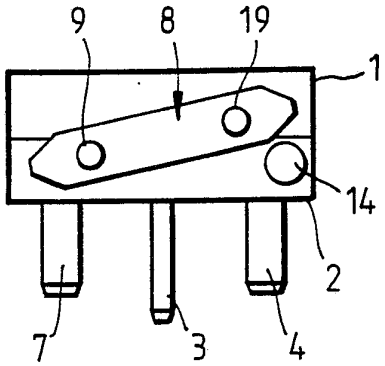


FIG. 3b

FIG. 5



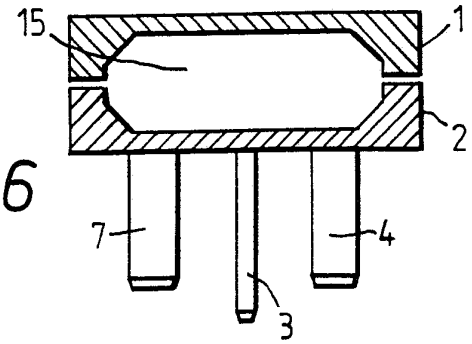


FIG. 6

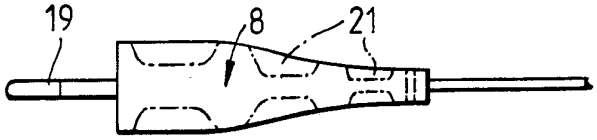


FIG. 7a

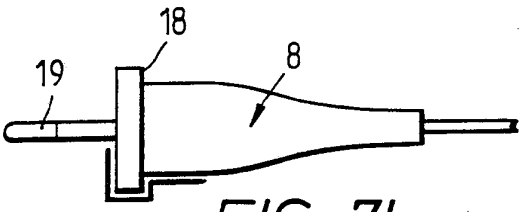


FIG. 7b

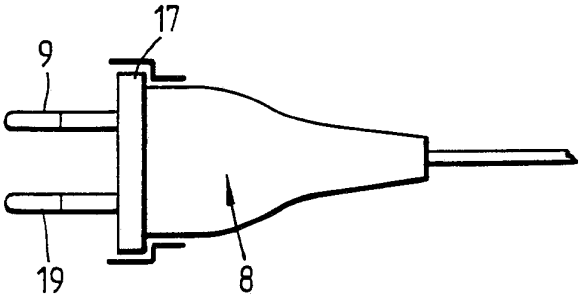


FIG. 7c

FIG. 7d

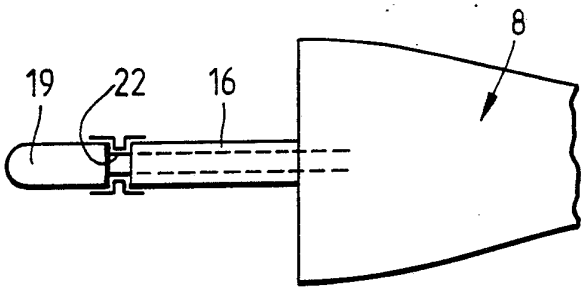


FIG.8

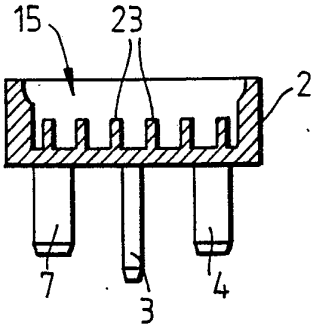


FIG. 9a

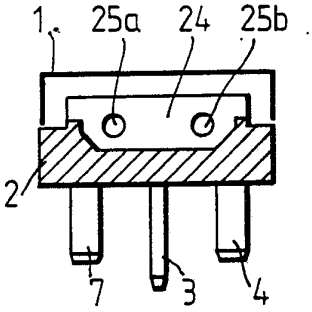


FIG. 9b

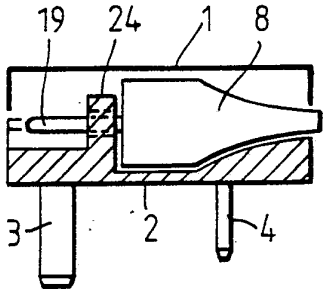


FIG. 9c

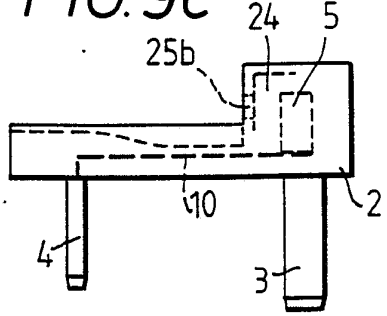
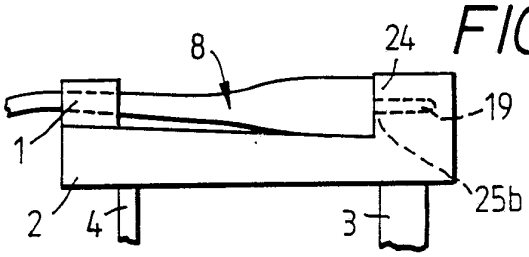


FIG. 9d



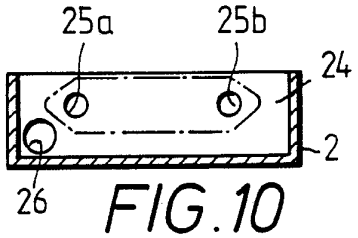


FIG. 10

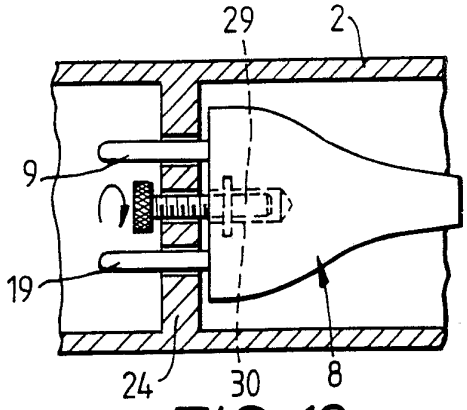


FIG. 12

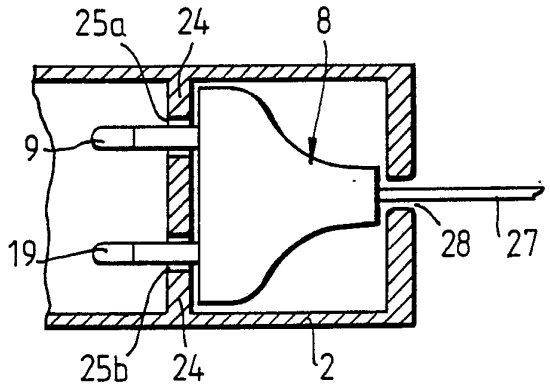


FIG. 11

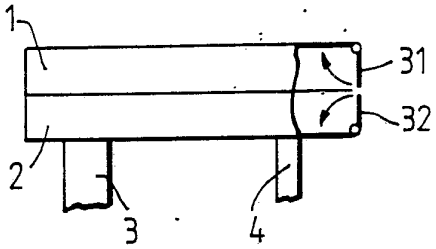


FIG. 13

FIG. 14

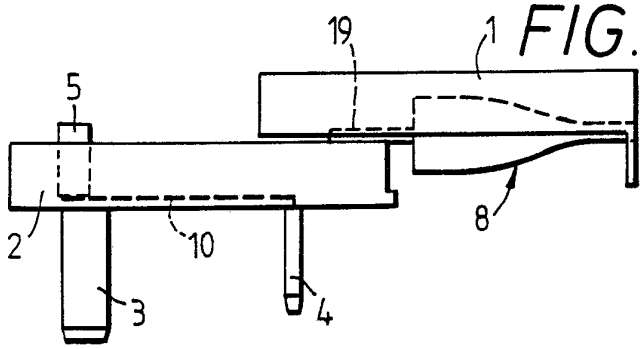


FIG. 15

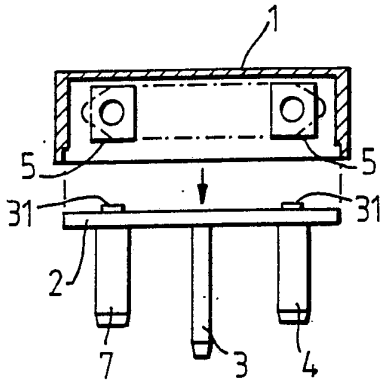
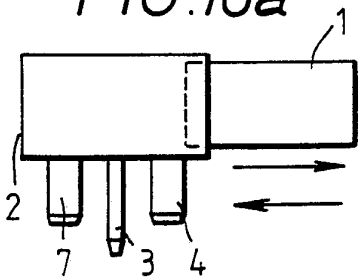


FIG. 16a



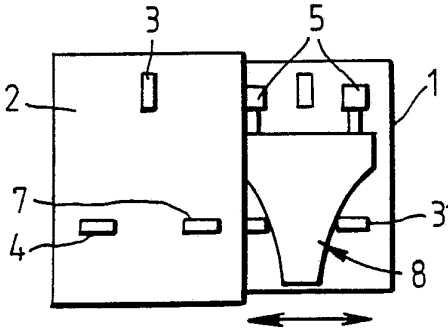


FIG. 16b

FIG.17

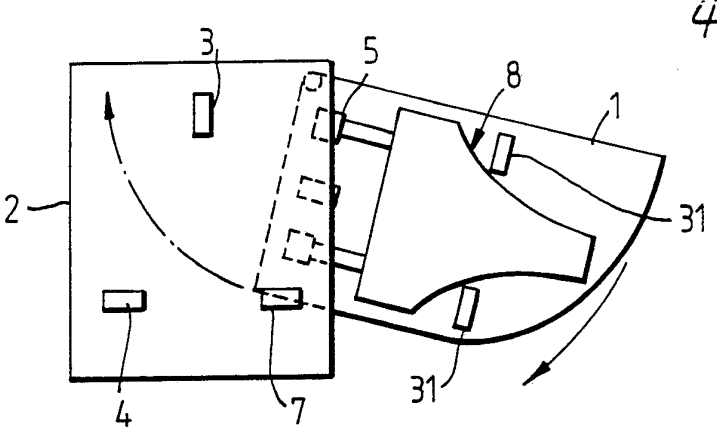


FIG.18a

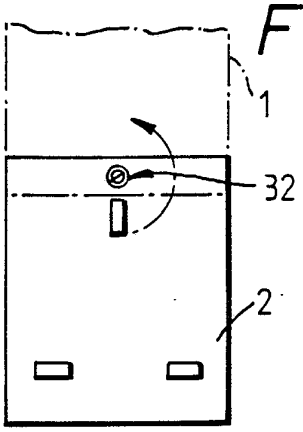


FIG.18b

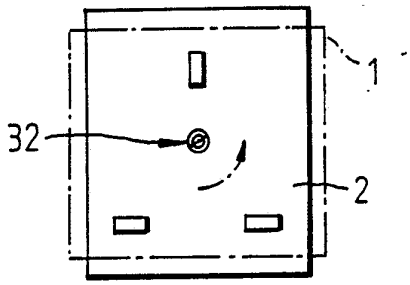


FIG.18c

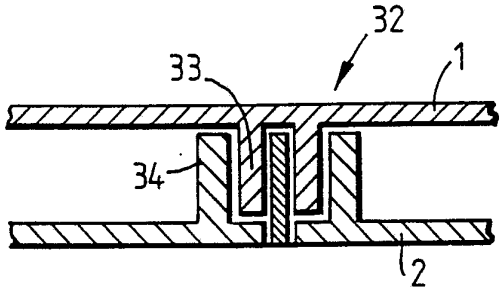


FIG.18d

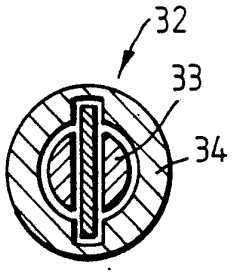
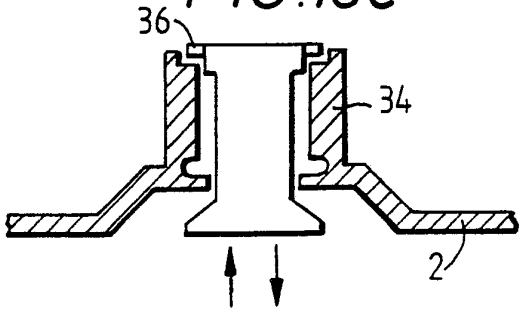


FIG.18e



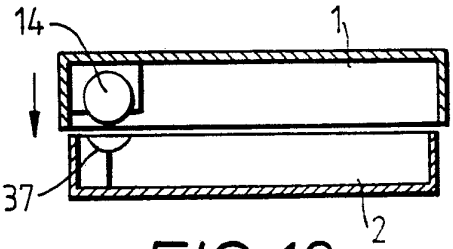


FIG.19

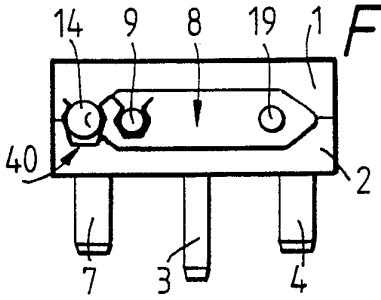


FIG.20a

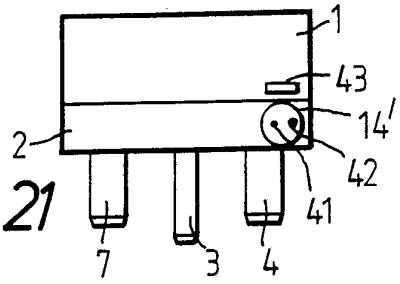
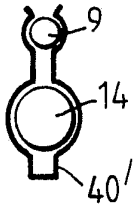


FIG.21

FIG.20b



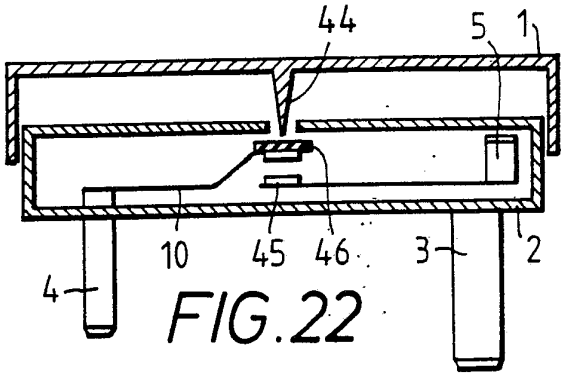


FIG.22

FIG.23

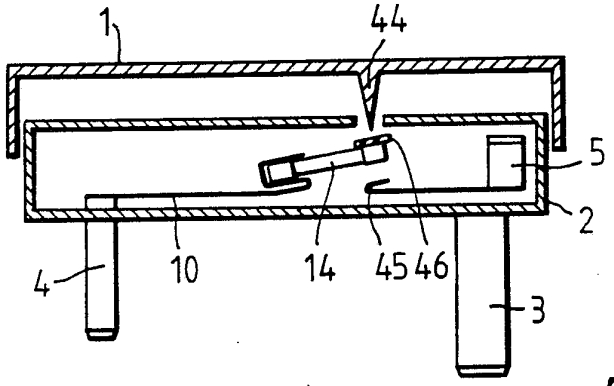


FIG.24a

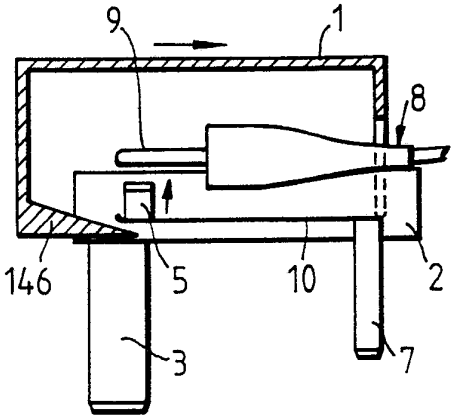


FIG.24b

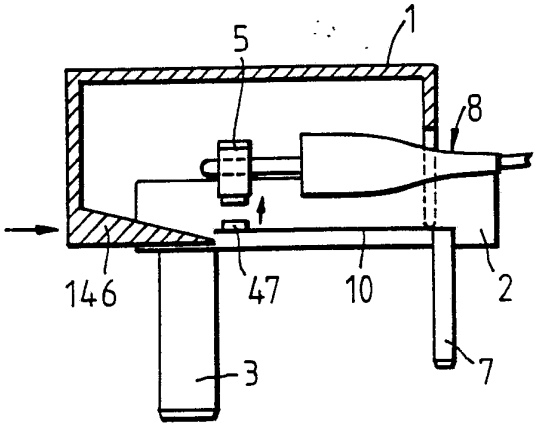


FIG. 25a

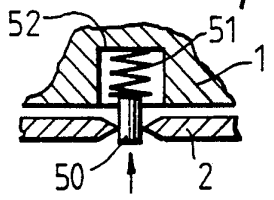
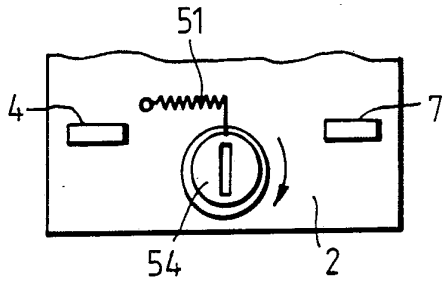


FIG. 25c



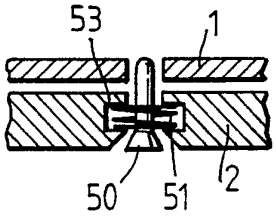
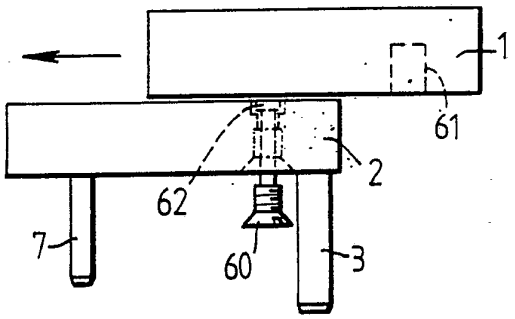


FIG. 25b

FIG. 26



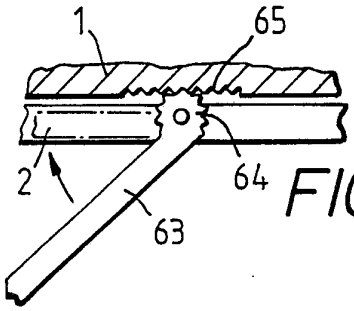


FIG. 27a

FIG. 27b

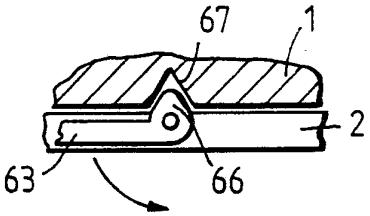
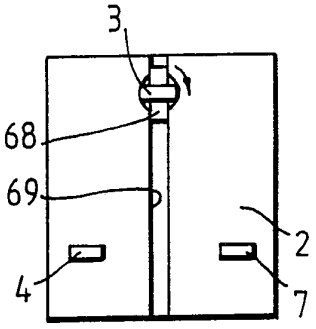


FIG. 28a



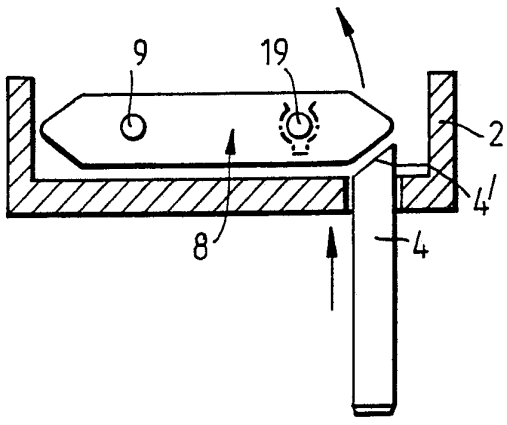


FIG. 28b

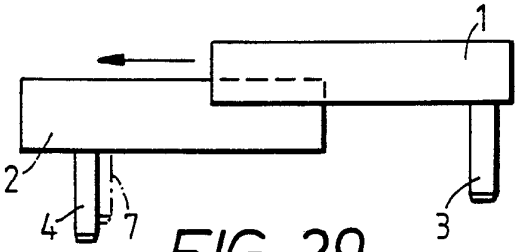


FIG. 29

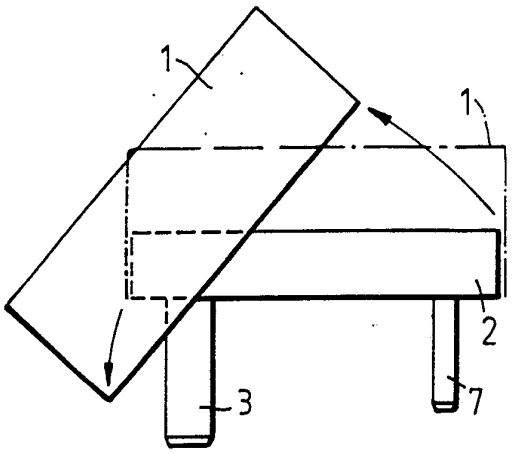


FIG. 30

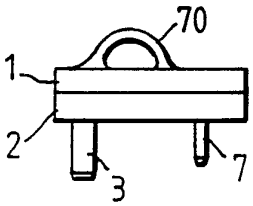


FIG. 31a

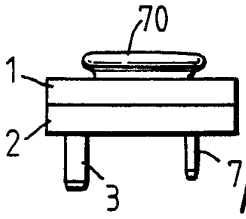


FIG. 31b

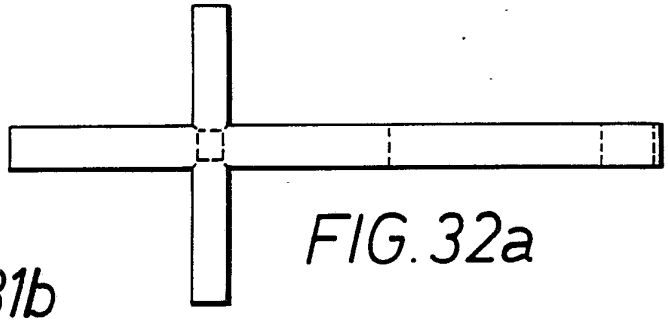


FIG. 32a

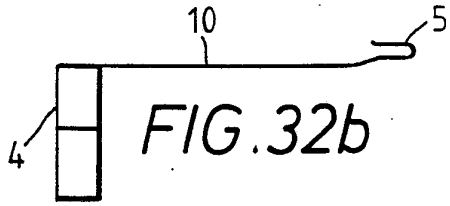


FIG. 32b

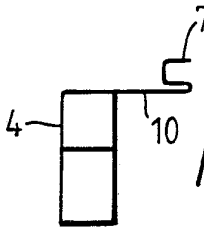
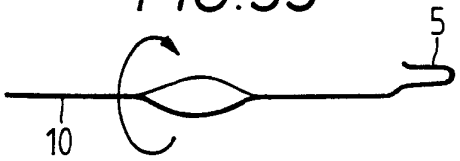


FIG. 32c

FIG. 33



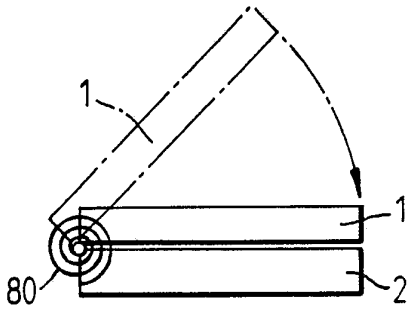


FIG. 34

FIG. 35

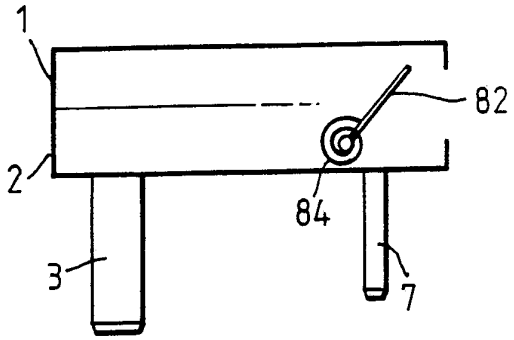


FIG. 36

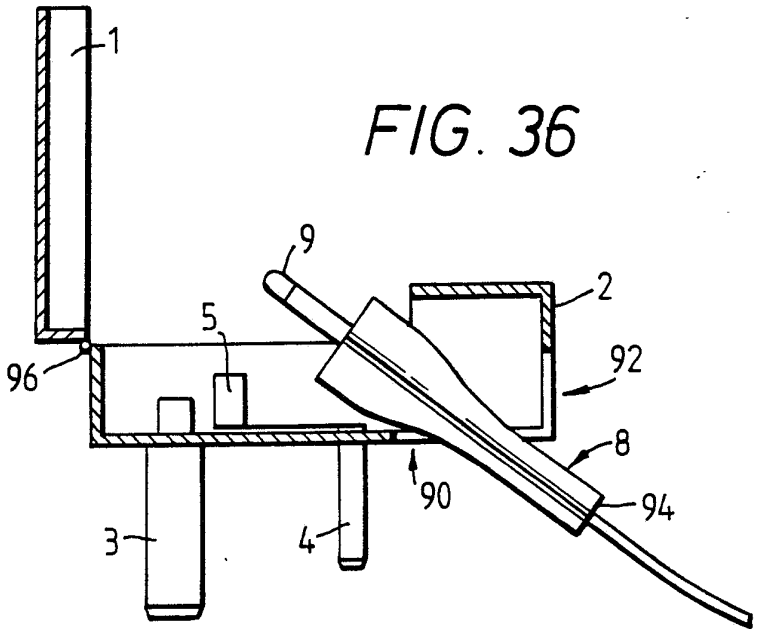
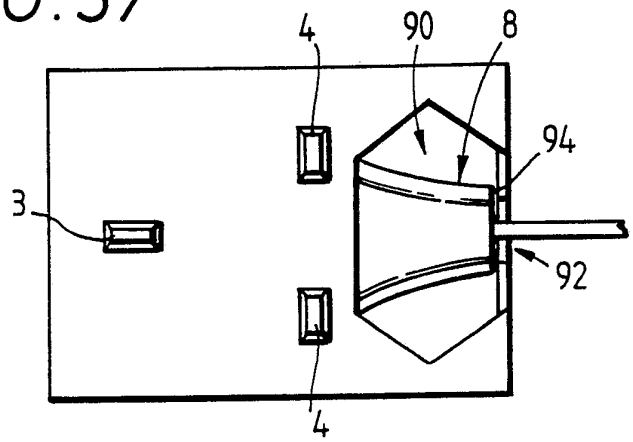


FIG. 37



INTERNATIONAL SEARCH REPORT

PCT/GB 91/00849

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 H01R31/00 ; H01R31/06

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	H01R

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X Y	EP,A,0342942 (HOSSACK,S.) 23 November 1989 see abstract; figure 1 (cited in the application)	1 2, 3
Y A	DE,U,8009606 (BRAUN AG.) 07 August 1980 see page 3, lines 5 - 20; figures 1, 2	2, 3 1
A	EP,A,0104279 (CORABELEMENT AG.) 04 April 1984 see page 3, lines 5 - 8; figure 21a	1-3
A	FR,A,2209230 (BUNKER RAMO CORP.) 28 June 1974 see page 3, line 22 - page 4, line 13; figures 4a-4c	1-4

° Special categories of cited documents :[10]

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
03 SEPTEMBER 1991	13. 09. 91
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	HORAK A.L.

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

SA 47966

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 03/09/91
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0342942	23-11-89	None	
DE-U-8009606	07-08-80	None	
EP-A-0104279	04-04-84	AU-B- 556581	13-11-86
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		CA-A- 1181828	29-01-85
		JP-C- 1293164	16-12-85
		JP-A- 59056377	31-03-84
		JP-B- 60014472	13-04-85
		US-A- 4518212	21-05-85
FR-A-2209230	28-06-74	None	