

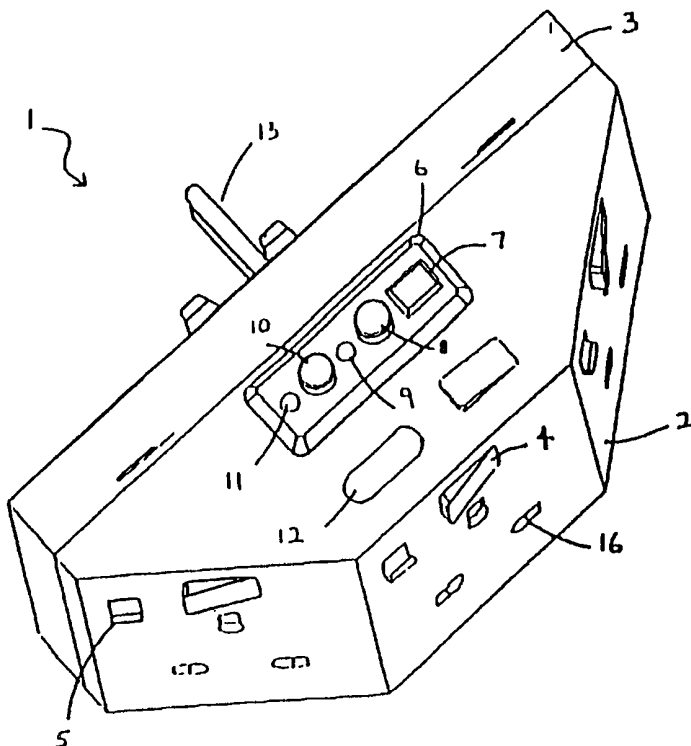


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(54) Title: IMPROVED ELECTRICAL SOCKET AND PLUG**(57) Abstract**

An improved electrical socket includes a plurality of socket apertures to receive the pins of plugs. The socket apertures can receive pins of plugs of various designs from many countries of the world. There is a plastic cover to prevent access to the internal electrical contacts when the plug is not inserted, and the plastic cover holds the plug in position when it is inserted. The electrical socket comprises a face plate connected to a socket bracket. The socket bracket has a 3-poles connector to receive wiring from the mains supply, and the face plate has corresponding 3-pole pins for mating connection with the 3-pole connector when the face plate is attached to the socket bracket for easy change of the face plate. A circuit breaker on the electrical socket prevents damage to an appliance attached to the socket due to current leakage or shock current, and the user is warned when there is a heat overload. An improved electrical plug is also described.



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IMPROVED ELECTRICAL SOCKET AND PLUG**FIELD OF THE INVENTION**

The present invention relates to an improved electrical socket. The electrical
10 socket has improved functions, such as ease of use and replacement, versatility,
and the protection of an appliance attached to the socket from damage due to
current leakage or shock current.

The present invention also relates to an improved electrical plug that can be more
15 easily withdrawn from a socket, and relates particularly, though not exclusively,
to an improved three-pin electrical plug.

BACKGROUND TO THE INVENTION

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The design and construction of conventional electrical sockets are well-known.
They consist of a socket with socket apertures for connecting 2-pin or 3-pin plugs
and an On/Off switch. The disadvantages of these sockets is that plugs
connected to the socket can be unintentionally dislodged when a pulling force acts
25 on the plug in a direction away from the socket. Further, once an electrical socket
is damaged and/or burnt out, the whole socket needs to be replaced. The person
replacing the socket requires knowledge of electrical wiring, in order to make the
appropriate connections of the live, neutral and earth wires. The wires must be
meticulously screwed into the electrical contacts of the new socket.

30

Also, the appliance attached to the conventional socket may be damaged as a

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result of current leakage or current overload. Even where the damage is prevented by a central fuse box, it may be difficult to tell which of the appliances in the house or factory premises caused the tripping of the fuse box. Sometimes, a small fuse may conventionally be inserted into a plug. When there is a current
5 overload, the fuse will cut off the electrical connection. The problem is that the user must open up the plug and replace the fuse. This is inconvenient. Finally, if too many appliances are connected to a conventional socket, too much heat may be generated which will damage the socket. The invention seeks to overcome the above disadvantages of conventional electrical sockets.

10

In Singapore, Australia and a number of other countries, electrical plugs of the type that are provided on electric appliances for connecting the appliance to a power outlet wall socket, are typically of the three-pin type. There are two pins designated the "live" and "neutral" pins which supply alternating current (AC)
15 electrical power to the appliance. A third "earth" pin is provided for safety reasons and provides a return path to earth for any leakage current. The earth pin is generally connected to a metal housing or casing of the appliance.

When a three-pin electrical plug is inserted in a socket, it sometimes requires
20 considerable force to withdraw the plug from the socket due to the friction between the metal parts within the socket and the three pins of the electrical plug. The face plate of the socket, which is typically manufactured from a plastics material, has three apertures provided therein designed so as to have a very close fit with the three pins of the electrical plug. This can further increase the difficulties
25 experienced in withdrawing the plug, as the pull force applied to the plug must be exactly perpendicular to the faceplate, otherwise the pins jam against the side faces of the apertures in the socket.

Many electrical plugs for domestic appliances have quite small physical
30 dimensions with minimum surface area provided to enable a firm grip during withdrawal. Add to this the fact that many wall sockets are located in relatively

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inaccessible places and / or require bending down to reach, the action of unplugging an electrical appliance can be quite difficult, requiring much exertion, particularly for the elderly.

- 5 There is a further danger that during withdrawal of a tightly attached plug, the force exerted may cause the face plate of the socket to loosen, presenting a potentially serious electrical hazard should the face plate eventually fall off after repeated pulling out of the plug from the socket.

10 SUMMARY OF THE INVENTION

The present invention was developed with a view to providing an improved electrical socket which can prevent a plug from being unintentionally dislodged when in connection with the socket. It is a further objective of this invention to
15 make it easy to replace the socket with a new socket or different configuration of socket without having to rewire the socket. It is a still further objective of this invention to provide an internal circuit-breaker mechanism for such electrical socket so that each appliance attached to the electrical socket is protected in the event of current leakage or electrical overload. The electrical supply can restored
20 simply by pushing buttons on the circuit-breaker. Where too many electrical appliances are connected to the socket and the temperature of the socket rises unacceptably, the user will be prompted to prevent damage or burn-out of the socket.

25 According to one aspect of the invention there is provided an electrical socket for a plug having a plurality of pins, comprising a socket face plate having at least one set of apertures therein for receiving respective ones of the pins of the plug, and having means for preventing withdrawal of the pins from the face plate when the pins have been received in the apertures.

30 Preferably, the means for preventing withdrawal of the pins comprises a formation of the socket face plate which is adapted to engage a cooperating

formation provided on the pins.

Preferably, the means for preventing withdrawal further comprises a screen having plurality of apertures therein for receiving the pins of the plug, and the screen is movable between a first position in which at least one of the screen apertures is out of alignment with the socket plate apertures, and a second position in which the screen apertures are in alignment with the socket plate apertures. Preferably also, the screen is movable from the first position to the second position under the pressure of the plug pins when the plug is inserted into the socket. Thus, the screen can prevent access to the interior of the socket, when the plug is not plugged in.

In a preferred embodiment, the screen is provided with an operating member, which may be in the form of a lever, for manually moving the screen from the first position to the second position.

It is desirable that the screen is biased towards the first position so that said screen formations are biased into engagement with said pin formations when the plug is received in the socket.

According to another aspect of the invention there is provided an electrical socket comprising: a socket support having at least live and neutral connectors which are adapted to be electrically connected to a mains electrical supply; a socket face plate having at least live and neutral connectors, the face plate having at least one set of apertures adapted to receive corresponding pins on a plug, whereby the pins on the plug are brought into electrical connection with respective ones of the live and neutral connectors of the face plate when the plug pins are received in the set of apertures ; and securing means to releasably secure the face plate to the support, the arrangement being such that when the face plate is secured to the support by the securing means, the live and neutral electrical connectors on the face plate are brought into electrical connection respectively with the live and neutral connectors on the support.

This arrangement will ensure that the face plate is firmly secured to the support plate when the socket is in use, but makes it possible for the face plate

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to be easily released from the support and replaced with a further face plate having a different size and or configuration of face plate apertures.

Usually, the support will be further provided with an earth connection which is adapted to be connected to a mains electrical supply. Furthermore, the face plate is usually provided with an earth connection which is brought into contact with the earth connection of the support when the face plate is secured to the support, whereby an earth pin of the plug can be brought into electrical contact with the earth connection of the face plate through a respective one of the set of apertures in the face plate.

Preferably the face plate is provided with at least two of said sets of apertures. The face plate may be provided with three, four, or more, of said sets of apertures. Preferably, the size and/or configuration of one of said sets of apertures is different from the size and/or configuration of another of the sets of apertures, whereby the face plate is adapted to receive at least two different types of plug.

In one embodiment, the electrical connectors on the face plate each comprises a projection, and the electrical connectors on the support each comprise a recess, each projection being received in a respective recess when the face plate is secured to the support.

In another embodiment, the electrical connectors on the support each comprises a projection, and the electrical connectors on the face plate each comprise a recess, each projection being received in a respective recess when the face plate is secured to the support.

Most preferably, the electrical connectors on the support are provided in the form of a female connector and the electrical connectors on the face plate are provided in the form of a male connector. It will, of course, be appreciated that it would instead be possible to provide the electrical connectors on the support in the form of a male connector and to provide the electrical connectors on the face plate in the form of a female connector. In a preferred embodiment, the connectors are three poles connectors.

In a preferred embodiment, the electrical socket further comprises a circuit breaker for disconnecting the electrical connection between the mains supply and any plug received in the or each set of apertures in response to a current leak or current overload. It is also preferable that the circuit breaker includes a thermostat for establishing a connection to an indication means to indicate that there is a heat overload or for disconnecting the electrical connection between the mains supply and any plug received in the or each set of apertures in response to a temperature in excess of a predetermined level, such as 105°C.

10 A cover is desirably provided for the socket support, the cover being releasably securable to the support when the socket face plate has been released from the support, the cover serving to prevent access to the electrical connections of the support.

In one embodiment, the socket support is adapted to be fixed to a structure, such as a wall, and the electrical connections of the socket support are adapted to be directly connected to the mains wires installed in the structure. This fixing may be substantially permanent. By means of this arrangement, the electrical socket according to the invention functions in the same way as a conventional wall mounted socket, except that a variety of face plates can be used with the socket support in order to provide electrical access for a variety of sizes and or configurations of plugs. Thus, this configuration obviates the necessity to use a conventional adapter plug with a wall socket.

In another embodiment the electrical socket further comprises an electrical connector lead, and a plug, the electrical connector lead being secured at one end to the electrical connections of the socket support, and being secured at the other end to the plug. The plug may then be plugged into a conventional wall-mounted electrical socket, or to a wall mounted socket according to the invention. This embodiment allows the socket according to the invention to be used to provide an electrical extension lead.

30 In another embodiment, the socket support is provided with two or more electrical pins which are adapted to be plugged directly into a mains supply, such

as an existing wall socket. The electrical connections of the socket-support are in electrical communication with said pins.

The socket support preferably further comprises a housing within which the electrical connectors are disposed, and the securing means secures the face plate to the housing. The circuit breaker may be carried on the face plate in such a way that it is received within the support housing when the face plate is secured to the support.

According to another aspect of the invention there is provided an electrical plug comprising a plug housing having a plurality of pins extending therefrom the pins being adapted to be received in respective ones of a plurality of aperture provided in an electrical socket, wherein the pins are adapted to interact with the socket, when received in the apertures, in such a way that removal of the pins from the apertures is prevented.

Preferably, the pins are provided with formations adapted to interengage with cooperating formations in the socket, in order to prevent removal of the pins from the apertures.

According to another aspect of the invention there is provided an electrical socket for a plug having plurality of pins, the socket comprising: a socket face plate having at least one set of apertures therein for receiving respective ones of the pins of the plug; a circuit breaker adapted to cut off any current supply to the plug in the event of current leakage or electrical overload; and reset means for manually resetting the current supply to the plug after activation of the circuit breaker wherein:

- (i) the electrical socket is adapted to be fixed to a structure, and the socket has electrical connections which are adapted to be directly connected to mains wires installed in the structure; or
- (ii) the electrical socket further comprises an electrical connector lead, and a plug, the electrical connector lead being secured at one end to electrical connections in the socket, and being secured at the other end to the plug to the plug.

Preferably the reset means comprises a reset switch. Desirably, the circuit

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breaker includes a thermostat for cutting of the current supply to the plug if the temperature in the socket exceeds a predetermined level, such as 105°C.

In one embodiment, the electrical socket further comprises a socket support
5 which is adapted to be fixed to the structure, and the socket face plate is
removably secured to the support. In this embodiment, the fixed structure may be,
for example a wall of building, and the socket support may be substantially
permanently fixed to the structure.

In another embodiment, the electrical socket further comprises a socket
10 support to which the electrical connector lead is adapted to be connected, and the
socket face plate is removably secured to the support.

The invention further provides a combination of the electrical socket and
plug described above.

15 The present invention was also developed with a view to providing an
improved electrical plug which can be withdrawn much more easily from a socket.

Thus, according to another aspect of the present invention there is
provided an improved electrical plug of the type having two or more pins adapted
20 to be received in a socket, the plug further comprising:

a release mechanism provided in the plug for releasing the plug from the socket,
the mechanism including a first portion that protrudes from a side of the plug and
which is designed to be pressed by a user to activate the release mechanism, and
25 a second portion that is pushed against the socket when the first portion is
pressed whereby, in use, the withdrawal of the two or more pins of the plug from
the socket is assisted by the action of the release mechanism when activated.

Preferably the activation of the release mechanism is sufficient to cause
withdrawal of the plug without additional effort from the user.

30 Preferably means are provided to enable the second portion of the release
mechanism to be pushed against the socket by means of a lever action when the

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first portion is pressed by the user. Typically the release mechanism includes a lever member pivotally mounted in the plug, and the first and second portions of the release mechanism are formed integral with the lever member. Preferably the lever member is movable from a first position in which the second portion is retracted and does not substantially protrude from a front face of the plug, and a
5 second position in which the second portion does protrude from the front face of the plug to push against the socket. Preferably the lever arm is biased towards the first position.

Typically the plug is a three-pin plug and in said second position of the lever member said second portion protrudes from the front face of the plug in a
10 space provided between an earth pin and the two other pins of the plug.

According to another aspect of the present invention there is provided an improved electrical plug of the type having two or more pins adapted to be received in a socket, the plug further comprising:

15 an electrical terminal clip for connecting a wire to one of the pins at a terminal provided within the plug, the clip having first and second surfaces resiliently biased towards each other and between which the wire is received and gripped to provide an electrical connection to the terminal.

20 Preferably the clip is formed from a single piece of metal having first and second arms upon which said first and second surfaces are provided. Preferably said first and second arms are connected by a bridging portion that acts to bias said first and second arms towards each other.

Preferably the plug further comprises a plug housing which houses an end
25 of said pins, wherein said end of said pins is provided with a recess adapted to receive a respective one of the clips therein in a tight friction fit. Preferably the clips are removable from the pin recesses.

It will be appreciated that the improved electrical plug may be provided with both the release mechanism and with the electrical terminal clip. It may also be
30 provided with the means for preventing withdrawal, and may be used in conjunction with the improved electrical socket described above.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to facilitate a more comprehensive understanding of the nature of the invention, a preferred embodiment of the electrical socket and plug device in accordance with the invention will now be described in detail, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of an electrical socket according to the preferred embodiment of this invention.

Figure 2 is a perspective view of an electrical socket according to another preferred embodiment of this invention, wherein the electrical socket is attached to an extension cable.

Figure 3 is the front view of the face plate of the electrical socket of Figure 1.

Figure 3A is a side view of the electrical socket of Figure 3 taken along the line A-A.

Figure 4 is a perspective view of the pin of a plug and plastic cover only, without the face plate of the electrical socket.

Figure 5 is the perspective view of the socket bracket when separated from the face plate.

Figure 6 is the rear view of the socket bracket of Figure 5.

Figure 7 illustrates the safety cover which can be used to cover the socket bracket when the face plate is not attached thereto.

Figure 8 illustrates the face plate of the electrical socket without the socket

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bracket, wherein the circuit-breaker assembly and 3-point pin assembly are revealed.

Figure 9 is a rear view of the face plate of Figure 8 illustrating the 3-point pins.

5

Figure 10 is a cross-sectional view of the circuit-breaker assembly showing the internal construction of the same.

Figure 11 is a top perspective view of a preferred embodiment of an electrical plug
10 in accordance with the invention;

Figure 12 is a side perspective view of the electrical plug of Figure 11;

Figure 13 is a bottom perspective view of the electrical plug of Figure 11;
15

Figure 14 is an exploded view of the electrical plug of Figure 12;

Figures 15(a),(b),(c),(d) and (e) illustrate the electrical plug of Figure 11 showing
a release mechanism in a first position;
20

Figure 16 is a section view through the line B-B in Figure 15(d);

Figures 17(a),(b),(c),(d) and (e) illustrate the electrical plug of Figure 11 showing
the release mechanism in a second position;
25

Figure 18 is a section view through the line B-B in Figure 17(d);

Figures 19(a) and (b) are enlarged perspective views of an electrical terminal clip
employed in the electrical plug of Figure 11; and,
30

Figure 20 illustrates the location of the electrical terminal clip within the electrical

plug of Figure 11.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

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Figure 1 illustrates the preferred embodiment of an improved electrical socket (1) in accordance with the invention. In this embodiment, a socket bracket (3) is attached to the face plate (2) by means of screws or snap-on means. On the face plate (2) are a plurality of socket apertures (16) for receiving plug-pins (35).

10 Corresponding to each set of socket apertures (16) is an on/off switch (4) for turning the current on or off. Also associated with and located behind each socket aperture (16) on the inside of the face plate (2) is a plastic cover (37) which has a plastic cover lever (5).

15 The electrical socket (1) also has a circuit breaker (6), which from an external view, consists of a shock bulb (7), reset button (8), current cut-off bulb (9), start button (10) and overload light bulb (11). The details of the operations of these features will be elaborated on below. Optionally, the face-plate may also include a night light (12) which can be switched on at night.

20

In the embodiment of the invention shown in Figure 1, at the rear of the socket bracket are plug pins (13) for connection to a main power source (not shown). In the second preferred embodiment of the invention shown in Figure 2, the electrical socket (1) has an extension cable (14) so that the electrical socket (1) may act as
25 an electrical extension. Figures 1 and 2 illustrate designs which enable the electrical socket (1) to have multiple sets of socket apertures in different configurations, and the apertures can receive different types of plugs from countries such as the United States, United Kingdom, Japan, Australia, Taiwan and India without limitation.

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Figure 3 is the front view of the face plate (2), showing the socket apertures (16), plastic cover lever (5) and on/off switch (4). Figure 3A is a cross-sectional view of the face plate taken at line A-A of Figure 3. In this preferred embodiment of the invention, the face plate (2) includes a snap-on notch (15) at the rear of the face plate (2). The said snap-on notch (15) is meant for engagement with a corresponding bracket notch (23) formed on the socket bracket (3). It would be apparent to a person skilled in the art that other engagement means, such as screws, may also be used alone and/or with the snap-on means to connect the face plate (2) to the socket bracket (3).

10

Figure 4 illustrates the interaction of the plastic safety cover (37) and the pin of a plug (35). When no plug is inserted into the socket aperture (16), the plastic cover (5) prevents access to the internal parts of the socket. The plastic safety cover (37) is biased downwards by means of a torsion spring or other similar device. In this biased position, the plastic cover apertures (38) are out of alignment with the socket apertures (16). The plastic safety cover (37) will thus prevent access to the internal electrical components. Before inserting the plug (not shown) into the socket aperture (16), the plastic safety cover (37) and plastic cover lever (5) are forced upwards using the plastic cover lever (5) to align the plastic cover aperture (38) with the socket aperture (16) to allow the plug to be inserted. Alternatively, the use of a plug-pin (35) with a tapered end will automatically lift the plastic safety cover (37) during insertion. Once the plug is fully inserted, the plastic safety cover (37) catches the notch (36) on the plug-pin (35), thereby securing the plug-pin (35) to the socket aperture (16). As a result, a pulling force on the plug will not remove it from its inserted position. In order to remove the plug, the plastic cover lever (5) must be pushed upwards in order to release the plastic safety cover (37) from locking connection with the notch (36) and allow the plug to be pulled out.

20

25

30 Figure 5 illustrates a third preferred embodiment of the invention, with an "in-box" socket bracket (17). The "in-box" socket bracket (17) may be secured into a wall

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or other permanent fixture. The "in-box" socket bracket (17) includes holes for screws (18) or it may include other means to secure the "in-box" socket bracket (17) to the wall or other permanent fixture.

- 5 The socket bracket (3 or 17) includes a 3-poles connector (39) for mating combination with corresponding 3-pole pins (25) on the face plate (2). The 3 poles correspond to the live wire (20), earth wire (21) and neutral wire (22) of an electrical connection. The said wires (20, 21 and 22) are secured to the 3-poles connector (39) by the use of screws, electrical clips or other means during
10 installation of the socket bracket (17) to the wall. Once the socket bracket (17) has been properly installed, there is no need to remove it again even when the face plate (2) needs to be replaced.

- Figure 6 shows the rear of the same socket bracket (17) wherein the wire (20, 21
15 and 22) extend outwards through holes pre-formed on the socket bracket. The bracket notch (23) for snap-on connection with the face plate (2) is also shown. Further, Figure 7 illustrates the safety cover (24) which can be used to cover the socket bracket (17) when the electrical socket (1) is not in use and the face plate (2) is removed therefrom. The safety cover conceals the internal wiring of the
20 socket bracket (17), and may also be designed as a decorative item with different colours.

- Figures 8 and 9 illustrate the 3-pole pins (25) to the rear of the face plate (2) for convenient mating combination with the 3-pole connector (39) of the socket
25 bracket 3 or (17). The 3-pole pins (25) are made of electrically conductive material. It is simple to connect the socket apertures (16) of the face plate (2) to the electrical wiring connection, because the connection is formed when the 3-pole pins (25) are inserted into the 3-pole connector (39), when the face plate (2) is joined to the socket bracket (3 or 17).

30

It is apparent from the above description that the invention improves versatility

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because socket brackets of different configurations (eg 3 or 17) may be matched or substituted with face plates (2) of different configurations without a need for the user to re-wire the socket.

- 5 Figure 10 is a cross-sectional view of the circuit breaker (6) assembly illustrating the mechanism of the circuit breaker. The circuit breaker (6) includes a shock bulb (7), reset button (8), current cut-off bulb (9), start switch (26), start button (10) and overload light bulb (11), each with its separate function.
- 10 The set-up of the wiring according to the preferred embodiment of this invention is shown in Figure 10. Briefly, the live wire (20) and neutral wire (22) are wound around the current transducer coil (27) two or three times and are connected to the N/C contact switch (29). The earth wire (21) is connected to the shock bulb (7). Another lead of the neutral wire (22) is connected to the shock bulb (7),
- 15 current cut-off bulb (9) and overload light bulb (11) in sequence. The function of the shock bulb (7), which lights up upon a current leakage or overload, is to absorb any leakage or shock current so as not to damage the appliance. As shown in Figure 10, the shock bulb (7) is earthed.
- 20 Any leakage or shock current down to as low as 50 watts is sufficient to trigger the N/C contact switch (29). Upon being triggered by a leakage or shock current, the N/C contact switch (29) will activate the lever A (30) and push lever B (31) until the spring lever C (32) is released from lever A (30). Then lever D (33) will be triggered and the reset button (8) will be pushed forward. The extension pin
- 25 (34) will then push lever A (30) back to its normal position and depress the N/C contact switch (29) to its normal position.

Simultaneously, the start button (10) will also be pushed out and the current cut-off bulb (9) will light up, preferably in red in the preferred embodiment. At this

30 time, the power supply from the electrical source is totally cut off. The overload light bulb (11), will also light up (preferably in orange in the preferred

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embodiment), which indicates that the socket (1) is overloaded.

To restart the appliance, the user should first push the reset button (8) to its depressed position, and then depress the start button (10). As a result, the start
5 switch (26) will close the circuit connection.

To protect the electrical socket (1) from damage due to current overload when too many electrical appliances are connected to it, a thermostat (28) is used. The thermostat (28) will only be activated at a certain temperature (say 105°C), at
10 which the electrical socket (1) is safe from damage. At a temperature greater than the pre-determined temperature, the thermostat (28) will close the electrical connection of the live wire (40) connecting the overload light bulb (11) to the thermostat, to thermostat (28). As a result, the overload light bulb (11) will light
15 up warning the user before damage, such as the melting of the electrical socket (1) occurs. Alternatively, in another embodiment, the thermostat (28) can instead be used to cut off the electrical connection from the mains supply to the plug inserted into the electrical socket (1).

Figures 11 to 14 illustrate a preferred embodiment of an improved electrical plug
20 (110) in accordance with the invention. In this embodiment, the electrical plug is of the type having three pins, namely an earth pin (112), a neutral pin (114), and live pin (116). The three pins protrude from a front face (118) of the plug and are provided with terminals (120) (see also Figure 20) inside a housing (122) of the plug, to which the corresponding wires of a three core flex cable (124) are
25 connected.

As can be seen most clearly in Figure 14, the housing (122) of the plug consists of a top shell (121) and a bottom shell (123). The top shell (121) has a small lens (125) provided therein, made of coloured translucent plastic. Within the housing
30 (122) there is provided a bulb (119), which is held between a first bulb contact (115) and a second bulb contact (117), and which is illuminated when the plug is

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corrected to a live power outlet. A fuse (113) is connected in series with the live pin (116) in a fuse holder (111). A cable holder (127) holds the cable (124) stable.

The electrical plug (110) further comprises a release mechanism (130) provided
5 in the plug for releasing the plug from a socket. The release mechanism (130) includes a first portion (132) that protrudes from a side of the plug (110) and which is designed to be pressed by a user to activate the release mechanism (130). The release mechanism (130) also includes a second portion (134) that is pushed
10 against the socket by means of a lever action when the first portion (132) is pressed by the user (see Figure 17). In this way, the three pins (112), (114) and (116) of the plug are withdrawn from the socket by the action of the release mechanism (130) when activated.

In this embodiment, the release mechanism (130) includes a lever member (136)
15 which is pivotally mounted in the housing (122) of the plug. The first and second portions (132), (134) of the release mechanism are formed integral with the lever member (136). Lever member (136) is manufactured of rigid material with the first portion shaped so as to form a smoothly contoured surface against which a user's fingers press when they grip the sides of the housing (122) of the plug. On the
20 other hand, the second portion (134) of the lever member is in the form of a rectangular tongue, as can be seen most clearly in Figure 14. Lever member (136) is pivotally mounted in the housing (122) of the plug by means of a pivot pin (138), which is provided with a small torsion spring (139) which clips onto the first portion (132) of the lever member.

25

In Figures 15 and 16 the lever member (136) is shown in a first position in which the second portion (134) is retracted and does not substantially protrude from the front face (118) of the plug. In Figures 17 and 18 the lever member (136) is shown
30 in a second position in which the second portion (134) does protrude from the front face (118) of the plug so that it pushes against the socket and thereby acts as a lever to push the housing (122) away from a face plate of the socket. In this

-18-

embodiment, the lever arm is biased towards the first position by means of the small torsion spring (139) provided within the housing (122). The spring (139) acts to prevent the second portion (134) of the lever arm from pivoting outwards and catching against the face plate of the socket during insertion of the plug.

5

As can be seen most clearly in Figures 17(a) and (c), when the lever arm (136) is in its second position, the tongue-shaped second portion (134) protrudes from the front face (118) of the plug in a space provided between the earth pin (112) and the two other pins (114), (116) of the plug. Hence, there is no danger of the
10 second portion (134) touching the pins or interfering with the normal operation of the plug.

In an alternative embodiment, (not illustrated), the first portion of the release mechanism may comprise first and second press surfaces or buttons which
15 respectively protrude from opposite sides of the housing (122) of the plug. Hence when a user's fingers grip the side of the housing a press force is applied to both press surfaces to increase the lever action applied to the second portion of the release mechanism when the first portion is pressed by the user.

20 In a conventional electrical plug, the earth, neutral and live wires of the three core flex (124) are connected to the corresponding earth, neutral and live pins of the plug by means of screws which hold the exposed ends of the wires against a respective terminal for each pin provided within the plug housing. It is not uncommon for the screws which hold the exposed ends of the earth, neutral and
25 live wires against the terminals to become loose due to constant handling of the plug. As a result, an open circuit is formed when one of the exposed ends of the wires fails to make proper electrical contact with the corresponding terminal. This results in a malfunction of the electrical appliance. The exposed end of the live wire may also result in a short circuit within the plug, if it inadvertently comes in
30 contact with one of the other terminals. Such a short circuit can result in a high current flowing through the plug, which generates a large amount of heat that may

-19-

result in melting and/or burning of the plug housing, producing a fire hazard.

The present inventor has also developed an electrical terminal clip for connecting a wire to one of the pins at a terminal provided within the plug. An embodiment of the electrical terminal clip (140) according to the invention is illustrated in Figure 19.

The terminal clip (140) of this embodiment, is manufactured from a single piece of spring steel bent into a shape so as to form first and second arms (142), (144) which are resiliently biased towards each other and have first and second surfaces between which a wire is received to provide an electrical connection to the terminal. The first and second arms (142),(144) are connected by means of a bridging portion (146) which acts as a spring to resiliently bias the first and second arms towards each other. The first and second (142),(144) are resiliently biased together with a force which is sufficient to securely grip the ends of the wires with substantially the same degree of effectiveness as the known screw-type connectors.

As shown in Figures 14 and 20, each of the terminals (120) is provided with a recess (126) within which the terminal clip (140) is slidably received. In the case of the live pin (116), the terminal (128) is designed to receive one end of the fuse (113) therein. The fuse holder (111) is provided with a terminal clip formed integral thereto. The recess (126) of each terminal (120) is sufficiently large to slidably receive a terminal clip (140) therein in a tight friction fit. In this way, the terminal clips (140) can be used instead of screws to hold the exposed ends of the three wires in electrical connection with the terminals. Since the clips (140) do not have any extra space for movement, unlike the screws which must be accessible to a screw driver, the clips will not work loose due to vibration and constant handling of the plug. On the other hand, the clip allows easy extraction of the wire when the plug needs to be repaired or a new flex connected thereto. The whole clip (140) can be removed from within the recess (126) of the terminal (120) and the wire

-20-

can then be extracted with ease from between the first and second arms **(142)**, **(144)**.

Now that a preferred embodiment of the improved electrical plug in accordance
5 with the invention has been described in detail, it will be apparent that the described plug provides a number of advantages over conventional electrical plugs, including the following:

(a) the release mechanism **(130)** enables easy extraction of the plug from a
10 socket;

(b) it avoids the need to pull on the plug to remove it from the socket, since a small press force applied to the first portion **(132)** of the lever arm will activate the release mechanism and automatically push the plug away from the socket;

15 (c) inadvertent loosening or damage to the face plate of the socket can be avoided, since the user does not have to pull on the plug but simply apply a press force to the side of the plug;

20 (d) the release mechanism is of simple construction and can be readily incorporated in a plug housing of conventional dimensions;

(e) the release mechanism is easy to use and inexpensive to manufacture;

25 (f) the electrical terminal clip provides secure connection of the exposed ends of the wires to the terminals within the plug.

Numerous variations and modifications to the described embodiment of the electrical plug will suggest themselves to persons skilled in the electrical arts, in
30 addition to those already described, without departing from the basic inventive concepts. For example, the first and second portions of the release mechanism

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may be separate parts of the mechanism, which are mechanically connected within the housing of the plug. Thus, for example, the first portion (132) of the release mechanism may take the form of a press button which is slidably mounted in the side of the plug housing. The electrical plug may also take the form of a two-pin plug, and is not limited in its application to three-pin plugs.

Furthermore, the plug shown in Figures 11 to 20 may be used in conjunction with the socket shown in Figures 1 to 10.

The invention described herein is susceptible to variations, modifications and/or additions other than those specifically described and it is to be understood that the invention includes all such variations, modifications and/or additions which fall within the spirit and scope of the above description.

CLAIMS:

1. An electrical socket (1) for a plug having a plurality of pins (35), comprising a socket face plate (2) having at least one set of apertures (16) therein for receiving respective ones of the pins (35) of the plug, and having means for preventing withdrawal of the pins (35) from the face plate (2) when the pins (35) have been received in the apertures (16).
2. An electrical socket (1) according to claim 1, wherein the means for preventing withdrawal of the pins (35) comprises a formation of the socket face plate (2) which is adapted to engage a cooperating formation (36) provided on at least one of the pins (35).
3. An electrical socket (1) according to claim 2, wherein the means for preventing withdrawal further comprises a screen (37) having a plurality of apertures (38) therein for receiving the pins (35) of the plug, and wherein the screen (37) is movable between a first position in which at least one of the screen apertures (38) are out of alignment with the socket plate apertures (16), and a second position in which the screen apertures (37) are in alignment with the socket plate apertures (16).
4. An electrical socket (1) according to claim 3, wherein the screen (37) is movable from the first position to the second position under the pressure of the plug pins (35) when the plug is inserted into the socket (1).
5. An electrical socket (1) according to claim 3 or 4, wherein the screen (37) is provided with an operating member (5) for manually moving the screen (37) from the first position to the second position.
6. An electrical socket (1) according to claim 3, 4, or 5, wherein the screen (37) is biased towards the first position so that said screen formations are biased

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into engagement with said pin formations (36) when the plug is received in the socket (1).

7. An electrical socket (1) according to any preceding claim, wherein the face plate (2) is provided with at least two of said sets of apertures (16).

8. An electrical socket (1) according to claim 7, wherein the size and/or configuration of one of said sets of apertures (16) is different from the size and/or configuration of another of the sets of apertures (16), whereby the face plate (2) is adapted to receive at least two different types of plug.

9. An electrical socket (1) according to any preceding claim, further comprising a socket support (3) having at least live and neutral connectors (20,22) which are adapted to be electrically connected to a mains electrical supply, and securing means to releasably secure the face plate (2) to the support (3), and wherein the socket face plate (2) has at least live and neutral connectors, whereby the pins (35) on the plug are brought into electrical connection with respective ones of the live and neutral connectors of the face plate (2) when the plug pins (35) are received in the set of apertures (16), the arrangement being such that when the face plate (2) is secured to the support (3) by the securing means, the live and neutral electrical connectors on the face plate (2) are brought into electrical connection respectively with the live and neutral connectors (20,22) on the support (3).

10. An electrical socket (1) according to claim 9, wherein the support (3) is further provided with an earth connection (21) which is adapted to be connected to a mains electrical supply.

11. An electrical socket (1) according to claim 10, wherein the face plate (2) is further provided with an earth connection which is brought into contact with the earth connection (21) of the support (3) when the face plate (2) is secured to the

-24-

support (3), whereby an earth pin of the plug can be brought into electrical contact with the earth connection of the face plate (2) through a respective one of the set of apertures (16) in the face plate (2).

5 12. An electrical socket (1) according to any one of claims 9 to 11, wherein the electrical connectors on the face plate (2) each comprises a projection, and the electrical connectors (20,22) on the support (3) each comprise a recess, each projection being received in a respective recess when the face plate (2) is secured to the support (3).

10

13. An electrical socket (1) according to any one of claims 9 to 11, wherein the electrical connectors (20,22) on the support (3) each comprises a projection, and the electrical connectors on the face plate (2) each comprise a recess, each projection being received in a respective recess when the face plate (2) is secured
15 to the support (3).

14. An electrical socket (1) according to any one of claims 9 to 13, wherein the securing means comprises a snap-fit connection provided between the support (3) and the face plate (2).

20

15. An electrical socket (1) according to any one of claims 9 to 14, further comprising a circuit breaker for disconnecting the electrical connection between the mains supply and any plug received in the or each set of apertures (16) in response to a current leak or current overload.

25

16. An electrical socket (1) according to any one of claims 9 to 15, wherein the circuit breaker includes a thermostat (28) for establishing a connection to an indication means (11) to indicate that there is a heat overload or for disconnecting the electrical connection between the mains supply and any plug received in the
30 or each set of apertures (16) in response to a temperature in excess of a predetermined level.

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17. An electrical socket (1) according to claim 15 or 16, further comprising reset means (8) for manually reconnecting the electrical connection between the mains supply and the plug.

5 18. An electrical socket (1) according to claim 17, wherein the reset means (8) comprises a reset button.

19. An electrical socket (1) according to claim 17 or 18, wherein the reset means is provided in the face plate (2).

10

20. An electrical socket (1) according to any one of claims 9 to 19, wherein a cover (24) is provided for the socket support (3), the cover (24) being releasably securable to the support (3) when the socket face plate (2) has been released from the support (2), the cover (24) serving to prevent access to the electrical
15 connections (20,22) of the support (3).

21. An electrical socket (1) according to any one of claims 9 to 20, wherein the socket support (3) further comprises a housing (19) within which the electrical connectors (20,22) are disposed, and the securing means secures the face plate
20 (2) to the housing (19).

22. An electrical socket (1) according to claim 21, when dependent upon claim 15 or 16, wherein the circuit breaker is carried on the face plate (2) in such a way that it is received within the support housing (19) when the face plate (2) is
25 secured to the support (19).

23. An electrical socket (1) according to any one of claims 9 to 22, wherein the socket support is adapted to be fixed to a structure, and the electrical connections of the socket support are adapted to be directly connected to the mains wires
30 installed in the structure.

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24. An electrical socket (1) according to any one of claims 9 to 22, wherein the electrical socket further comprises an electrical connector lead, and a plug, the electrical connector lead being secured at one end to the electrical connections of the socket support, and being secured at the other end to the plug.

5

25. An electrical socket (1) according to any one of claims 9 to 24, wherein the electrical connectors on the support (3) are provided in the form of a female connector (39) and the electrical connectors on the face plate (2) are provided in the form of a male connector (25).

10

26. An electrical socket (1) according to any one of claims 9 to 24, wherein the electrical connectors on the support (3) are provided in the form of a male connector and the electrical connectors on the face plate (2) are provided in the form of a female connector.

15

27. An electrical socket (1) comprising: a socket support (3) having at least live and neutral connectors (20,22) which are adapted to be electrically connected to a mains electrical supply; a socket face plate (2) having at least live and neutral connectors, the face plate (2) having at least one set of apertures (16) adapted to receive corresponding pins (35) on a plug, whereby the pins (35) on the plug are brought into electrical connection with respective ones of the live and neutral connectors of the face plate (2) when the plug pins (35) are received in the set of apertures (16); and securing means to releasably secure the face plate (2) to the support (3), the arrangement being such that when the face plate (2) is secured to the support (3) by the securing means, the live and neutral electrical connectors on the face plate (2) are brought into electrical connection respectively with the live and neutral connectors (20,22) on the support (3).

25

28. An electrical socket (1) according to claim 27, wherein the support (3) is further provided with an earth connection (21) which is adapted to be connected to a mains electrical supply.

30

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29. An electrical socket (1) according to claim 27, wherein the face plate (2) is further provided with an earth connection which is brought into contact with the earth connection (21) of the support (3) when the face plate (2) is secured to the support (3), whereby an earth pin of the plug can be brought into electrical contact
5 with the earth connection of the face plate (2) through a respective one of the set of apertures (16) in the face plate (2).

30. An electrical socket (1) according to claim 27, 28 or 29, wherein the face plate (2) is provided with at least two of said sets of apertures (16).

10 31. An electrical socket (1) according to claim 30, wherein the size and/or configuration of one of said sets of apertures (16) is different from the size and/or configuration of another of the sets of apertures (16), whereby the face plate (2) is adapted to receive at least two different types of plug.

15 32. An electrical socket (1) according to any one of claims 27 to 31, wherein the electrical connectors on the face plate (2) each comprises a projection, and the electrical connectors (20,22) on the support (3) each comprise a recess, each projection being received in a respective recess when the face plate (2) is secured
20 to the support (3).

33. An electrical socket (1) according to any one of claims 27 to 31, wherein the electrical connectors (20,22) on the support (3) each comprises a projection, and the electrical connectors on the face plate (2) each comprise a recess, each
25 projection being received in a respective recess when the face plate (2) is secured to the support (3).

34. An electrical socket (1) according to any one of claims 27 to 33, wherein the securing means comprises a snap-fit connection provided between the
30 support (3) and the face plate (2).

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35. An electrical socket (1) according to any one of claims 27 to 34, further comprising a circuit breaker for disconnecting the electrical connection between the mains supply and any plug received in the or each set of apertures (16) in response to a current leak or current overload.

5

36. An electrical socket (1) according to any one of claims 27 to 35, wherein the circuit breaker includes a thermostat (28) for establishing a connection to an indication means (11) to indicate that there is a heat overload or for disconnecting the electrical connection between the mains supply and any plug received in the
10 or each set of apertures (16) in response to a temperature in excess of a predetermined level.

37. An electrical socket (1) according to claim 35 or 36, further comprising reset means (8) for manually reconnecting the electrical connection between the
15 mains supply and the plug.

38. An electrical socket (1) according to claim 37, wherein the reset means (8) comprises a reset button (8).

20 39. An electrical socket (1) according to claim 37 or 38, wherein the reset means is provided in the face plate (2).

40. An electrical socket (1) according to any one of claims 27 to 39, wherein a cover (24) is provided for the socket support (3), the cover (24) being
25 releasably securable to the support (3) when the socket face plate (2) has been released from the support (2), the cover (24) serving to prevent access to the electrical connections (20,22) of the support (3).

41. An electrical socket (1) according to any one of claims 27 to 40, wherein
30 the socket support (3) further comprises a housing (19) within which the electrical connectors (20,22) are disposed, and the securing means secures the face plate

(2) to the housing (19).

42. An electrical socket (1) according to claim 41, when dependent upon claim 35 or 36, wherein the circuit breaker is carried on the face plate (2) in such a way that it is received within the support housing (19) when the face plate (2) is secured to the support (19).

43. An electrical socket (1) according to any one of claims 24 to 42, wherein the socket support is adapted to be fixed to a structure, and the electrical connections of the socket support are adapted to be directly connected to the mains wires installed in the structure.

44. An electrical socket (1) according to any one of claims 24 to 42, wherein the electrical socket further comprises an electrical connector lead, and a plug, the electrical connector lead being secured at one end to the electrical connections of the socket support, and being secured at the other end to the plug.

45. An electrical socket (1) according to any one of claims 24 to 44, wherein the electrical connectors on the support (3) are provided in the form of a female connector (39) and the electrical connectors on the face plate (2) are provided in the form of a male connector (25).

46. An electrical socket (1) according to any one of claims 24 to 44, wherein the electrical connectors on the support (3) are provided in the form of a male connector and the electrical connectors on the face plate (2) are provided in the form of a female connector.

47. An electrical socket (1) according to any of claims 24 to 46, which includes an electrical shock absorption means (7) to absorb electricity from the earth connection of the electrical appliance attached to the electrical socket (1) in the event of current leakage or electrical overload to prevent damage to the electrical

appliance.

48. A electrical socket (1) for a plug having plurality of pins (35), the socket (1) comprising : a socket face plate (2) having at least one set of apertures (16) therein for receiving respective ones of the pins (35) of the plug; a circuit breaker
5 adapted to cut off any current supply to the plug in the event of current leakage or electrical overload; and reset means (8) for manually resetting the current supply to the plug after activation of the circuit breaker, wherein :

- 10 (i) the electrical socket is adapted to be fixed to a structure, and the socket (1) has electrical connections which are adapted to be directly connected to mains wires installed in the structure; or
- (ii) the electrical socket further comprises an electrical connector lead, and a plug, the electrical connector lead being secured at one end to electrical connections in the socket (1), and being secured at the
15 other end to the plug.

49. An electrical socket (1) according to claim 48, wherein the reset means (8) comprises a reset switch (8).

20 50. An electrical socket (1) according to claim 48 or 49, wherein the circuit breaker includes a thermostat (28) for establishing a connection to an indication means (11) to indicate that there is a heat overload or for cutting of the current supply to the plug if the temperature in the socket (1) exceeds a predetermined level.

25 51. An electrical socket (1) according to claim 48, 49 or 50, further comprising a socket support (3) which is adapted to be connected to the fixed structure, and wherein the socket face plate (2) is removably secured to the support (3).

30 52. An electrical socket (1) according to claim 48, 49 or 50, further comprising a socket support to which the electrical connector lead is adapted to be

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connected, and wherein the socket face plate is removably secured to the support.

53. An electrical socket comprising an electrical socket (1) according to any preceding claim, wherein the support (3) includes pins for a plug (13) for electrical
5 connection of the electrical socket (1) to a mains or other power supply with corresponding apertures to receive the same.

54. An electrical socket and plug combination comprising a electrical socket (1) according to any preceding claim in combination with a plug comprising a plug
10 housing having plurality of pins (35) extending therefrom, the pins (35) being receivable in respective ones of the apertures (16) of the face plate (2).

55. An electrical plug comprising a plug housing having a plurality of pins (35) extending therefrom the pins (35) being adapted to be received in respective ones
15 of a plurality of apertures (16) provided in an electrical socket, wherein the pins (35) are adapted to interact with the socket (1), when received in the apertures (16) in such a way that removal of the pins (35) from the apertures (16) is prevented.

20 56. An electrical plug according to claim 55, wherein the pins are provided with formations adapted to interengage with cooperating formations in the socket (1), in order to prevent removal of the pins (35) from the apertures (16).

57. An electrical plug of the type having two or more pins adapted to be
25 received in a socket, the plug further comprising:

a release mechanism provided in the plug for releasing the plug from the socket, the mechanism including a first portion that protrudes from a side of the plug and which is designed to be pressed by a user to activate the release mechanism, and
30 a second portion that is pushed against the socket when the first portion is pressed whereby, in use, the withdrawal of the two or more pins of the plug from

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the socket is assisted by the action of the release mechanism when activated.

58. An electrical plug according to claim 57, wherein the activation of the release mechanism is sufficient to cause withdrawal of the plug without additional effort from the user.

59. An electrical plug according to claim 57 or 58, wherein means are provided to enable the second portion of the release mechanism to be pushed against the socket by means of a lever action when the first portion is pressed by the user.

60. An electrical plug according to claim 59, wherein the release mechanism includes a lever member pivotally mounted in the plug, and the first and second portions of the release mechanism are formed integral with the lever member.

61. An electrical plug according to claim 60, wherein the lever member is movable from a first position in which the second portion is retracted and does not substantially protrude from a front face of the plug, and a second position in which the second portion does protrude from the front face of the plug to push against the socket.

62. An electrical plug according to claim 61, wherein the lever arm is biased towards the first position.

63. An electrical plug according to claim 62, wherein the lever member is biased by a torsion spring which is mounted on a pivot pin on which said lever member is pivotally mounted.

64. An electrical plug according to claim 61, 62 or 63, wherein the plug is a three-pin plug and in said second position of the lever member said second portion protrudes from the front face of the plug in a space provided between an earth pin and the two other pins of the plug.

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65. An electrical plug according to any preceding claim, comprising two of said release mechanisms.

66. An electrical plug of the type having two or more pins adapted to be
5 received in a socket, the plug further comprising:

an electrical terminal clip for connecting a wire to one of the pins at a terminal provided within the plug, the clip having first and second surfaces resiliently biased towards each other and between which the wire is received and gripped
10 to provide an electrical connection to the terminal.

67. An electrical plug according to claim 66, wherein the clip is formed from a single piece of metal having first and second arms upon which said first and second surfaces are provided.

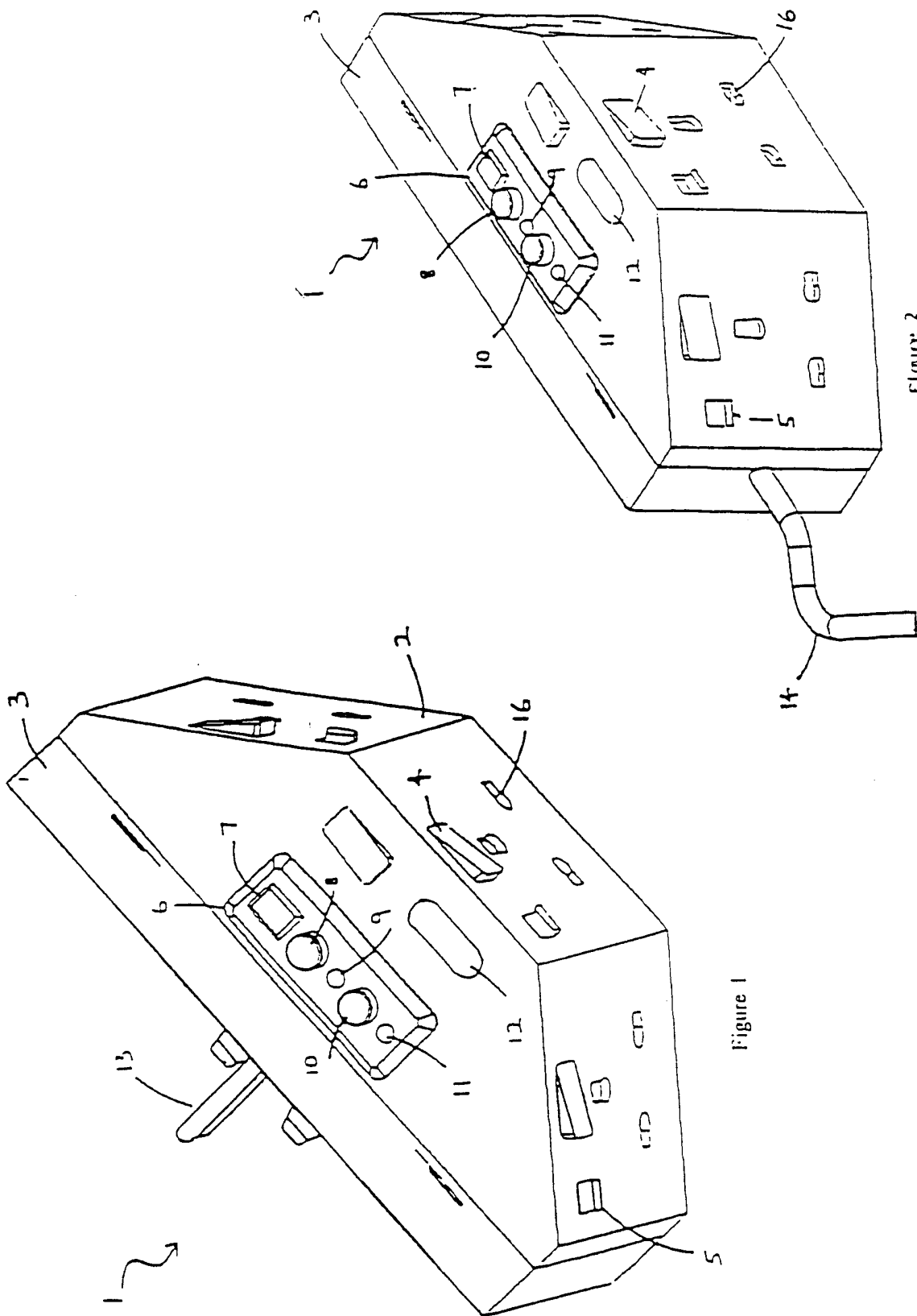
15

68. An electrical plug according to claim 67, wherein said first and second arms are connected by a bridging portion that acts to bias said first and second arms towards each other.

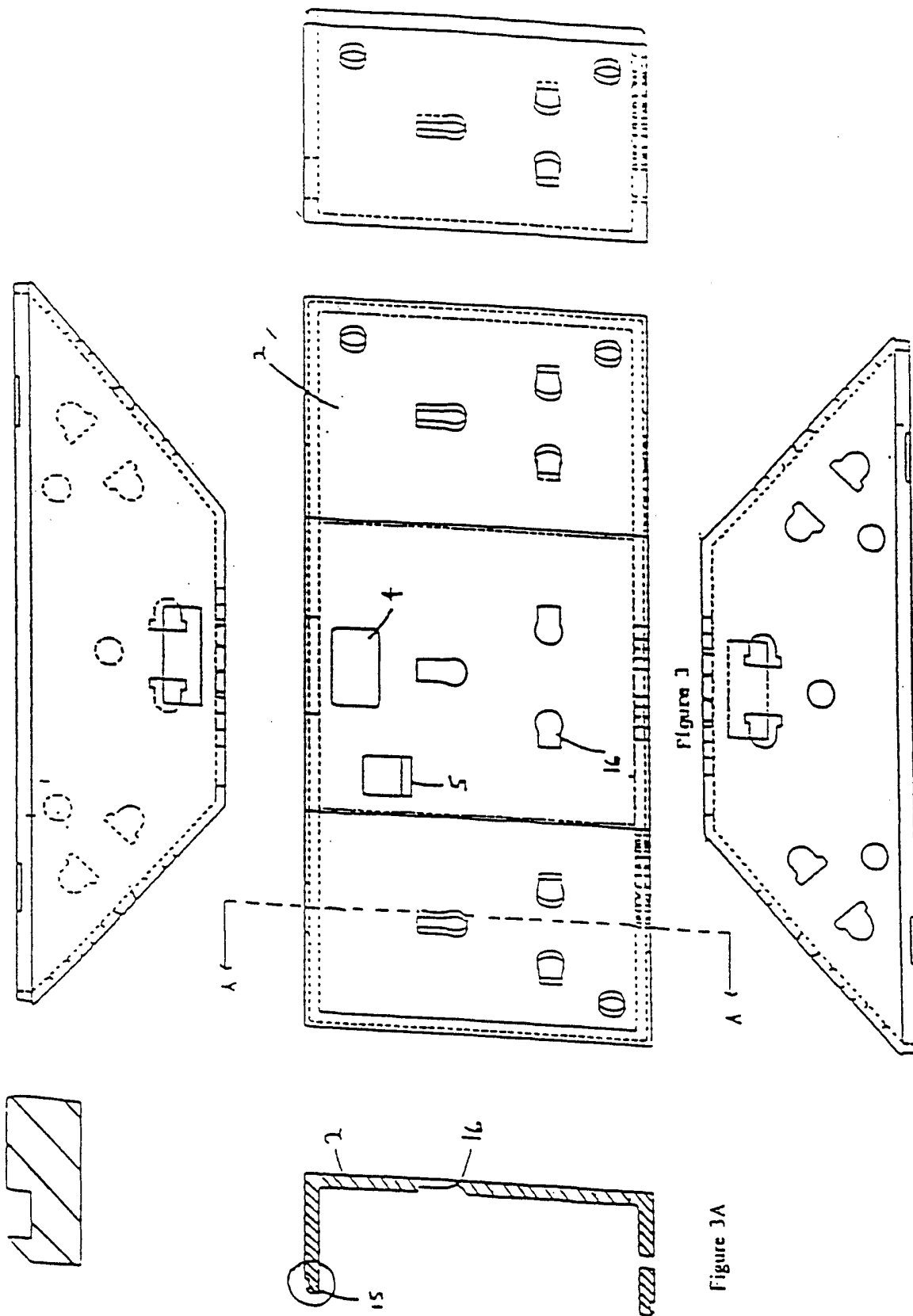
20 69. An electrical plug according to any one of claims 66 to 68, further comprising a plug housing which houses an end of said pins, wherein said end of said pins is provided with a recess adapted to receive a respective one of said clips therein in a tight friction fit.

25 70. An electrical plug according to claim 69, wherein the clips are removable from the pin recesses.

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2/10



3/10

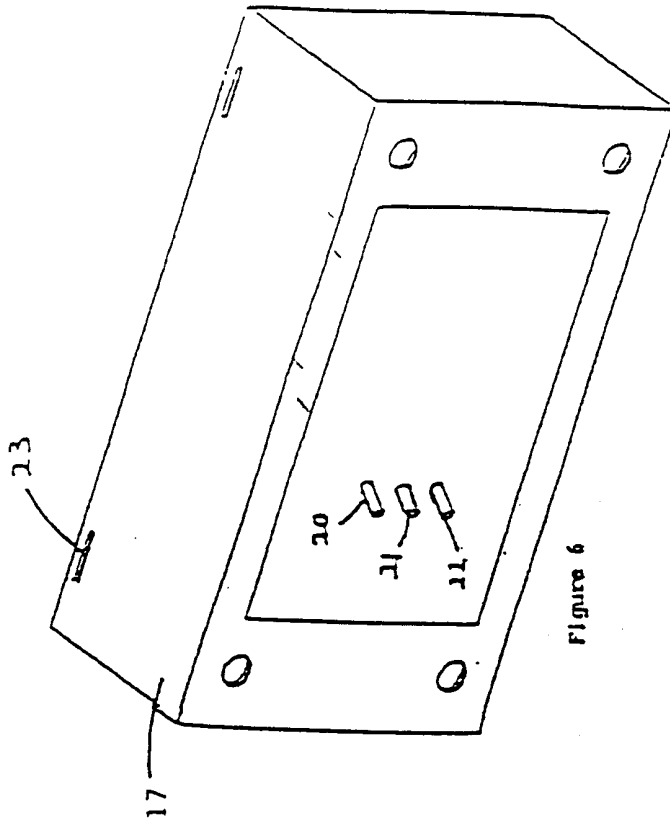


Figure 6

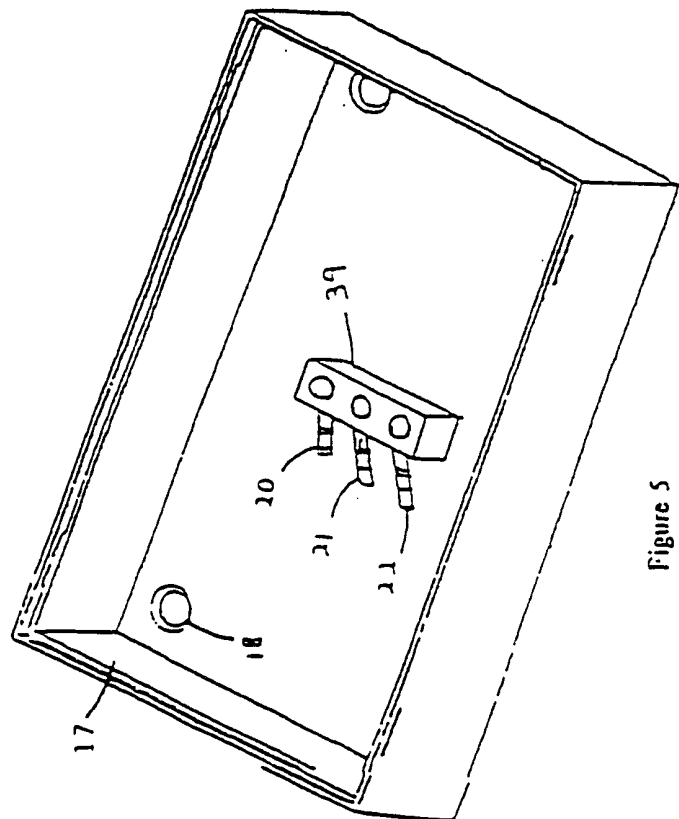
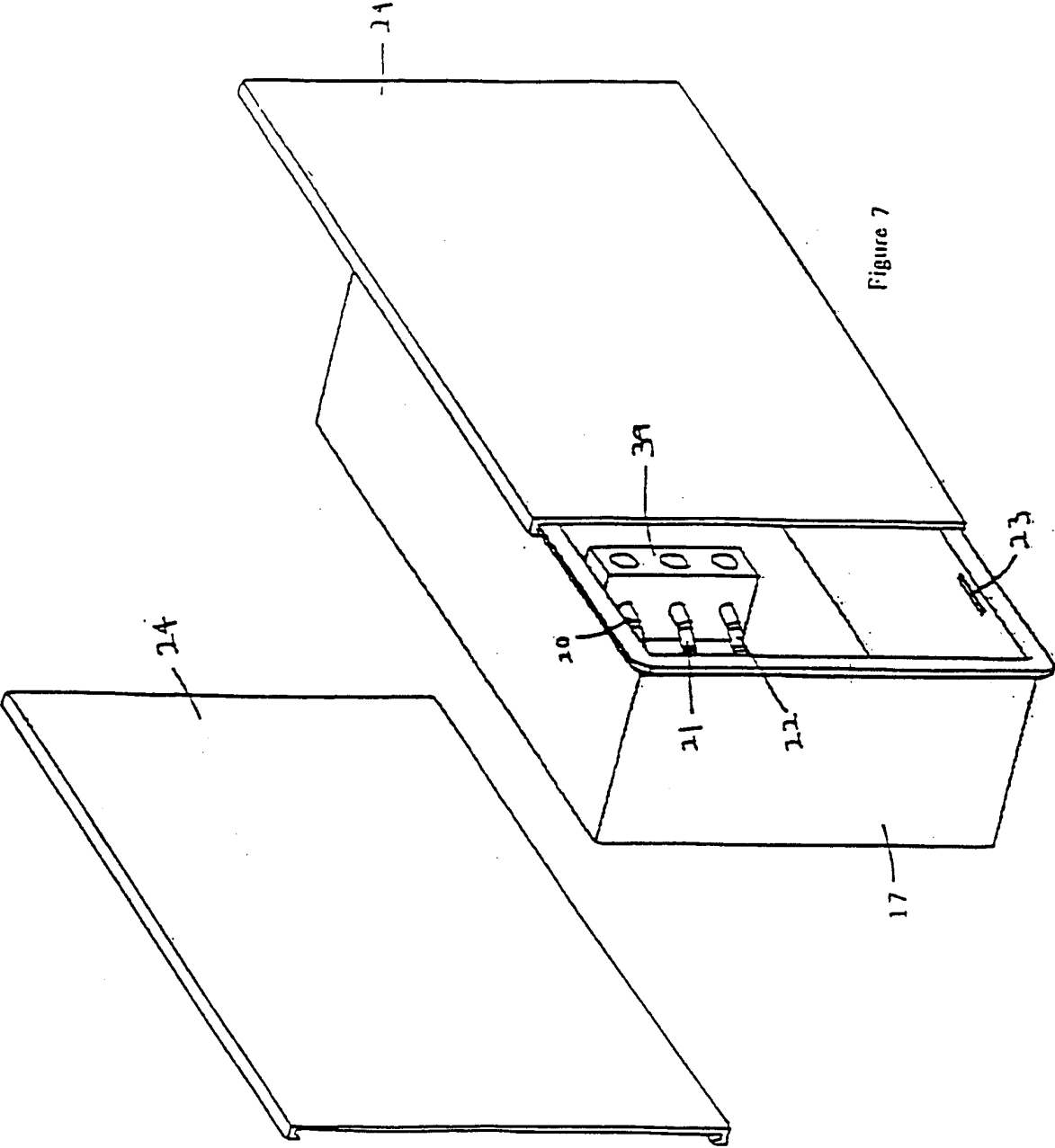
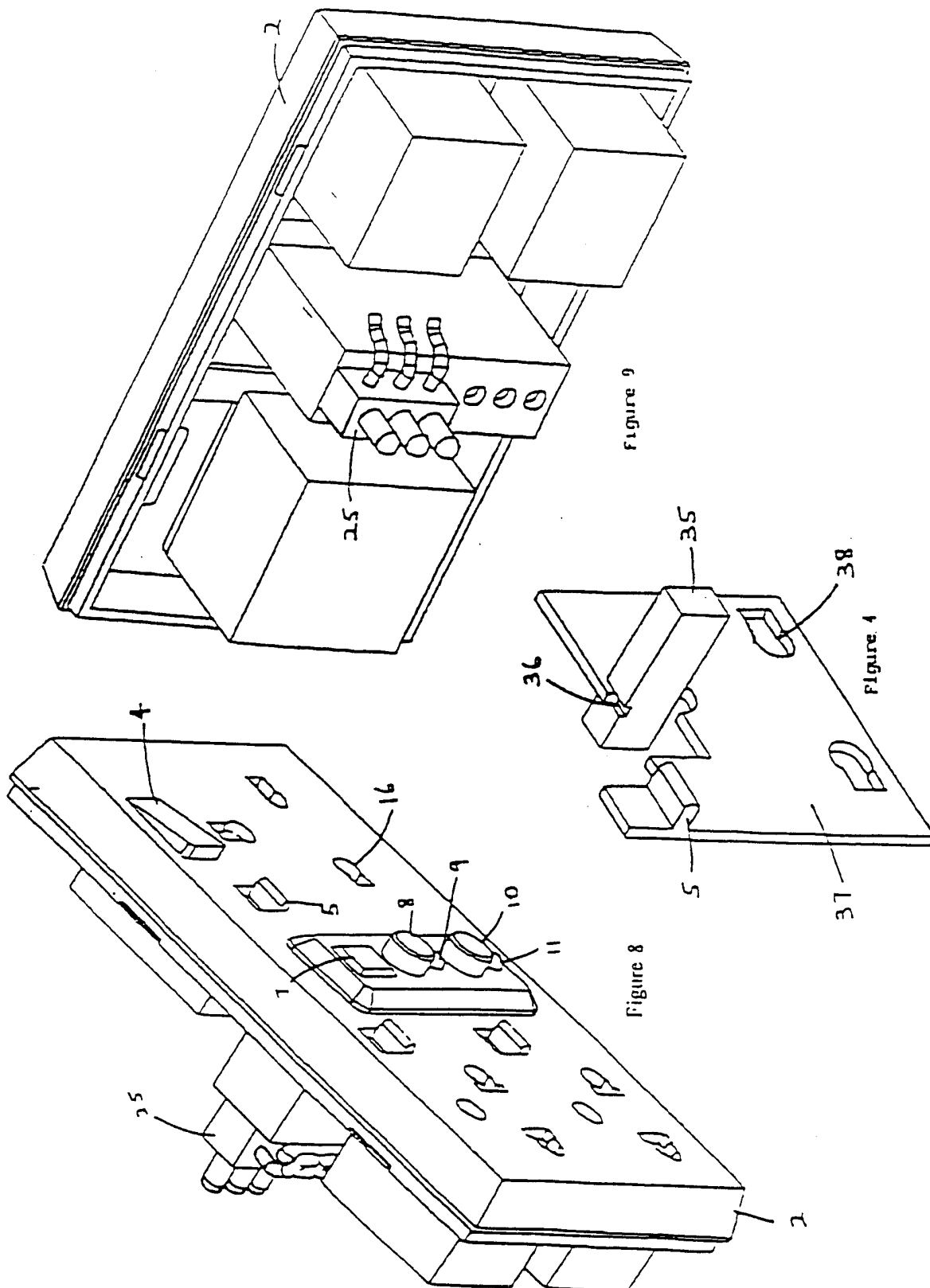


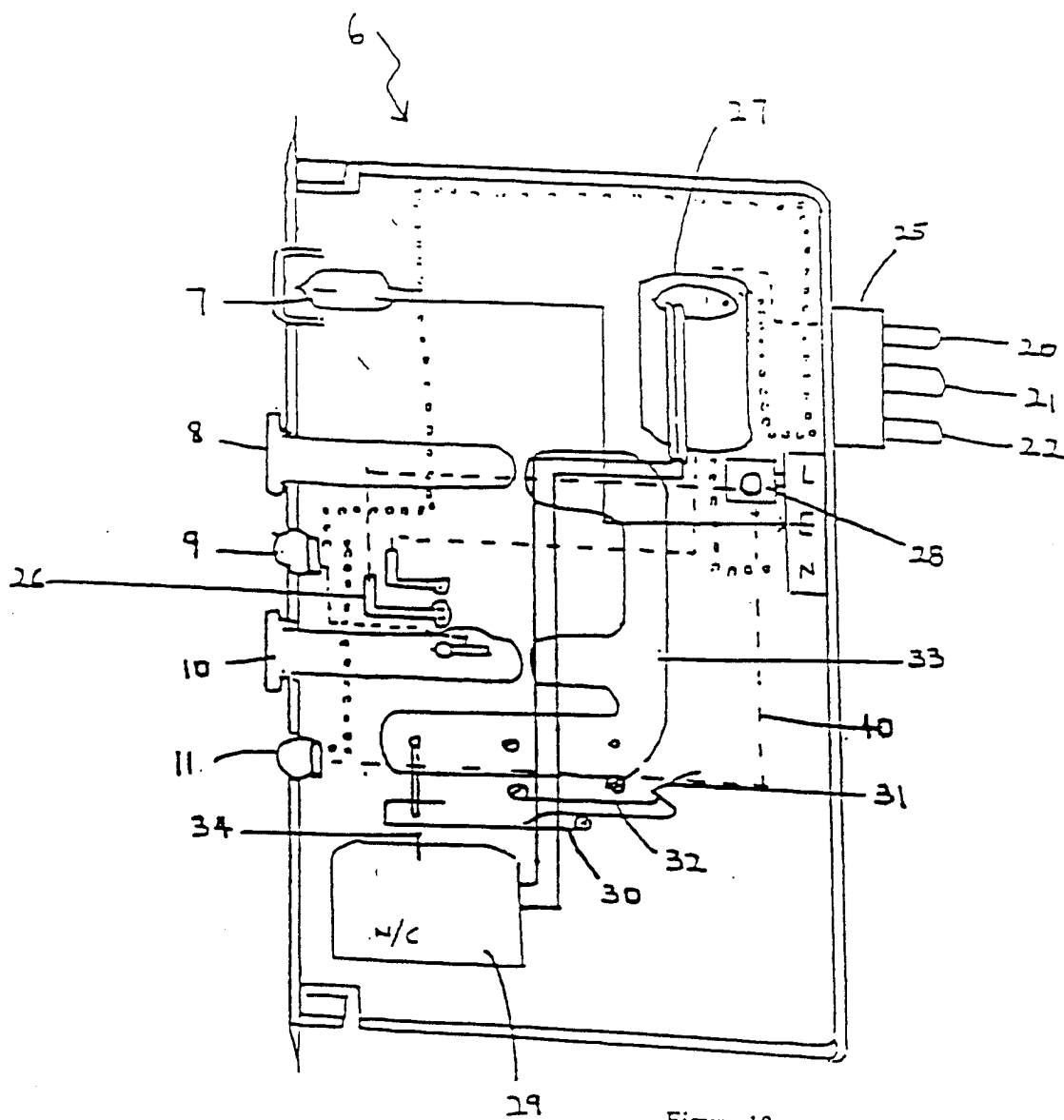
Figure 5



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6/10



Live - - - - -
 Earth - - - - -
 Neutral

7/10

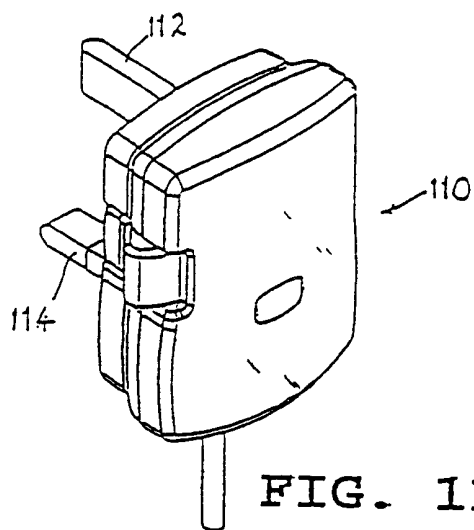


FIG. 11

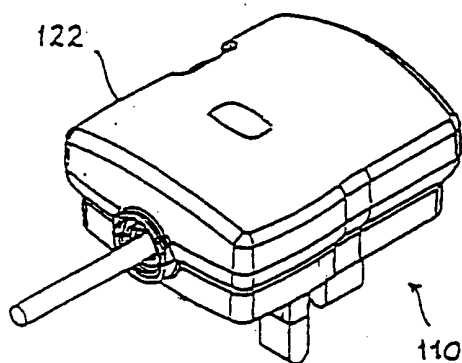


FIG. 12

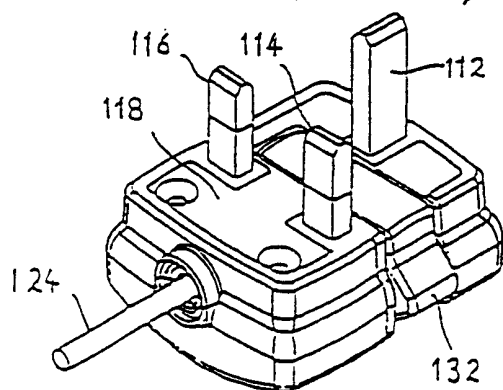


FIG. 13

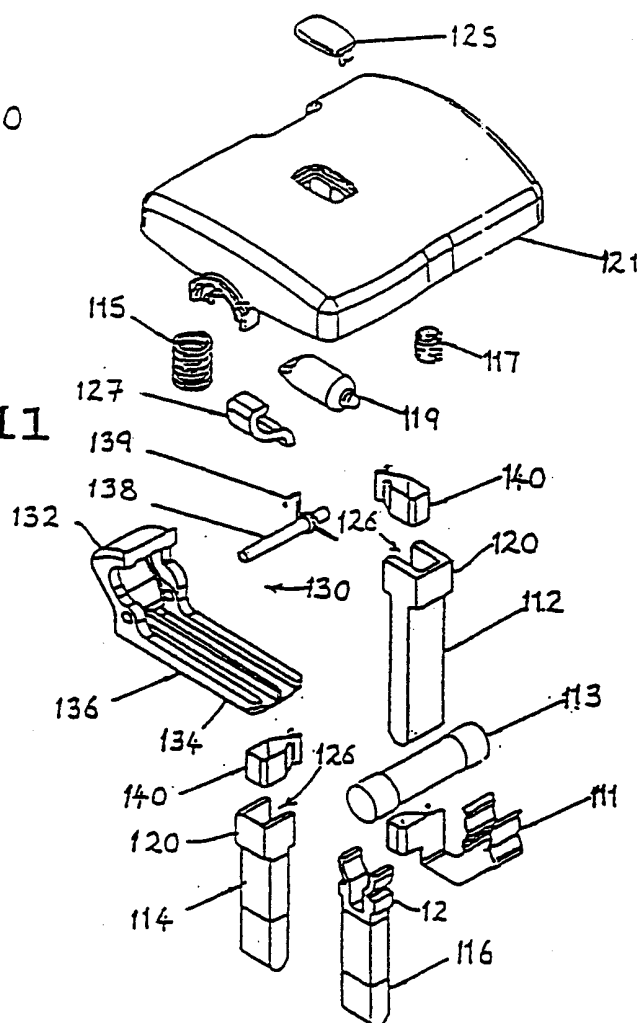


FIG. 14

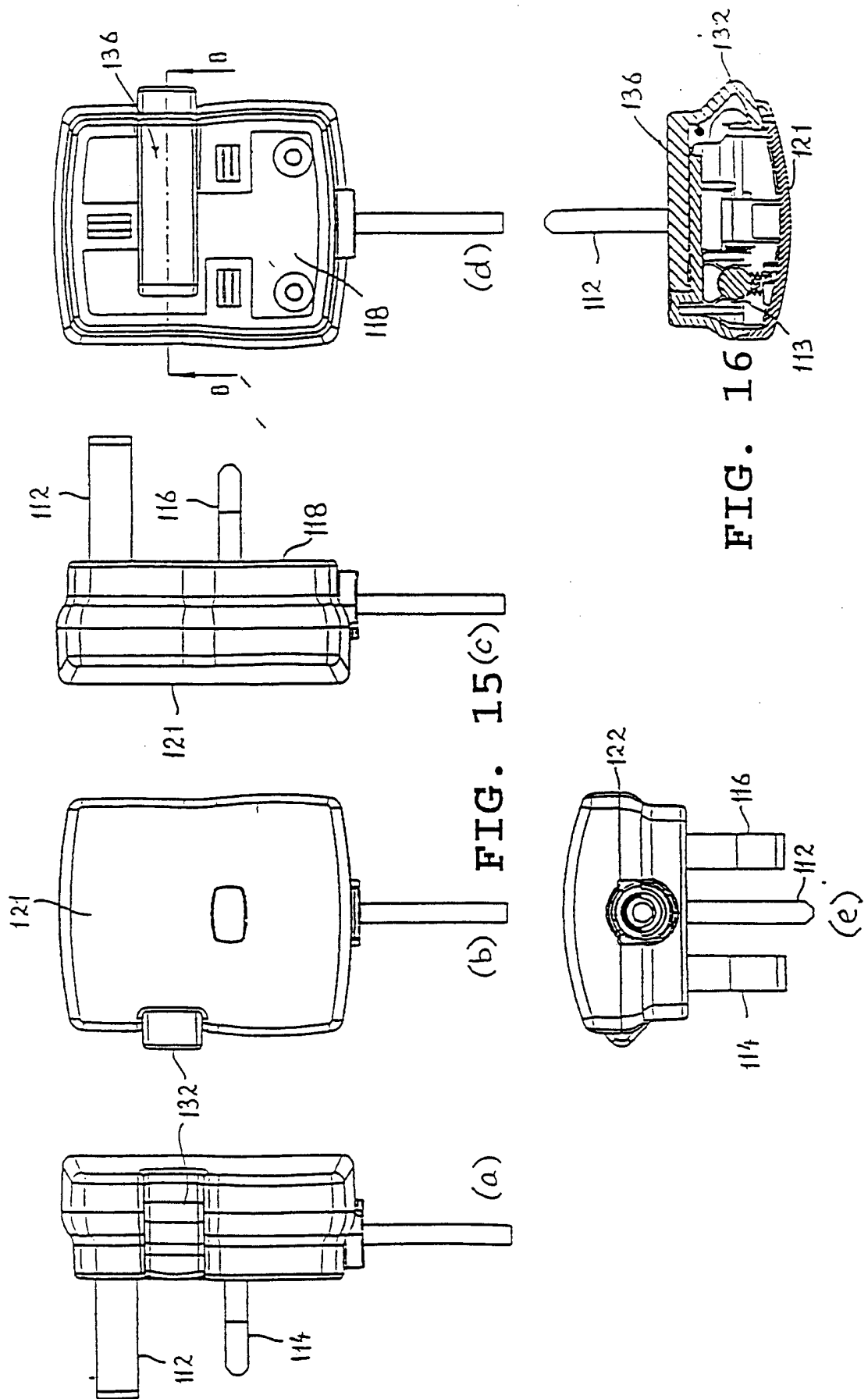
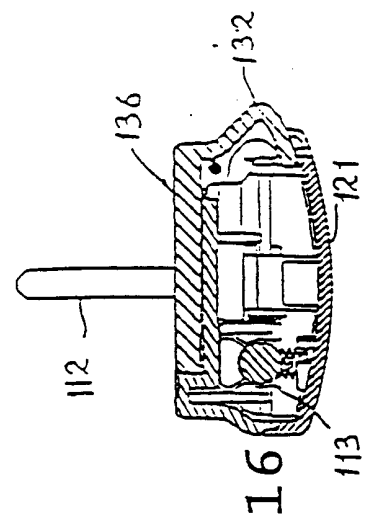
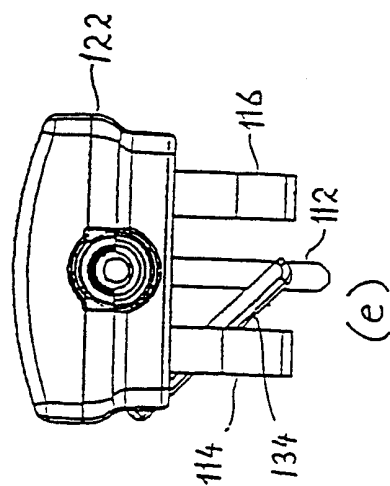
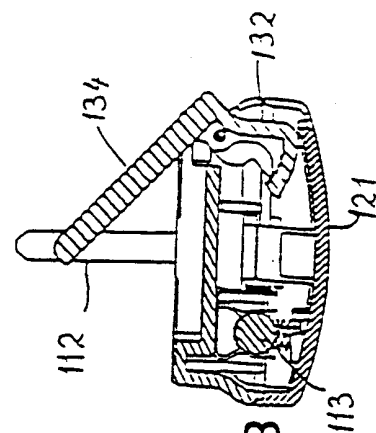
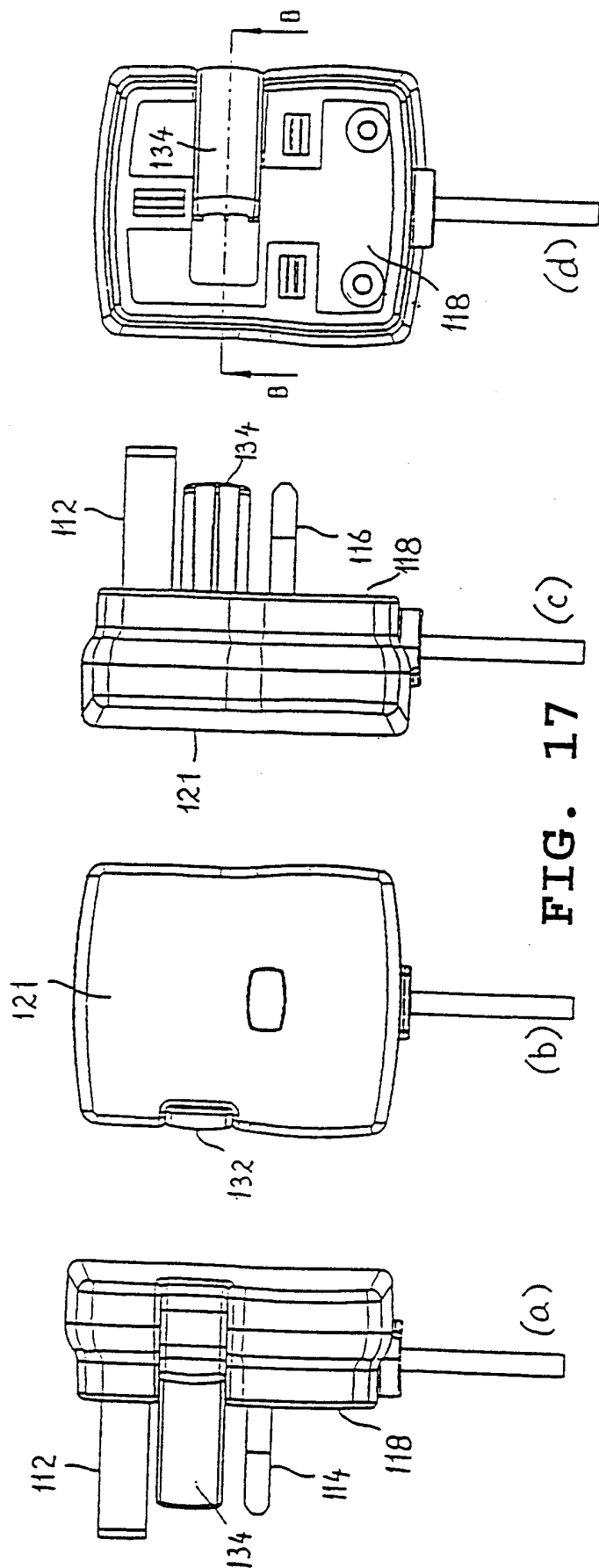


FIG. 16



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10/10

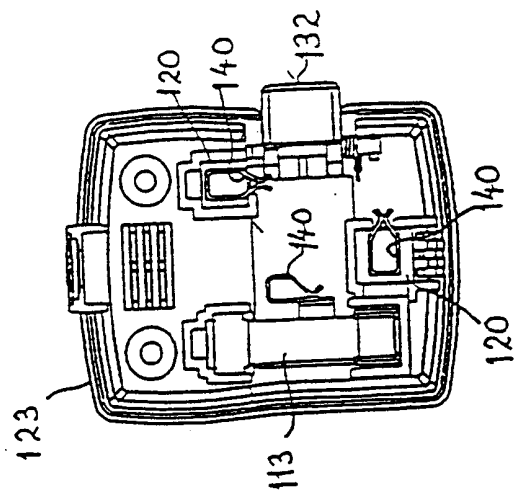


FIG. 20

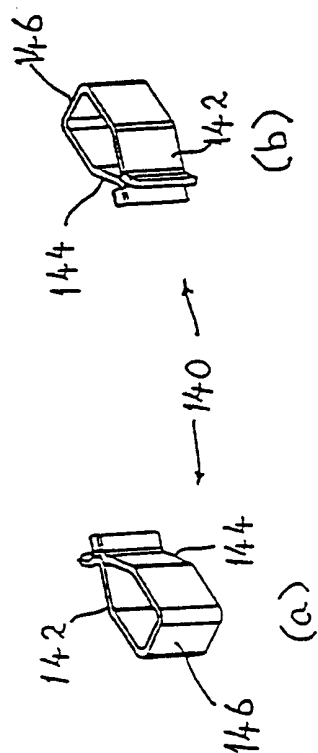


FIG. 19