



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.01.2017 Bulletin 2017/03

(51) Int Cl.:
H01R 13/703 (2006.01) **H01R 24/76** (2011.01)
H01R 103/00 (2006.01)

(21) Application number: **16179201.5**

(22) Date of filing: **13.07.2016**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

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(30) Priority: **15.07.2015 BE 201505454**

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(54) **SOCKET WITH IMPROVED CONTACT ASSEMBLY**

(57) The present invention provides a socket (10) comprising a first and a second contact assembly (100, 200) configured for receiving a first and second pin of a plug. The first contact assembly (100) comprises a first member (110) which is electrically conductive, a second member (120) which is electrically insulating, and a third member (130) which is again electrically conductive. The first member (110) is a spring-loaded part configured for

receiving the first pin of the plug such that the first pin contacts the first member. The third member (130) is configured for receiving an end (E) of a first electrical wire (W1). The second member (120) extends between the first member (110) and the third member (130) for electrically insulating the first member (110) from the third member (130).

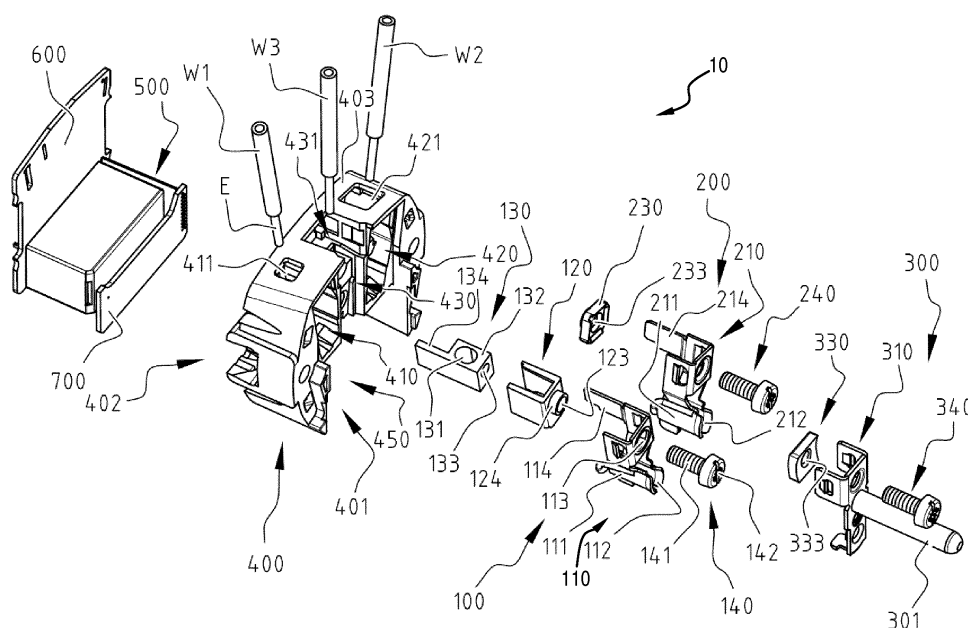


FIG. 1A

Description

Technical field of the invention

[0001] The invention relates to a socket for providing power to an electrical load via a plug inserted in the socket, and in particular to a socket with a switch. Further the invention relates to a contact assembly for use in such a socket.

Background of the invention

[0002] There are sockets that include a relay for interrupting the provision of power to a plug inserted into the socket. Such a relay may be operated by a microcontroller in the socket, or by a manual interface means provided at the front side of the socket, or more generally by any suitable means. For implementing such a switch in a socket, according to prior art solutions the socket may be modified as disclosed in EP 0 437 696. EP 0 437 696 discloses a remote-controlled connecting device comprising a housing with a plug socket and a switch for controlling the provision of power via the plug socket to an electrical load. In this embodiment the housing is large and specially adapted to contain the various components.

Summary of the invention

[0003] It is an object of embodiments of the present invention to provide a socket which is suitable for being combined with a switch and which allows for the switch to be connected in an improved way, resulting in a compact socket.

[0004] The above objective is accomplished by a device according to embodiments of the present invention.

[0005] In a first aspect, the present invention provides a socket. The socket comprises a first and a second contact assembly configured for receiving a first and second pin of a plug. The first contact assembly comprises a first member which is electrically conductive, a second member which is electrically insulating and a third member which is electrically conductive. The first member is a spring-loaded part configured for receiving a first pin of a plug such that the first pin contacts the first member and the third member is configured for receiving an end of a first electrical wire. The second member extends between the first and the third member for electrically insulating the first member from the third member.

[0006] In other words, the contact assembly can be referred to as being "decoupled" with a first and third member being isolated from each other through the use of a second member. By using such a "decoupled" first contact assembly, a switch can be connected between the first and third member, resulting in a very compact solution which does not require the rest of the socket to be significantly modified with respect to existing sockets. In preferred embodiments the invention allows using a

conventional power socket layout in which the insert position of the first electrical wire and the first member for receiving the first pin of a plug are not modified, such that existing installation habits can be kept.

[0007] According to embodiments of the invention, the socket may furthermore comprise at least one electronic component connected between the first member and the third member. The electronic component may, according to embodiments of the invention, comprise one or more of a controllable switch such as a relay, a measurement component or a fuse.

[0008] The first contact assembly may furthermore comprise a wire fixation means configured for fixing the end of the first electrical wire such that it is in contact with the third member. According to embodiments of the invention, the wire fixation means may be a screw extending through the first and the second member in the third member for fixing the end of the first electrical wire. In that way the position of the screw may be the same as in conventional power sockets, which makes it easier for the installer to install a socket according to embodiments of the invention. According to further embodiments, the wire fixation means may comprise a spring or clamp element configured for pushing or clamping the end of the first electrical wire against the third member. Also according to such embodiments, the position of the wire fixation means may be the same as in conventional power sockets.

[0009] According to embodiments of the invention in which the wire fixation means is a screw, the second member may be provided with a protruding part protruding through a hole in the first member, the protruding part having a hole for the screw. According to other embodiments, an electrically insulating ring may be arranged a part of the screw extending through a hole in the first member. In that way, metal screws can be used thereby still ensuring that the first and third member are electrically insulated from each other.

[0010] The first member may comprise a contact tube for receiving a first pin of a plug. The contact tube may be a conventional contact tube as used in conventional power sockets and as known by a person skilled in the art.

[0011] According to embodiments of the invention, the socket may furthermore comprise a base having a front side, a back side and a top side. The front side may be provided with a first and a second recess in which the first and second contact assembly are arranged. The top side of the base may be provided with a first and a second opening for connecting the first wire and a second wire to the third member of the first contact assembly and to a member of the second contact assembly, respectively. According to other embodiments of the invention, the openings may also be provided in the bottom side of the base. According to embodiments in which the wire fixation means is a screw, the screw may be accessible from the front side of the base.

[0012] The first member may be provided with a first contact lip and the third member may be provided with a

second contact lip. The base may be provided with a first passage from the first recess to the back side for the first contact lip, and with a second passage from the first recess to the back side for the second contact lip. The first and second contact lip may be connected, e.g. soldered to a PCB arranged at the back side of the base. An electronic component, such as a switch, may be inserted between the first contact lip and the second contact lip. In that way, the compactness of the socket can be further improved.

[0013] The base may be provided with a recess for receiving at least one electronic component. The at least one electronic component may be mounted on a PCB, and the PCB may be fixed against the back side or the front side of the base. According to embodiments of the invention, the recess may be a through-hole extending from the back side to the front side of the base.

[0014] The socket may, according to embodiments of the invention, furthermore comprise a cover configured for being arranged at the front side of the base, the cover having a first hole and a second hole for allowing the first and second pin of the plug to extend through the cover in the first and second contact assembly. The cover may be a multipart cover with a central cover element in which the first and second holes are arranged, and a frame part. According to embodiments of the invention, the at least one electronic component may comprise a switch, and the socket may furthermore comprise interface means for operating the switch, the interface means being accessible through the cover.

[0015] The socket may be configured for being flush-mounted in a wall. In such cases, the base may be intended for being at least partially built-in into an opening in the wall. The socket may also comprise a cover and that cover may be configured for being attached to the base and for covering the opening in the wall. The cover may comprise a cover frame and a central member with a first hole and a second hole for allowing the first and second pin of the plug to extend through the central member in the first and second contact assembly, the cover being fixable to the base around the central member. According to other embodiments of the invention, the socket may be configured for being surface mounted.

[0016] According to embodiments of the invention, the socket may furthermore comprise one or more of a power conversion circuitry configured for converting a first voltage present between the first and the second electrical wires in the wall into a lower second voltage for feeding low-voltage components; a microcontroller configured for operating the switch; communication circuitry connected to an antenna, for wirelessly sending or receiving data; measurement circuitry configured for measuring a measure representative for the power consumed by a load connected to the socket.

[0017] In a second aspect, the present invention provides a contact assembly for use in a socket according to embodiments of the invention. The contact assembly comprises a first member which is electrically conductive,

a second member which is electrically insulating, and a third member which is electrically conductive. The first member is a spring-loaded part configured for receiving a first pin of a plug such that the first pin contacts the first member. The third member is configured for receiving and being in contact with an end of an electrical wire. The second member extends between the first and the third member for electrically insulating the first member from the third member.

[0018] The contact assembly further comprises a wire fixation means configured for fixing the end of the electrical wire such that it is in contact with said third member. The wire fixation means may be a screw extending through the first and the second member in the third member for fixing said end of said electrical wire. According to other embodiments, the wire fixation means may comprise a spring or clamping element configured for pushing or clamping the end of the electrical wire against the third member.

[0019] The second member may be provided with a protruding part protruding through a hole in the first member; the protruding part having a hole for the screw.

[0020] An electrically insulating ring may be arranged around a part of the screw extending through a hole in the first member.

[0021] The first member may furthermore comprise a contact tube for receiving a first pin of a plug.

Brief description of the drawings

[0022] It has to be noted that same reference signs in the different figures refer to same, similar or analogous elements.

Figures 1A and 1B illustrate an exploded perspective view of a socket according to an embodiment of the invention, in respectively a completely and partially disassembled state;

Figures 2A and 2B illustrate perspective views looking from the front to the back of a socket according to an embodiment of the invention, in respectively a partially assembled and a fully assembled state;

Figures 3A and 3B illustrate perspective views corresponding with the views of figures 2A and 2B but looking from the back to the front;

Figures 4A and 4B illustrate perspective views of a contact assembly for being used in a socket according to embodiments of the invention, in respectively a disassembled and assembled state; and

Figures 5A, 5B, and 5C illustrate perspective views of a contact assembly for being used in a socket according to further embodiments of the invention, in respectively a disassembled state and an assembled state seen from two directions.

Description of illustrative embodiments

[0023] In the description different embodiments will be

used to describe the invention. Therefore reference will be made to different drawings. It has to be understood that these drawings are intended to be non-limiting, the invention is only limited by the claims. The drawings are thus for illustrative purposes, the size of some of the elements in the drawings may be exaggerated for clarity purposes.

[0024] The term "comprising" is not to be interpreted as limiting the invention in any way. The term "comprising", used in the claims, is not intended to be restricted to what means is described thereafter; it does not exclude other elements, parts or steps.

[0025] The term "connected" as used in the claims and in the description has not to be interpreted as being restricted to direct connections, unless otherwise specified. Thus, part A being connected to part B is not limited to part A being in direct contact to part B, but also includes indirect contact between part A and part B, in other words also includes the case where intermediate parts are present in between part A and part B. the term "wall" may refer to a side wall, a ceiling, a floor, a wall of a cable duct, etc.

[0026] Not all embodiments of the invention comprise all features of the invention. In the following description and claims, any of the claimed embodiments can be used in any combination.

[0027] The present invention provides a socket. The socket comprises a first and a second contact assembly configured for receiving a first and second pin of a plug. The first contact assembly comprises a first member which is electrically conductive, a second member which is electrically insulating and a third member which is electrically conductive. The first member is a spring-loaded part configured for receiving a first pin of a plug such that the first pin contacts the first member and the third member is configured for receiving an end of a first electrical wire. The second member extends between the first and the third member for electrically insulating the first member from the third member.

[0028] In other words, the contact assembly can be referred to as being "decoupled" with a first and third member being isolated from each other through the use of a second member. By using such a "decoupled" first contact assembly, a switch can be connected between the first and third member, resulting in a very compact solution which does not require the rest of the socket to be significantly modified with respect to existing sockets. In preferred embodiments the invention allows using a conventional power socket layout in which the insert position of the first electrical wire and the first member for receiving the first pin of a plug are not modified, such that existing installation habits can be kept.

[0029] The present invention will hereinafter be described by means of different embodiments. It has to be understood that these embodiments are only for the ease of understanding the invention and are not intended to limit the invention in any way.

[0030] Figures 1A, 1B, 2A, 2B, 3A, and 3B illustrate a

socket 10 according to a first embodiment of the invention. The socket 10 comprises a first contact assembly 100 and a second contact assembly 200 configured for respectively receiving a first pin and a second pin of a plug (not shown). The socket 10 may, according to embodiments of the invention and as illustrated in figures 1A, 1B, 2A, 2B, 3A, and 3B, further comprise a third contact assembly 300 with an earth pin 301 configured for being inserted in a contact hole in the plug. This third contact assembly 300 functions as an earth connection. The third contact assembly 300 is optional and is not part of the invention. Also, other earth connections may be used according to embodiments of the invention, such as, for example, a side earth connection (such as Type F CEE 7/4 Schuko which is common in The Netherlands and Germany).

[0031] The first contact assembly 100 comprises a first member 110 which is electrically conductive, a second member 120 which is electrically insulating, a third member 130 which is electrically conductive, and a wire fixation means in the form of a screw 140. The first member 110 may be identical to a spring-loaded member in a conventional socket (see further). This spring-loaded member may have a first leg part in the form of a curved contact part 111 and a second leg part in the form of a curved contact part 112. The first curved part 111 and the second curved part 112 together form a so-called contact tube (111, 112) for the first pin of a plug. Therefore, the first curved contact part 111 and the second curved contact part 112 are spring-loaded with respect to each other, such that the first pin of a plug can be clampingly received between the first curved contact part 111 and the second curved contact part 112.

[0032] In the illustrated embodiment, the second member 120 is provided with a protruding part 124 dimensioned for protruding through a hole 113 in the first member 110. The protruding part 124 comprises a hole 123 for the screw 140. According to other embodiments which are not illustrated here, an electrically insulating ring may be arranged around a part of the screw 140, the ring thereby extending through the hole 113 in the first member 110. According to still further embodiments, the screw 140 may be made of an electrically insulating material.

[0033] The third member 130 has a top side 132 which is provided with a passage 131 for receiving an end E of a first electrical wire W1. The second member 120 is arranged between the first member 110 and the third member 130 in order to create an electrical insulation between the first member 110 and the third member 130. The screw 140 extends through the hole 113 in the first member 110 and through the hole 123 in the second member 120 into a passage 133 in the third member 130 for fixing the end E of the first wire W1. The passage 133 may be provided with an internal thread corresponding with the thread 141 of the screw 140.

[0034] The second contact assembly 200 and the third contact assembly 300 may be conventional standard components as provided in existing sockets manufac-

tured by the Applicant. The second contact assembly 200 comprises a spring-loaded member 210 adapted for receiving a second pin of a plug between a first leg 211 and a second leg 212, and for receiving an end of a second wire W2 between the spring-loaded member 210 and a second member 230 which can be approached to the spring-loaded member 210 by means of a wire fixation means such as a screw 240. The first leg 211 and the second leg 212 together form a contact tube for the second pin of a plug.

[0035] The third contact assembly 300 comprises a first member 310 carrying the earth pin 301 and is adapted for receiving an end of a second wire W3 between the first member 310 and the second member 330 which can be approached to the first member 310 by means of a wire fixation means such as a screw 340. Typically, the electrical wires W1, W2, W3 are wires provided in a wall for connecting the socket 10 to the mains. However, according to other embodiments the electrical wires may comprise wires connected to a DC power source. More generally, the wires may be connected to any AC or DC power source.

[0036] The socket 10 may further comprises a base 400 with recesses 410, 420, 430 for respectively receiving the first contact assembly 100, the second contact assembly 200 and the third contact assembly 300. Also, the base 400 may comprise a recess 450 for an electric component 500. The electronic component 500 may, according to embodiments of the invention, be a controllable switch such as a relay, a measurement component or a fuse. In the example given, the electronic component is a relay 500. The relay 500 is intended for being connected between the first member 110 and the third member 130. The base 400 has a front side 401, a back side 402 and a top side 403. The front side 401 may be provided with the first and second recess 410, 420 in which the first and second contact assembly 100, 200 are to be arranged, such that the screws 140, 240 are accessible from the front side 401 of the base 400. The top side 403 may be provided with a first and a second opening 411, 421 for respectively connecting the first wire W1 to the third member 130 of the first contact assembly 100 and the second wire W2 to the first member 210 of the second contact assembly 200.

[0037] The recess 450 for the electronic component, e.g. relay 500, may be a through-hole extending from the back side 402 to the front side 401 of the base 400. A first PCB 600 may be arranged at the back side 402 and/or a second PCB 700 may be arranged at the front side 401 of the base 400. In the illustrated embodiment the relay 500 is mounted on the PCB 600 at the back side 402, but it could also be mounted on the PCB 700 at the front side 401.

[0038] The first member 110 of the first contact assembly 100 may be provided with a first contact lip 114 and the third member 130 may be provided with a second contact lip 134. The base 400 may be provided with a first passage 414 (see figure 3A) extending from the first

recess 410 to the back side 402, and with a second passage 415 extending from the first recess 410 to the back side 402. The first contact lip 114 extends through the first passage 414, and the second contact lip 134 extends through the second passage 415. The first member 210 of the second contact assembly 200 may be provided with a contact lip 214. The base 400 may be provided with a further passage 424 (see figure 3A) extending from the second recess 420 to the back side side 402. The contact lip 214 may extend through the further passage 424. The contact lips 114, 134, 214 may be electrically connected, e.g. by soldering, to PCB 600. According to the present embodiment, the contact lips 114, 134, 214 may extend through slits 601, 602, 603 of PCB 600. The relay 500 may be provided between contact lips 114 and 134, such that the relay 500 can control the provision of power by the socket 10.

[0039] Figures 2B and 3B schematically illustrate the first and second contact assemblies 100, 200 and the third contact assembly 300 are shown in the assembled state. Further, the relay 500 mounted on PCB 600 is shown. In the assembled state, PCB 600 is arranged against the back side 402 of the base 400 with the relay 500 in the recess 450 in the base 400.

[0040] According to specific embodiments, the at least one electronic component 500 may comprises a switch, and the socket 10 may furthermore comprise interface means for operating the switch, the interface means being accessible through a cover that may be provided over the socket 10 when mounted in a hole in a wall.

[0041] PCB 600 and optionally one or more further PCB's, such as PCB 700, may comprise additional electronic circuitry, such as circuitry for operating the electronic component 500, in the example given the relay 500. The circuitry may comprise one or more of a power conversion circuitry configured for converting a first voltage present between the first and the second electrical wires W1, W2 in the wall into a lower second voltage for feeding low-voltage components, such as a microcontroller, measurement circuitry, communication circuitry, etc.; a microcontroller configured for operating the switch and for controlling other components; communication circuitry connected to an antenna, for wirelessly sending or receiving data; measurement circuitry configured for measuring a measure representative for the power consumed by a load connected to the socket. Also, the socket 10 may comprise interface means for operating the electronic component 500, in the example given the relay 500. Such embodiments are disclosed in patent applications BE 2015/5257, BE 2015/5166, and BE 2015/5258 in the name of the Applicant, which are included herein in their entirety by reference.

[0042] Figures 4A-4B, and 5A-5B illustrate two different embodiments of a contact assembly for being used in a socket 10 according to the invention. Same or similar components have been indicated with the same reference numerals as in figures 1A, 1B, 2A, 2B, 3A and 3B. The contact assembly 100 of figures 4A and 4B is similar

to the first contact assembly 100 of figures 1A and 1B has already been described above.

[0043] The contact assembly 100 illustrated in figures 5A and 5B comprises a first member 110 which is electrically conductive, a second member 120 which is electrically insulating, and a third member 130 which is electrically conductive. The first member 110 is a spring-loaded part comprising a tube contact 111, 112 for receiving a first pin of a plug such that the first pin contacts the first member 110. The third member 130 is configured for receiving an end E of a first electrical wire W1. The second member 120 extends between the first and third member for electrically insulating the first member 110 from the third member 130.

[0044] The contact assembly 100 further comprises a wire fixation means 140 configured for fixing the end E of the first wire W1 such that it is in contact with the third member 130. The wire fixation means 140 comprises a spring element 143 and a spring fixation element 144, wherein the spring element 143 is configured such that an inserted end E of the first electrical wire W1 is pushed against the third member 130. The first, second and third members 110, 120, 130 may be provided with corresponding holes 113, 123, 133 such that the spring element 143 can be accessed and pushed by a pin-like element 150 when a wire end E needs to be removed.

[0045] According to embodiments of the invention, the socket 10 may be configured for being flush-mounted in a wall. The socket 10 may then furthermore comprise, as known by a person skilled in the art, a cover (not shown) configured for being attached to the base 400 and for covering an opening in the wall in which the base 400 is provided. The cover may comprise a cover frame and a central member with a first hole and a second hole for allowing the first and second pin of the plug to extend through said central member in the first and second contact assembly 100, 200. The cover frame may be fixable to the base 400 around the central member.

[0046] Whilst the principles of the invention have been set out above in connection with specific embodiments, it is to be understood that this description is merely made by way of example and is not intended to limit the scope of protection which is determined by the appended claims.

Claims

1. A socket (10) comprising a first and a second contact assembly (100, 200) configured for receiving a first and second pin of a plug, wherein the first contact assembly (100) comprises a first member (110) which is electrically conductive, a second member (120) which is electrically insulating, and a third member (130) which is electrically conductive; **characterized in that:**

- the first member (110) is a spring-loaded part

configured for receiving a first pin of a plug such that the first pin contacts the first member (110);
- the third member (130) is configured for receiving an end (E) of a first electrical wire (W1); and
- the second member (120) extends between the first and the third member for electrically insulating the first member from the third member.

2. A socket (10) according to claim 1, furthermore comprising at least one electronic component (500) connected between the first member (110) and the third member (130).

3. A socket (10) according to claim 2, wherein the at least one electronic component (500) comprises one or more of a controllable switch such as a relay, a measurement component or a fuse.

4. A socket (10) according to any of the previous claims, wherein the first contact assembly (100) further comprises a wire fixation means (140) configured for fixing the end (E) of the first electrical wire (W1) such that it is in contact with the third member (130).

5. A socket (10) according to claim 4, wherein the wire fixation means (140) is a screw extending through the first and the second member (110, 120) in the third member (130) for fixing the end (E) of the first electrical wire (W1).

6. A socket (10) according to claim 4, wherein the wire fixation means (140) comprises a spring or clamp element (143) configured for pushing or clamping the end (E) of the first electrical wire (W1) against the third member (130).

7. A socket (10) according to claim 5, wherein the second member (120) is provided with a protruding part (124) protruding through a hole (113) in the first member (110); the protruding part (124) having a hole (123) for the screw (140).

8. A socket (10) according to claim 5, wherein an electrically insulating ring is arranged around a part of the screw (140) extending through a hole (113) in the first member (110).

9. A socket (10) according to any of the previous claims, wherein the first member (110) comprises a contact tube (111, 112) for receiving a first pin of a plug.

10. A socket (10) according to any of the previous claims, furthermore comprising a base (400) having a front side (401), a back side (402) and a top side (403), wherein the front side (401) is provided with a first and a second recess (410, 420) in which the first and second contact assembly (100, 200) are arranged.

11. A socket (10) according to claim 10, wherein the top side (403) of the base (400) is provided with a first and a second opening (411, 421) for connecting the first wire (W1) and a second wire (W2) to respectively the third member (130) of the first contact assembly (100) and a member (230) of the second contact assembly (200). 5
12. A socket (10) according to claim 10 or 11, wherein the first member (110) is provided with a first contact lip (114) and the third member (130) is provided with a second contact lip (134), the base (400) being provided with a first passage (414) from the first recess (410) to the back side (402) for the first contact lip (114), and with a second passage (415) from the first recess (410) to the back side (402) for the second contact lip (134). 10 15
13. A socket (10) according to claim 2 and any of claims 10 to 12, wherein the base (400) is provided with a recess (450) for at least one electronic component (500). 20
14. A socket (10) according to any of claims 10 to 13, furthermore comprising a cover configured for being arranged at the front side (401) of the base (400), the cover having a first hole and a second hole for allowing the first and second pin of the plug to extend through the cover in the first and second contact assembly (100, 200). 25 30
15. A socket (10) according to claim 3 and 14, wherein the at least one electronic component (500) comprises a switch, and the socket (10) furthermore comprises interface means for operating the switch, the interface means being accessible through the cover. 35

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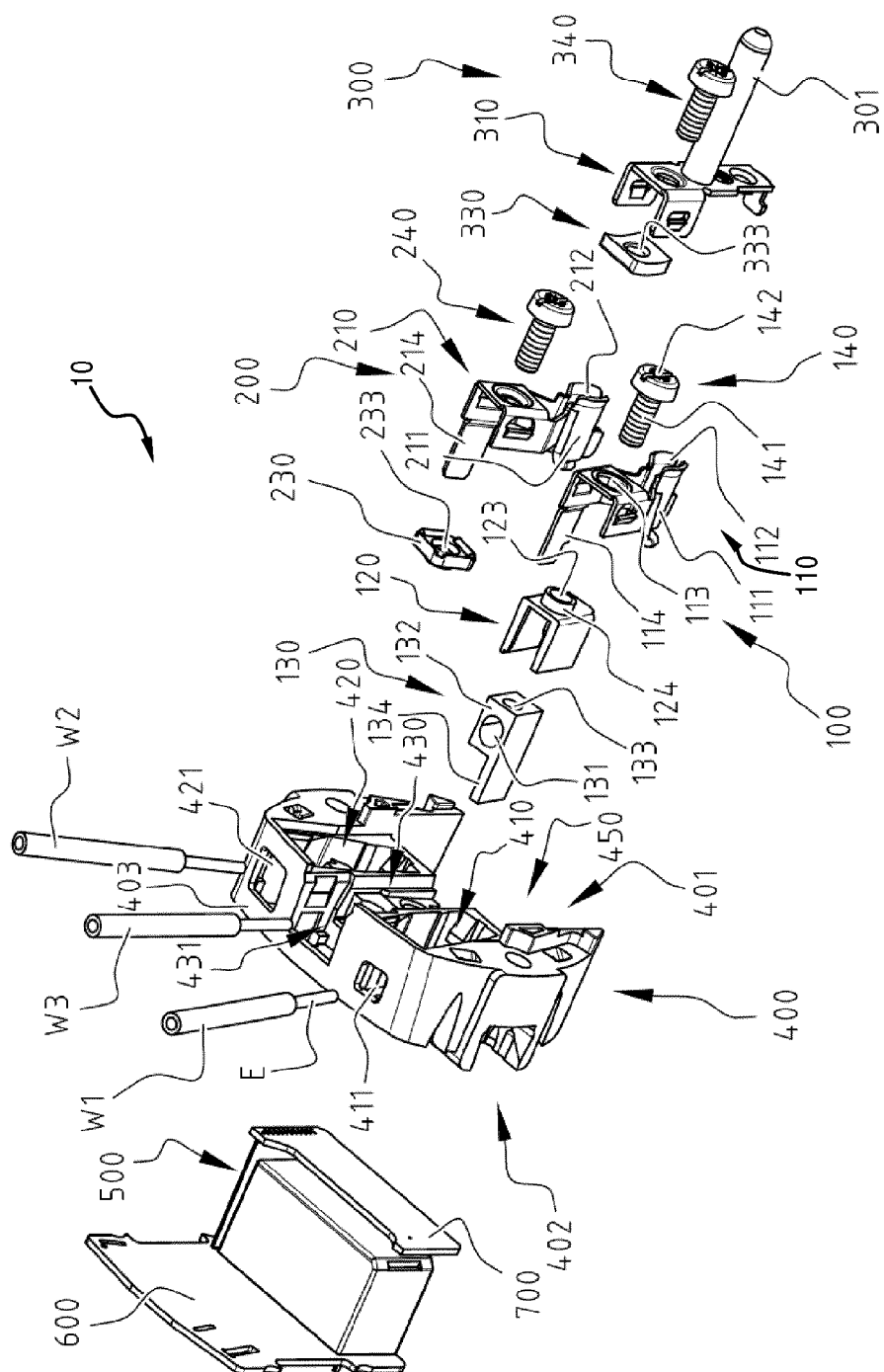


FIG. 1A

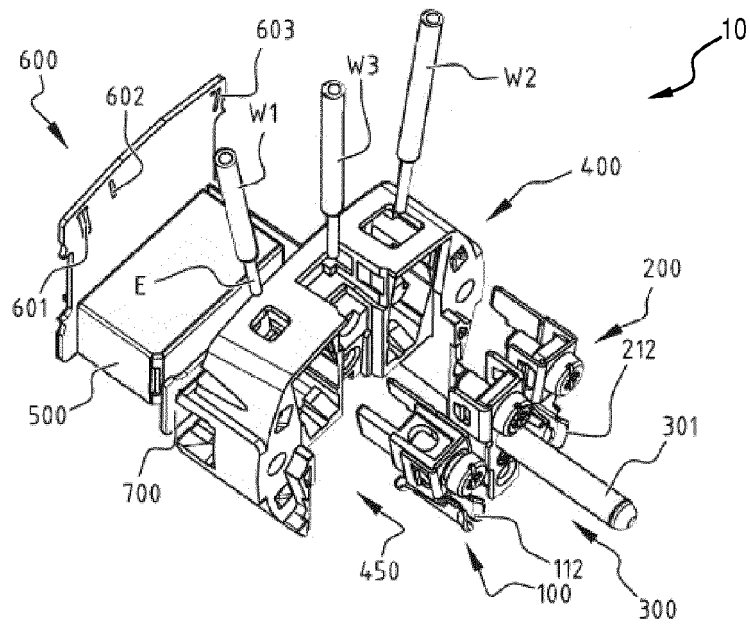


FIG. 1B

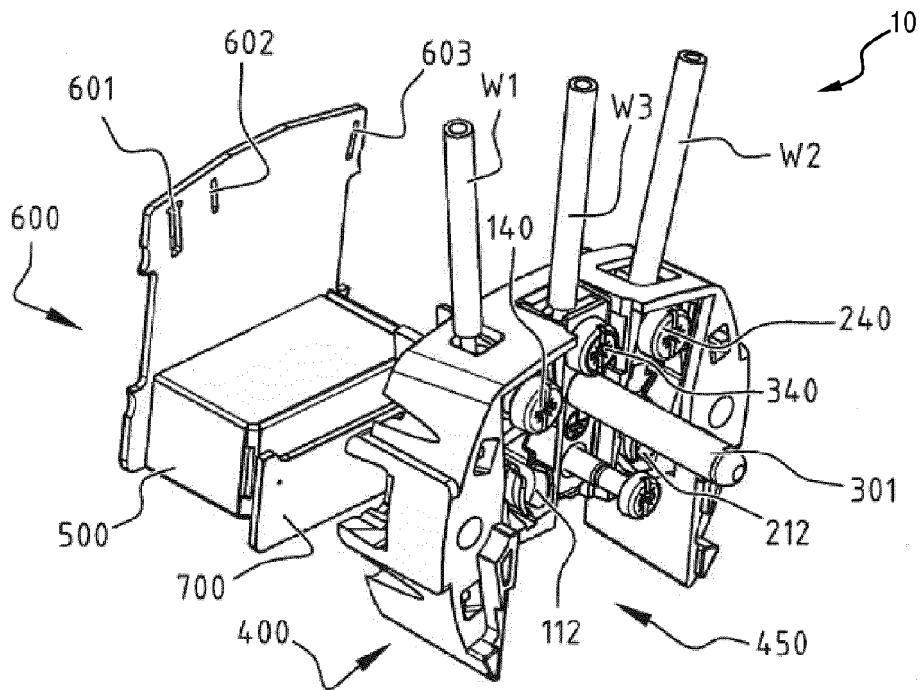


FIG. 2A

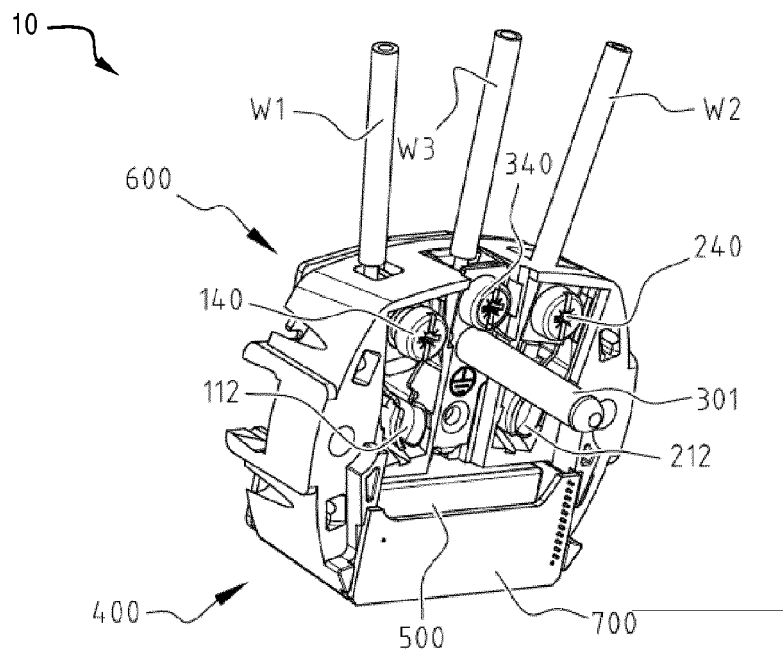


FIG. 2B

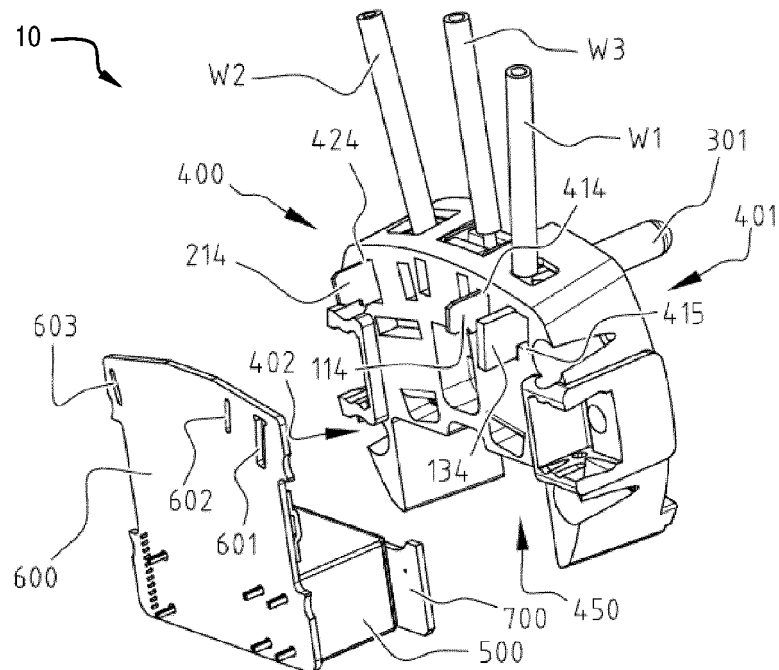


FIG. 3A

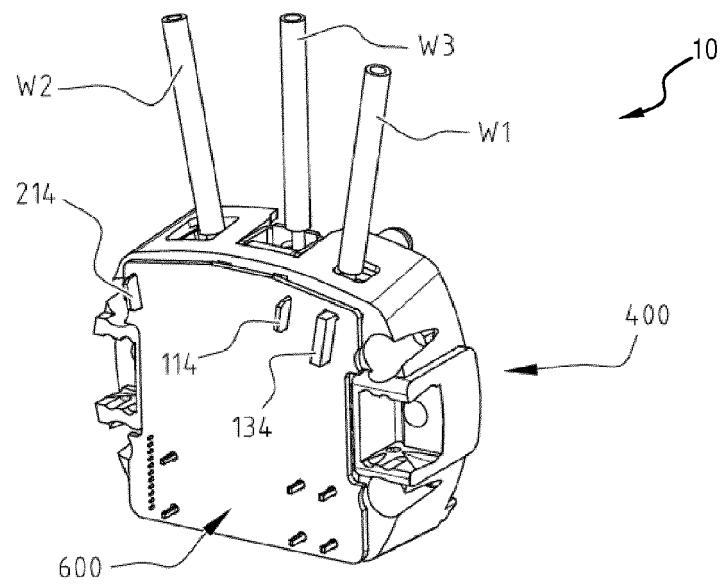


FIG. 3B

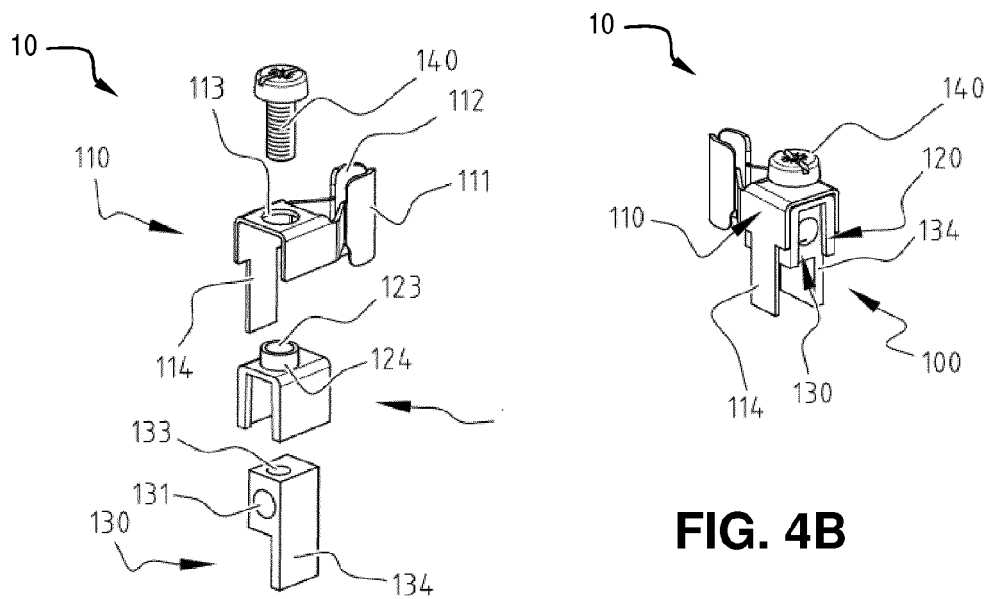


FIG. 4A

FIG. 4B

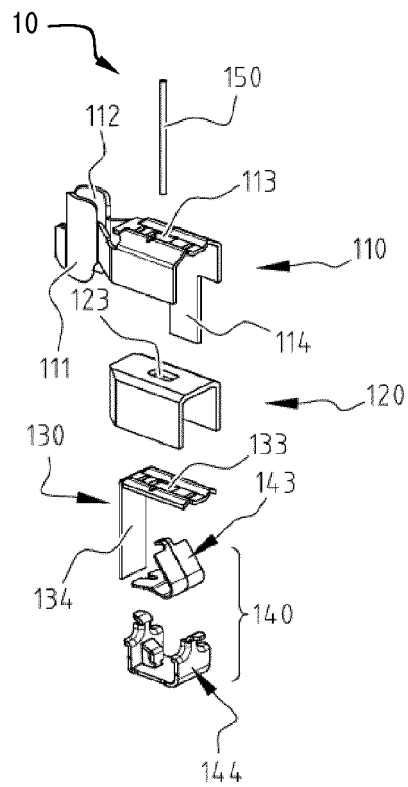


FIG. 5A

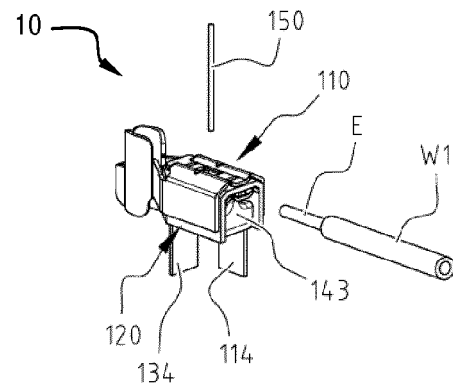


FIG. 5B

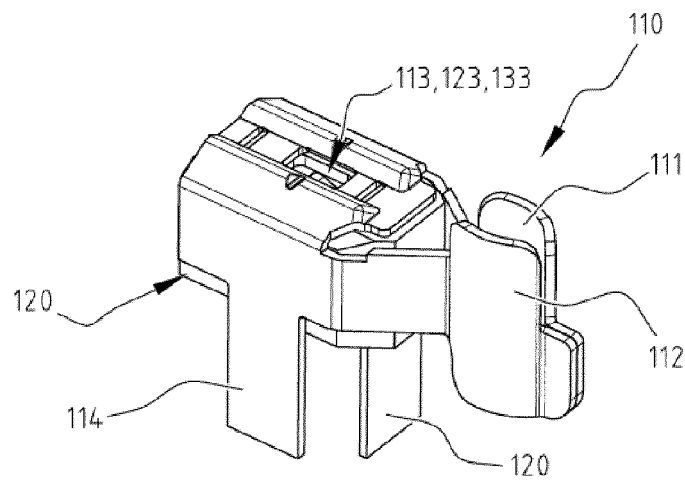


FIG. 5C



EUROPEAN SEARCH REPORT

Application Number
EP 16 17 9201

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2002/104745 A1 (ALLISON JOHN [US]) 8 August 2002 (2002-08-08)	1,2,4-9	INV. H01R13/703 H01R24/76 H01R103/00
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