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(54) **ELECTRICAL CONNECTORS**

ELEKTRISCHER VERBINDER

CONNECTEURS ELECTRIQUES

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**DE-U- 7 502 842 GB-A- 2 303 256  
US-A- 5 641 292**

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**Description****TECHNICAL FIELD**

**[0001]** The invention relates to electrical connectors and more particularly but not exclusively to electrical plugs.

**BACKGROUND ART**

**[0002]** Electrical connectors are often somewhat bulky in size and more importantly, generally have electrical connections protruding from a face of the electrical connector. The protruding connections causes problems in transport. The problem of providing a compact connector is addressed in US 4,629,279 which describes a connector housing having a first and a second part which are hinged together. The first and second parts are movable relative to each other from a first position in which the parts are side-by-side to a second position in which the parts are superposed.

**[0003]** The electrical connector of US 4,629,279 does not have electrical connections which protrude therefrom. It is an object of the present invention to provide an improved electrical connector.

**DISCLOSURE OF INVENTION**

**[0004]** According to the invention there is provided an electrical connector comprising a body having first and second housing parts each having front faces, **characterised in that** at least one electrical connection is mounted on and projects from the front face of the first housing part and that the first and second housing parts are movable relative to each other between a storage position in which the or each electrical connection is concealed by concealing means in the second body part to a use position.

**[0005]** The present invention thus addresses the problem of housing electrical connections which protrude from a surface of the electrical connector when folding the electrical connector. Thus in the storage position, the electrical connections are conveniently located within the body of the connector which enables easier transportation of the connector. Furthermore, in the storage position, the electrical connections are concealed and thus protected from wear and tear during transport of the electrical connector.

**[0006]** The first and second housing part are preferably hollow so as to house the various electrical component of the electrical connector, including the or each electrical connection in the storage position.

**[0007]** The electrical connector may further comprise at least one electrical connection mounted on and projecting from the front face of the second body part, the or each connection being concealed by concealing means in the first body part in the storage position. The first and second parts are preferably connected by a

hinge so that the first and second parts are hinged together for movement between the storage or folded position and the use or open position.

**[0008]** Since the hinge is located on the body of the connector rather than on the connections, there is no risk of the connections being incorrectly aligned in their use position. In addition the electrical integrity of the connector can be assured. Thus, the or each electrical connection is preferably rigidly mounted on the body.

**[0009]** In the storage position the first and second parts are preferably superposed so that the front faces of the first and second parts are in the same plane and in the use position the first and second parts are preferably disposed side-by-side so that the front faces are face-to-face. The first and second housing parts may comprise engagement means for holding the first and second housing parts in the use position. The engagement means may be releasable to allow movement from the use position to the storage position.

**[0010]** The engagement means may be in the form of a catch mechanism comprising first and second hooks which lock together and a spring which exerts a force biasing the hooks into contact. The first hook may be housed in the second housing part and the second hook may be housed in the first housing part. The catch mechanism may further comprise an elongate member on one end of which the second hook is mounted, the elongate member contacting the spring so that a force on an opposed end of the elongate member releases the force exerted by the spring.

**[0011]** The concealing means may be in the form of a slot or a cavity. The cross-section and the depth of each slot or cavity is preferably slightly larger than the cross-section and the depth of corresponding electrical connection so as to ensure a snug-fit of the electrical connection in the corresponding slot or cavity.

**[0012]** The electrical connector may further comprise a captive lead, one end of which is connected electrically to the electrical connections. The body may further comprise a lead housing which may be generally cylindrical. The lead may extend through a hole in the lead housing which may be in the second part.

**[0013]** The electrical connector may be in the form of a mains electrical plug for connecting an electrical device to a power supply. The electrical connections may be in the form of pins. There may be one pin mounted on the first body part with a corresponding slot in the second body part and two pins mounted on the second part body part with corresponding cavities in the first body part so that as the plug is rotated from the storage position to the use position, the pins are released from the corresponding slot or cavity. The pins may be square pins. The plug may comprise a fuse.

**[0014]** The electrical connector body may house an a/c adapter e.g. to supply low voltage d.c. current for charging a rechargeable battery. Thus the connector may comprise means for electrically connecting to a mobile phone for re-charging the battery thereof. Equally an a/c

adapter in the body of the electrical connector may be arranged to supply low voltage d.c. power to other electrical equipment such as radios or the like. The electrical connector may house a printed circuit board which may contain a built-in switching supply. The circuit board may be housed in the second housing part.

#### BRIEF DESCRIPTION OF DRAWINGS

**[0015]** The invention is diagrammatically illustrated, by way of example, in the accompanying drawings in which:-

- Figure 1 is a front perspective view of an electrical plug according to the invention;
- Figure 2 is a rear perspective view of the plug of Figure 1;
- Figure 3 is a front view of the plug of Figure 1;
- Figure 4 is a cross-section on line AA of Figure 3;
- Figure 5 is a plan view of the plug of Figure 1;
- Figure 6 is a front perspective view of the plug of Figure 1 in a storage state;
- Figure 7 is a rear perspective of the plug of Figure 6;
- Figure 8 is a front perspective view of the plug of Figure 1 in a semi-folded state;
- Figure 9 is a rear perspective view of the plug of Figure 1 in a semi-folded state;
- Figure 10 is an exploded sectional view of the plug of Figure 1;
- Figure 11 is a side view of a second plug according to the invention;
- Figure 12 is a cross-section on line AA of Figure 11, and
- Figure 13 is a cross-section on line BB of Figure 12.

#### BEST MODE FOR CARRYING OUT THE INVENTION

**[0016]** Figures 1 to 10 illustrate an electrical connector (10) in the form of a mains plug according to the present invention. The electrical connector or plug (10) comprises a body (12) having first and second hollow housing parts (14,16) which are connected together and rotatable relative to each other about a hinge (18). The first and second housing parts (14,16) are rotatable from a first position in which they are side-by-side as shown in Figures 6 and 7 to a second position in which they are vertically aligned as shown in Figures 1 to 5. The first position of the first and second housing parts corresponds to a storage position of the plug and the second position to a use position.

**[0017]** A first electrical connection or pin (22) is rigidly mounted on the first housing part (14) so that the first pin (22) projects perpendicularly from a front face (20) of the first housing part (14). Second and third electrical connections or pins (30,32) are rigidly mounted on the second housing part (16) so that the second and third pins (30,32) project perpendicularly from a front face (28) of the second housing part (16). The pins (22,30,32) are standard square pins with the second and third pins

(30,32) being of equal size and the first pin (22) being larger than the second and third pins (30,32).

**[0018]** The second housing part (16) further comprises concealing means in the form of a slot (34) which is designed to house the first pin (22) in the storage position. Similarly, the first housing part (14) further comprises concealing means in the form of two cavities (24,26) which are designed to house the second and third pins (30,32), respectively, in the storage position. Each slot or cavity is at least as deep and has a larger cross-section than the corresponding pin. In view of the size constraints for the plug, the slot and cavities are designed so that the pins are a snug fit.

**[0019]** The plug (10) further comprises a lead (36) which extends through a generally cylindrical lead housing (38) in the rear face (40) of the second housing part (16). One end (42) of the lead (36) is connected electrically to the pins (22,30,32) in the normal arrangement of a mains plug. As shown in Figure 2, the lead housing (38) has a curved surface which is raised from the rear surface of the plug.

**[0020]** In Figures 1 to 5, the plug (10) is shown in a use position in which the first and second housing parts (14,16) are vertically aligned. The first and second housing parts (14,16) are held with their front faces (20,28) in the same plane, namely in vertical alignment, by a catch mechanism (58) which is shown in Figure 4.

**[0021]** The catch mechanism (58) comprises first and second hooks (60,62) which lock together and are biased into contact by a spring (64). The second hook (62) is mounted on an end of an elongate member (63) housed in the first housing part and contacting the spring (64). The first hook (60) is mounted in the second housing part. The opposed end (76) of the elongate member (68) is visible in the front face (20) of the first housing part (14). By exerting a force on the opposed end (76), the biasing force of the spring (64) on the second hook (62) is released. The second hook (62) is then released from its engagement with the first hook (60).

**[0022]** In Figures 6 and 7, the plug is in a storage position in which the first and second housing parts (14,16) are horizontally aligned. The front faces of both the first and second housing parts (14,16) are adjacent and face-to-face. The first pin (22) is housed within the first slot (34) and the second and third pins (30,32) within the corresponding first and second cavities (24,26).

**[0023]** As a result, with the exception of a hinge (18), the lead (36), the lead housing (38) and the first and second hooks (60,62) of the catch mechanism, there are no projections from the surfaces of the plug in the storage position. Thus, the bottom (44) of the first housing part (14) and the top (46) of the second housing part (16) form a generally flat first surface (48) of the plug. Similarly, the top (50) of the first housing part (14) and the bottom (52) of the second housing part (16) form a generally smooth, curved second surface (54).

**[0024]** Before the plug (10) is used, the plug must be moved from its storage position shown in Figures 6 and

7 to the use position shown in Figures 1 to 5. Figures 8 and 9 show the plug (10) in a transitional or semi-folded state. The first and second housing parts (14,16) are rotated about the hinge (18) so as to release pins (22,30,32) from the corresponding slot and cavities (34, 24,26). As the first and second housing parts are brought into vertical alignment, the first hook (60) of the catch mechanism is forced past the second hook (62). The hooks are generally rigid but with sufficient flexibility to allow a small deflection. As described above, the catch mechanism (58) is releasable so that the plug may be returned to the storage position from the use position, if desired.

[0025] Figure 10 shows the location of the hinge (18) which fits in holes (66) adjacent the front faces (20,28) of the housing parts (14,16) to link the two housing parts together. A fuse housing (56) is located on a top face of the second housing part (16) so that the plug (10) may comprise a fuse (not shown) if necessary.

[0026] Figures 11 to 13 show a second plug (70) according to the present invention. The features in common with the first embodiment of the invention depicted in Figures 1 to 10 are labelled using the same reference numbers.

[0027] The plug (70) comprises a body (12) having first and second hollow housing parts (14,16) which are rotatable relatively to each other about a hinge (18) in a similar manner to the first embodiment depicted in Figures 1 to 10. Thus, the first and second housing parts are rotated between a storage position (not shown) to a use position shown in Figures 11 to 13 in which the first and second housing parts (14,16) are aligned vertically or superposed.

[0028] A first square pin (22) is rigidly mounted on the first housing part (14) and two smaller square pins (30,32) are rigidly mounted on the second housing part (16). In the storage position, pins (30,32) are housed in corresponding slots (24,26) which are spaced from the surface on the first housing part (14). The second housing part is provided with a cutaway section or slot (72) which extends to the surface of the second housing part and which houses the pin (22) on the first housing part (14) in the storage position.

[0029] The second housing part (16) also houses a circuit board (74) which contains a built-in switching supply.

#### INDUSTRIAL APPLICABILITY

[0030] The invention thus provides a simple foldable electrical connector, e.g. a mains plug.

#### **Claims**

1. An electrical connector (10) comprising a body (12) having first and second housing parts (14,16) each having front faces (20, 28), **characterised in that** at least one electrical connection (22) is mounted on

and projects from the front face (20) of the first housing part (14) and that the first and second housing parts (14,16) are movable relative to each other between a storage position in which the or each electrical connection (22) is concealed by concealing means (34) in the second housing part (16), to a use position.

2. An electrical connector according to claim 1, further comprising at least one electrical connection (30,32) mounted on and projecting from the front face (28) of the second housing part (16), the or each connection (30,32) being concealed by concealing means (24,26) in the first housing part (14) in the storage position.
3. An electrical connector (10) according to claim 1 or claim 2, wherein the first and second housing parts (14,16) are hinged together for rotational movement between the storage position and the use position.
4. An electrical connector (10) according to claim 3, wherein in the use position the first and second housing parts (14,16) are superposed so that the front faces (20,28) are in the same plane and in the storage position the first and second housing parts (14,16) are disposed side-by-side so that the front faces (20,28) are face-to-face.
5. An electrical connector (10) according to any one of the preceding claims, wherein the first and second housing parts (14,16) comprise engagement means for holding the first and second housing parts (14,16) in the use position.
6. An electrical connector (10) according to claim 5, wherein the engagement means is releasable to allow movement from the use position to the storage position.
7. An electrical connector (10) according to claim 5 or claim 6, wherein the engagement means is in the form of a catch mechanism (58) comprising first and second hooks (60, 62) which lock together and a spring (64) exerts a force biasing the hooks (60, 62) into contact.
8. An electrical connector (10) according to claim 7, wherein the catch mechanism (58) further comprises an elongate member (68) on one end of which the second hook (62) is mounted, the elongate member contacting the spring so that a force on an opposed end (76) of the elongate member (68) releases the force exerted by the spring (64).
9. An electrical connector (10) according to any one of the preceding claims, wherein the concealing means are in the form of slots.

- 10.** An electrical connector (10) according to any one of claims 1 to 8, wherein the concealing means are in the form of cavities.
- 11.** An electrical connector according to any one of the preceding claims, wherein the electrical connector is in the form of a mains electrical plug for connecting an electrical device to a power supply.
- 12.** An electrical connector according to claim 11, wherein the electrical connectors are in the form of pins and there is one pin (22) mounted on the first housing part (14) with a corresponding slot (34) in the second housing part (16) and two pins (30,32) mounted on the second housing part (16) with corresponding cavities (24,26) in the first housing part (14).
- 13.** An electrical connector according to any one of the preceding claims, wherein the body houses an a/c adapter for supplying low voltage d.c. current for charging a rechargeable battery.
- 14.** An electrical connector according to claim 11, wherein the electrical connector comprises means for electrically connecting to a mobile phone for re-charging the battery thereof.
- 15.** An electrical connector according to any one of the preceding claims, wherein the second housing part (16) houses a printed circuit board (74).

### Patentansprüche

- 1.** Elektrischer Steckverbinder (10), der einen Körper (12) umfasst, der ein erstes und ein zweites Gehäuseteil (14, 16) umfasst, die jeweils Vorderflächen (20, 28) haben, **dadurch gekennzeichnet, dass** wenigstens ein elektrischer Anschluss (22) an der Vorderfläche (20) des ersten Gehäuseteils (14) angebracht ist und von derselben vorspringt und dass das erste und das zweite Gehäuseteil (14, 16) im Verhältnis zueinander bewegt werden können, zwischen einer Aufbewahrungsposition, in welcher der oder jeder elektrische Anschluss (22) durch Verdeckungsmittel (34) in dem zweiten Gehäuseteil (16) verdeckt wird, und einer Anwendungsposition.
- 2.** Elektrischer Steckverbinder nach Anspruch 1, der ferner wenigstens einen elektrischen Anschluss (30, 32) umfasst, der an der Vorderfläche (28) des zweiten Gehäuseteils (16) angebracht ist und von derselben vorspringt, wobei der oder jeder Anschluss (30, 32) in der Aufbewahrungsposition durch Verdeckungsmittel (24, 26) in dem ersten Gehäuseteil (14) verdeckt wird.
- 3.** Elektrischer Steckverbinder (10) nach Anspruch 1 oder Anspruch 2, wobei das erste und das zweite Gehäuseteil (14, 16) für eine Drehbewegung zwischen der Aufbewahrungsposition gelenkig miteinander verbunden sind.
- 4.** Elektrischer Steckverbinder (10) nach Anspruch 3, wobei das erste und das zweite Gehäuseteil (14, 16) in der Anwendungsposition übereinandergelegt sind, so dass sich die Vorderflächen (20, 28) in der gleichen Ebene befanden, und das erste und das zweite Gehäuseteil (14, 16) in der Aufbewahrungsposition nebeneinander angeordnet sind, so dass sich die Vorderflächen (20, 28) einander gegenüber befinden.
- 5.** Elektrischer Steckverbinder (10) nach einem der vorhergehenden Ansprüche, wobei das erste und das zweite Gehäuseteil (14, 16) ein Eingriffsmittel umfassen, um das erste und das zweite Gehäuseteil (14, 16) in der Anwendungsposition zu halten.
- 6.** Elektrischer Steckverbinder (10) nach Anspruch 5, wobei das Eingriffsmittel lösbar ist, um eine Bewegung von der Anwendungsposition zu der Aufbewahrungsposition zu ermöglichen.
- 7.** Elektrischer Steckverbinder (10) nach Anspruch 5 oder Anspruch 6, wobei das Eingriffsmittel die Form eines Sperrmechanismus (58) hat, der einen ersten und einen zweiten Haken (60, 62) umfasst, die sich aneinander verriegeln, und eine Feder (64) eine Kraft ausübt, welche die Haken (60, 62) in eine Berührung vorspannt.
- 8.** Elektrischer Steckverbinder (10) nach Anspruch 7, wobei der Sperrmechanismus (58) ferner ein längliches Element (68) umfasst, an dessen einem Ende der zweite Haken (62) angebracht ist, wobei das längliche Element die Feder berührt, so dass eine Kraft auf ein entgegengesetztes Ende (76) des länglichen Elements (68) die durch die Feder (64) ausgeübte Kraft freigibt.
- 9.** Elektrischer Steckverbinder (10) nach irgendeinem der vorhergehenden Ansprüche, wobei die Verdeckungsmittel die Form von Schlitten haben.
- 10.** Elektrischer Steckverbinder (10) nach irgendeinem der Ansprüche 1 bis 8, wobei die Verdeckungsmittel die Form von Hohlräumen haben.
- 11.** Elektrischer Steckverbinder (10) nach irgendeinem der vorhergehenden Ansprüche, wobei der elektrische Steckverbinder die Form eines elektrischen Netzsteckers zum Anschließen eines elektrischen Geräts an eine Stromversorgung hat.
- 12.** Elektrischer Steckverbinder (10) nach Anspruch 11,

wobei die wenigstens eine elektrische Verbindung die Form von Stiften hat und es einen Stift (22), der an dem ersten Gehäuseteil (14) angebracht ist, mit einem entsprechenden Schlitz (34) in dem zweiten Gehäuseteil (16), und zwei Stifte (30, 32), die an dem zweiten Gehäuseteil (16) angebracht sind, mit entsprechenden Hohlräumen (24, 26) in dem ersten Gehäuseteil (14), gibt.

13. Elektrischer Steckverbinder (10) nach einem der vorhergehenden Ansprüche, wobei der Körper einen Wechselstromadapter aufnimmt, um einen Niederspannungsgleichstrom zum Laden einer wiederaufladbaren Batterie zu liefern.
14. Elektrischer Steckverbinder (10) nach Anspruch 11, wobei der elektrische Steckverbinder Mittel zum elektrischen Anschließen an ein Mobiltelefon umfasst, um die Batterie desselben wiederaufzuladen.
15. Elektrischer Steckverbinder (10) nach einem der vorhergehenden Ansprüche, wobei das zweite Gehäuseteil (16) eine gedruckte Leiterplatte (74) aufnimmt.

### Revendications

1. Connecteur électrique (10), comprenant un corps (12) avec des première et deuxième parties de boîtier (14, 16), comportant chacune des faces frontales (20, 28), **caractérisé en ce qu'**au moins une connexion électrique (22) est montée sur la face frontale (20) de la première partie de boîtier (14) et déborde de celle-ci, et **en ce que** les première et deuxième parties de boîtier (14, 16) peuvent être déplacées l'une par rapport à l'autre entre une position de stockage, dans laquelle la ou chaque connexion électrique (22) est dissimulée par des moyens de dissimulation (34) dans la deuxième partie de boîtier (16), vers une position d'utilisation.
2. Connecteur électrique selon la revendication 1, comprenant en outre au moins une connexion électrique (30, 32) montée sur la face frontale (28) de la deuxième partie de boîtier (16) et débordant de celle-ci, la ou chaque connexion (30, 32) étant dissimulée par des moyens de dissimulation (24, 26) dans la première partie de boîtier (14) dans la position de stockage.
3. Connecteur électrique (10) selon les revendications 1 ou 2, dans lequel les première et deuxième parties de boîtier (14, 16) sont assemblées par articulation en vue d'un mouvement de rotation entre la position de stockage et la position d'utilisation.
4. Connecteur électrique (10) selon la revendication 3,

5 dans lequel, dans la position d'utilisation, les première et deuxième parties de boîtier (14, 16) sont superposées, de sorte que les faces frontales (20, 28) se situent dans le même plan, les première et deuxième parties de boîtier (14, 16) étant agencées côté à côté dans la position de stockage, de sorte que les faces frontales (20, 28) se font face.

5. Connecteur électrique (10) selon l'une quelconque des revendications précédentes, dans lequel les première et deuxième parties de boîtier (14, 16) comprennent un moyen d'engagement pour retenir les première et deuxième parties de boîtier (14, 16) dans la position d'utilisation.
- 10 6. Connecteur électrique (10) selon la revendication 5, dans lequel le moyen d'engagement peut être dégagé pour permettre le déplacement de la position d'utilisation vers la position de stockage.
- 15 7. Connecteur électrique (10) selon les revendications 5 ou 6, dans lequel le moyen d'engagement a la forme d'un mécanisme de cliquet (58), comprenant des premier et deuxième crochets (60, 62) se verrouillant ensemble, un ressort (64) exerçant une force entraînant la mise en contact des crochets (60, 62).
- 20 8. Connecteur électrique (10) selon la revendication 7, dans lequel le mécanisme de cliquet (58) comprend en outre un élément allongé (68), le deuxième crochet (62) étant monté sur une extrémité de celui-ci, l'élément allongé contactant le ressort, de sorte qu'une force exercée sur l'extrémité opposée (76) de l'élément allongé (68) dégage la force exercée par le ressort (64).
- 25 9. Connecteur électrique (10) selon l'une quelconque des revendications précédentes, dans lequel les moyens de dissimulation ont la forme de fentes.
- 30 10. Connecteur électrique (10) selon l'une quelconque des revendications 1 à 8, dans lequel les moyens de dissimulation ont la forme de cavités.
- 35 11. Connecteur électrique (10) selon l'une quelconque des revendications précédentes, dans lequel le connecteur électrique a la forme d'une fiche de secteur électrique pour connecter un dispositif électrique à une alimentation en courant.
- 40 12. Connecteur électrique selon la revendication 11, dans lequel la au moins une connexion électrique est en forme de broche, une broche (22) étant montée sur la première partie de boîtier (14), une fente correspondante (34) étant formée dans la deuxième partie de boîtier (16), deux broches (30, 32) étant montées sur la deuxième partie du boîtier (16) et des cavités correspondantes (24, 26) étant formées
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dans la première partie de boîtier (14).

13. Connecteur électrique selon l'une quelconque des revendications précédentes, dans lequel le corps contient un adaptateur à courant alternatif pour fournir un courant continu basse tension afin de charger une batterie rechargeable. 5
14. Connecteur électrique selon la revendication 11, dans lequel le connecteur électrique comprend un moyen servant à assurer la connexion électrique à un téléphone mobile afin de recharger sa batterie. 10
15. Connecteur électrique selon l'une quelconque des revendications précédentes, dans lequel la deuxième partie de boîtier (16) contient une carte à circuit imprimé (74). 15

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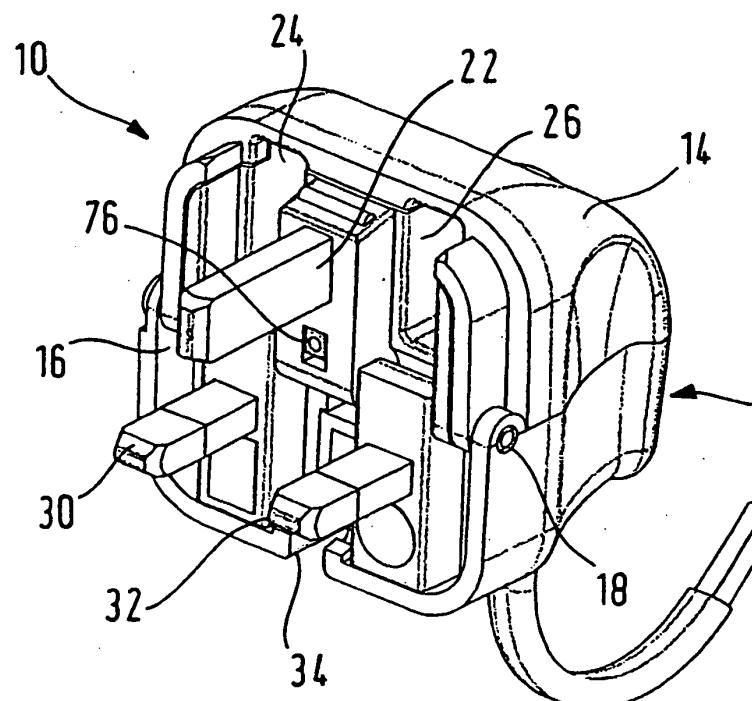


FIG. 1

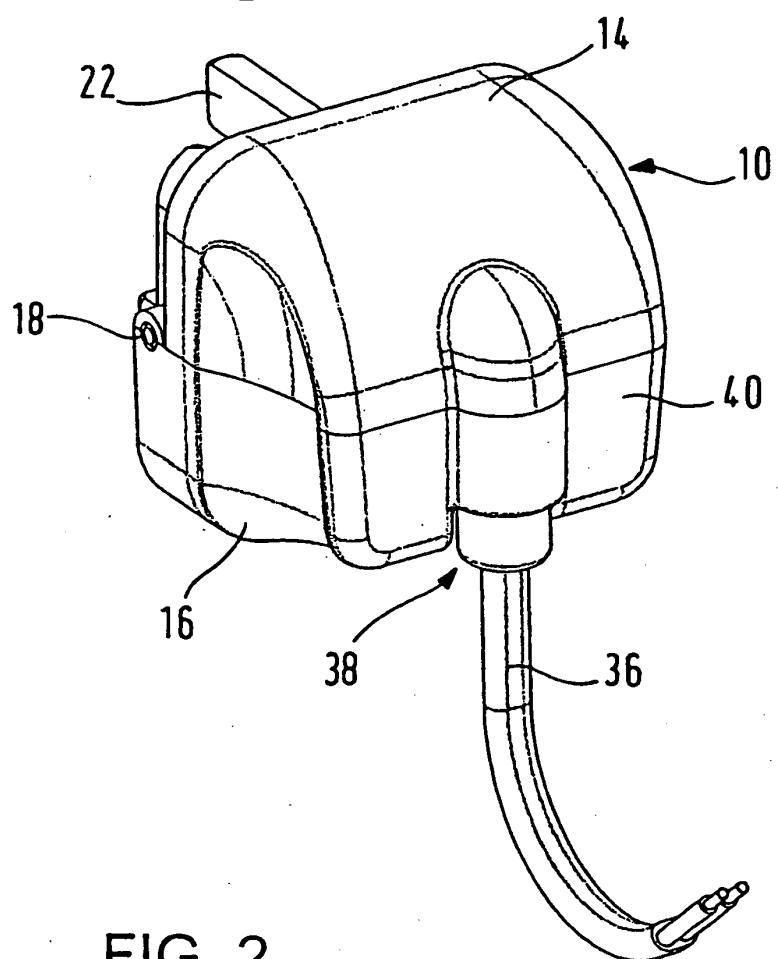


FIG. 2

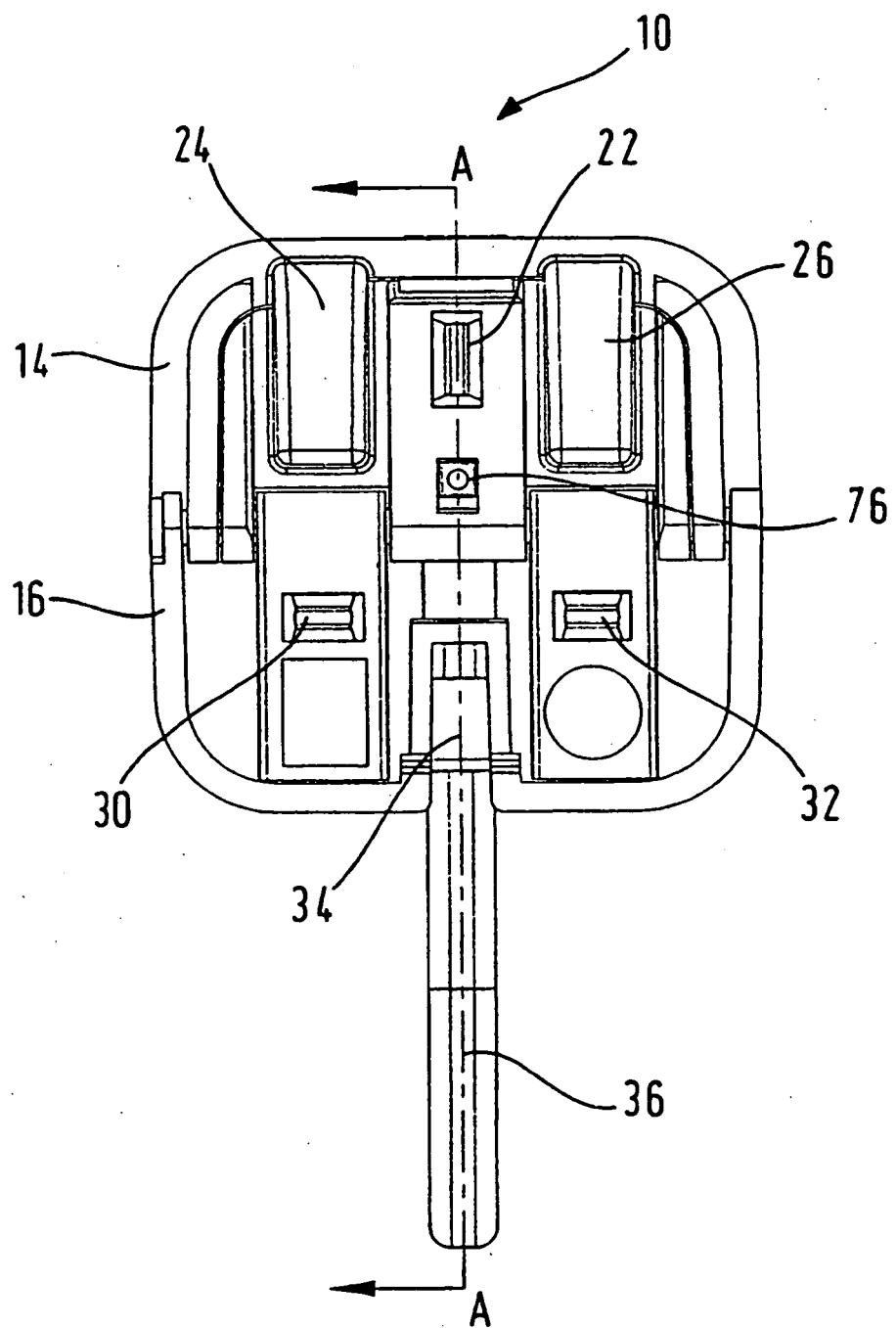


FIG. 3

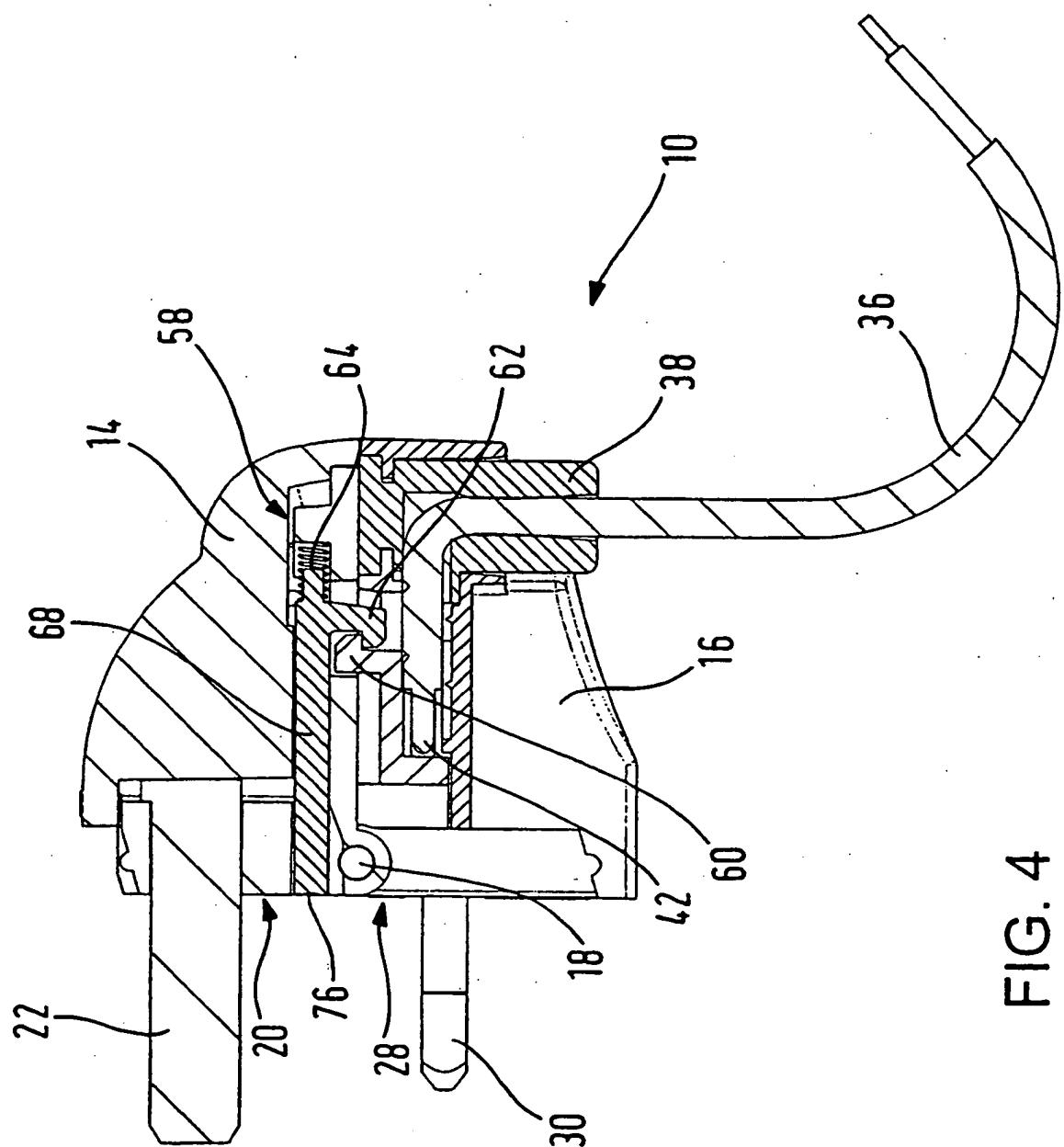


FIG. 4

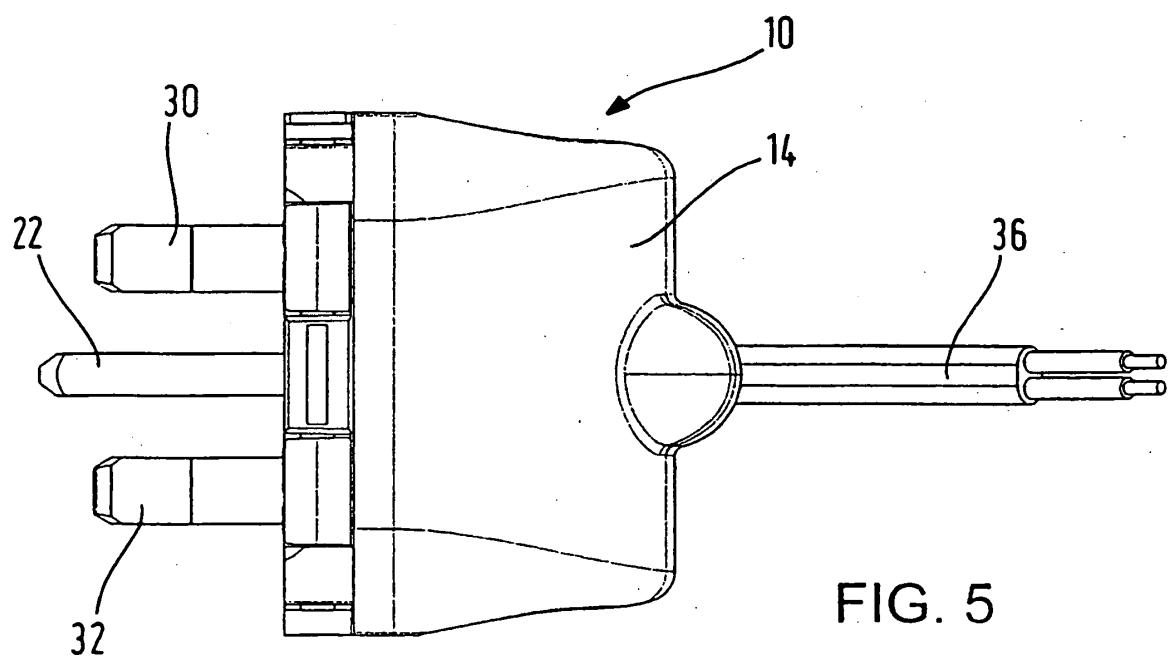


FIG. 5

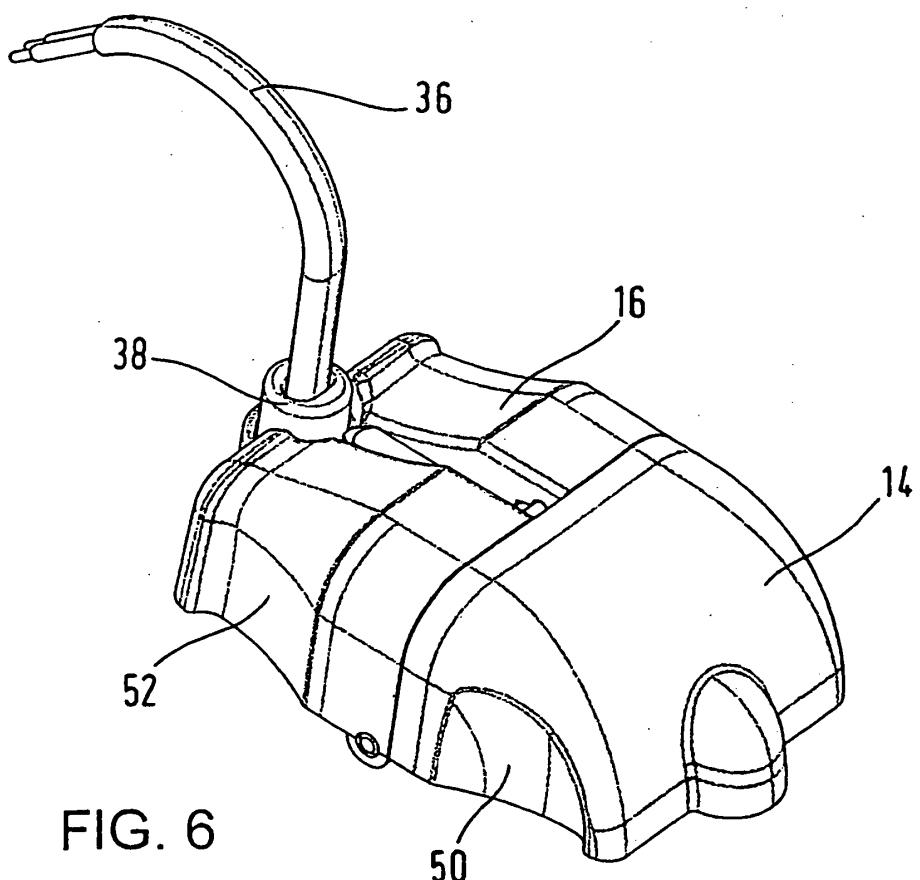
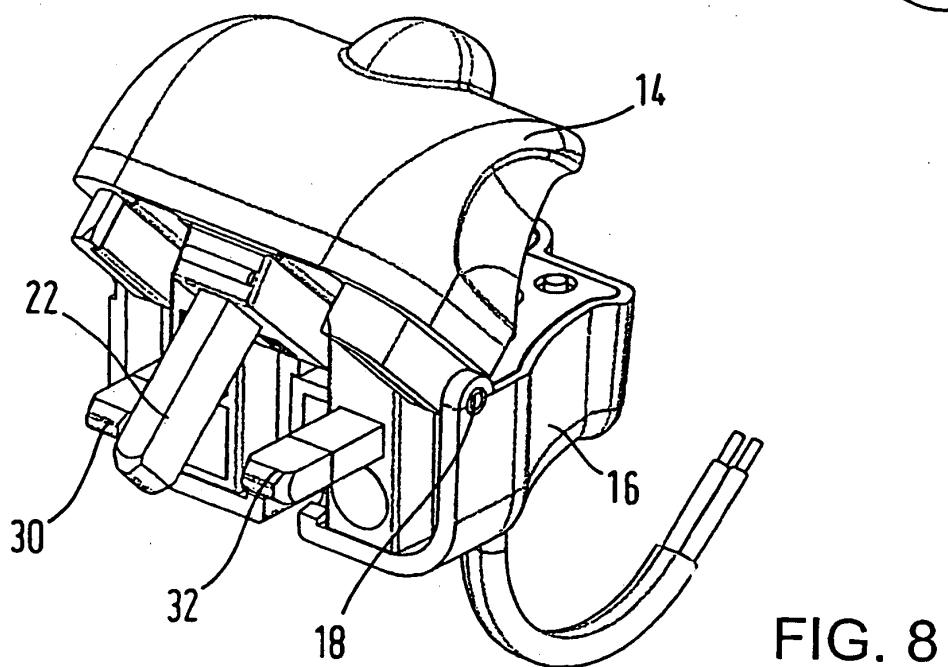
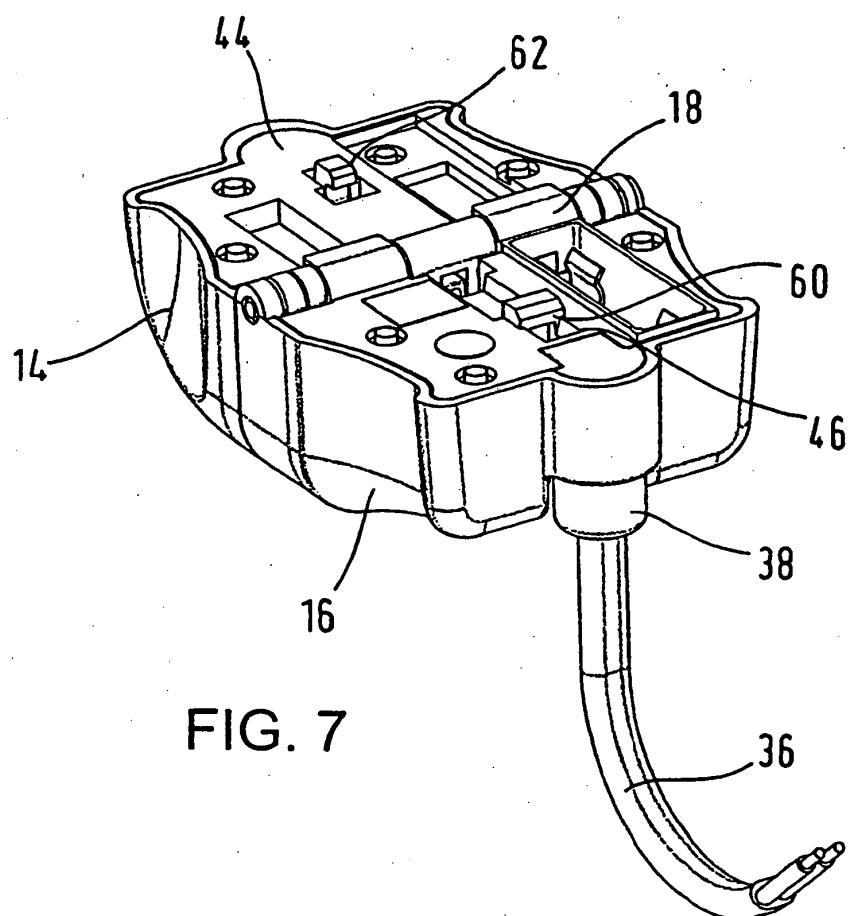


FIG. 6



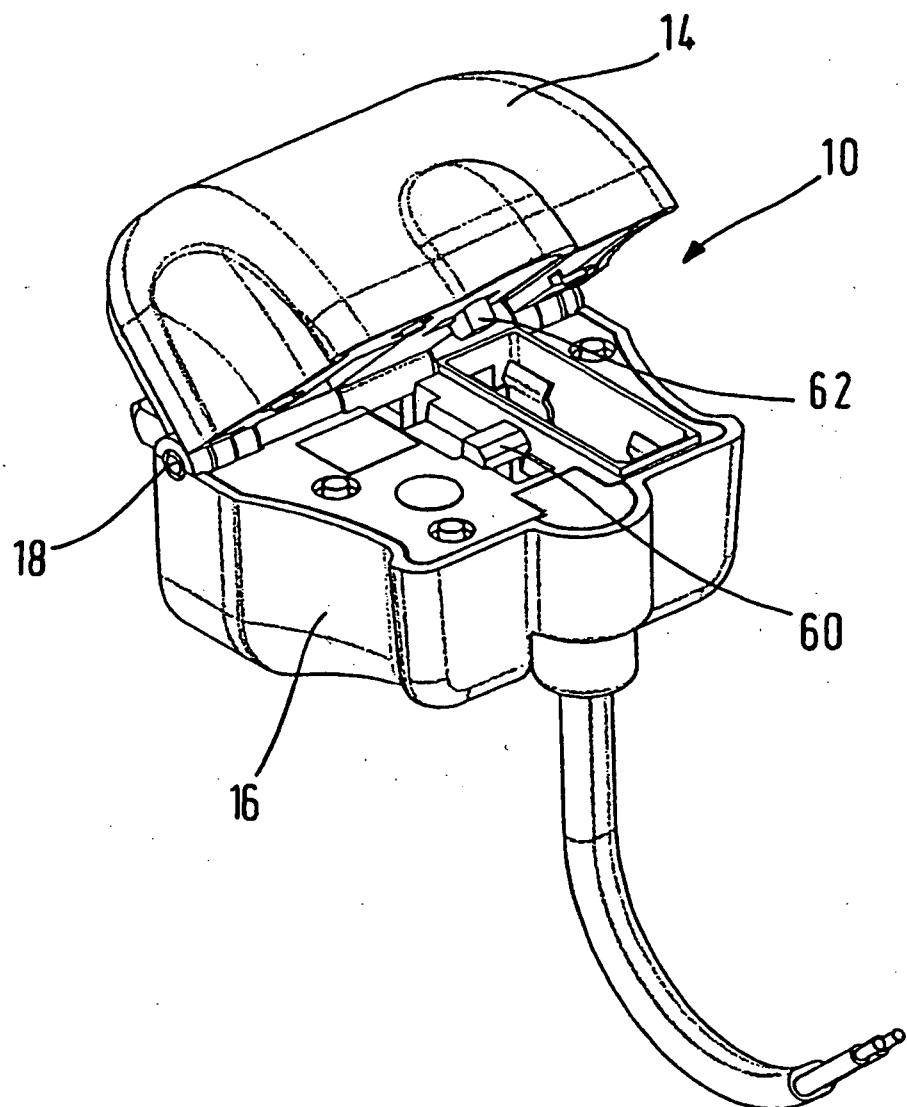


FIG. 9

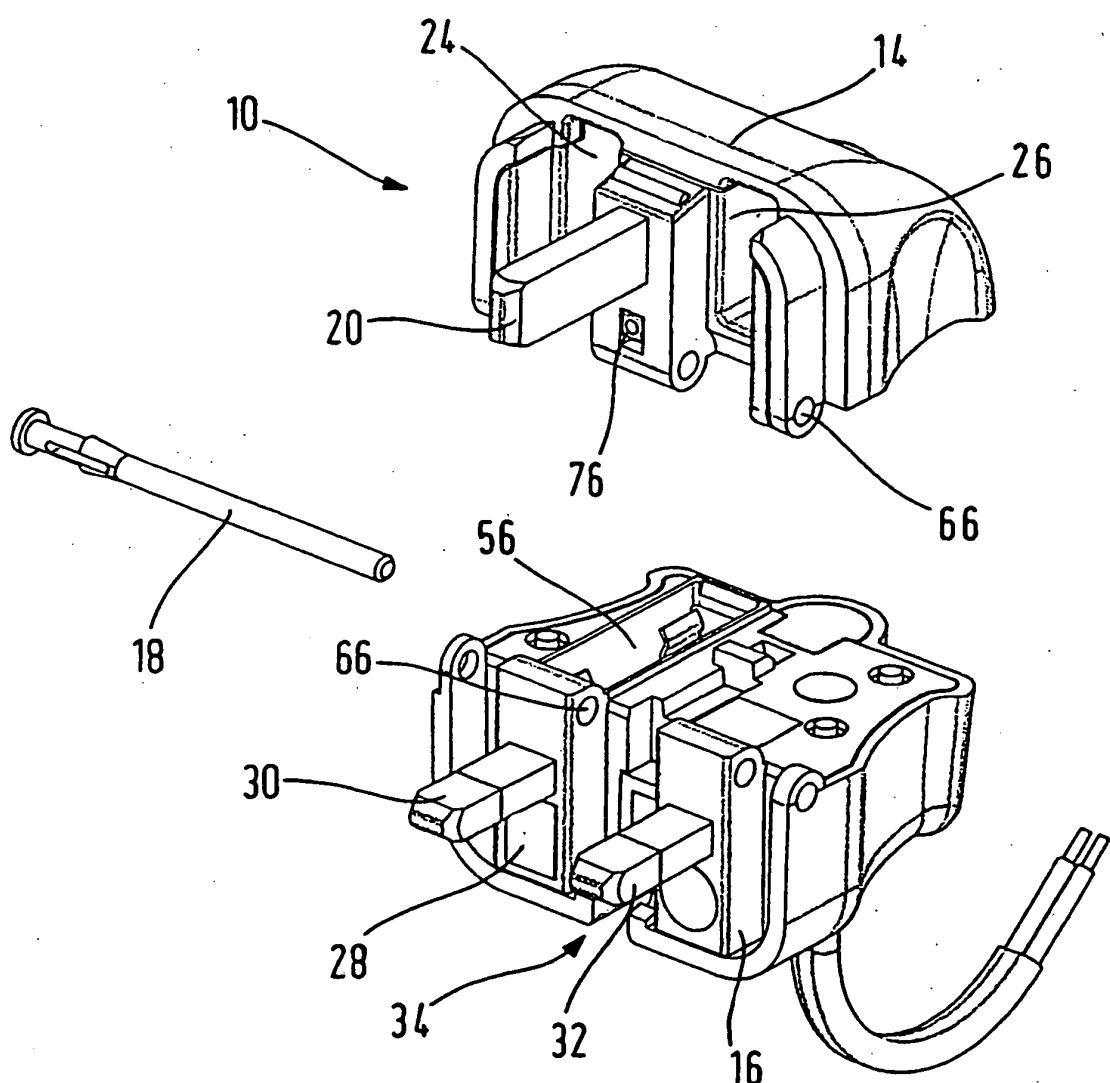
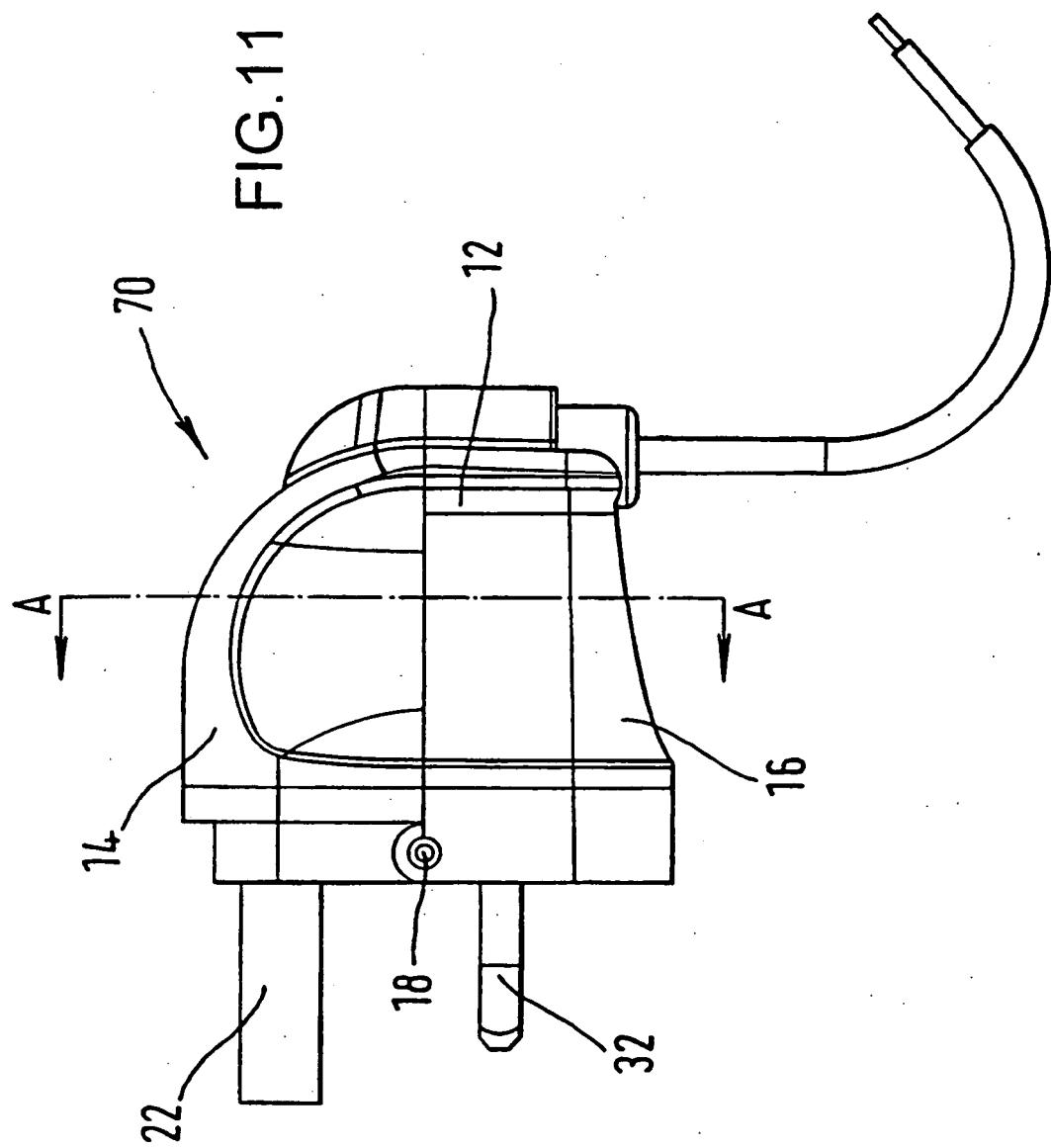


FIG. 10

FIG. 11



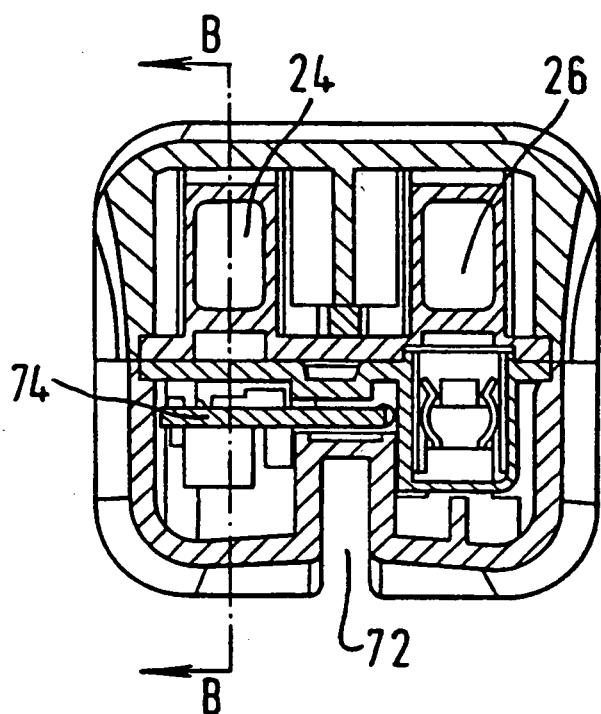


FIG.12

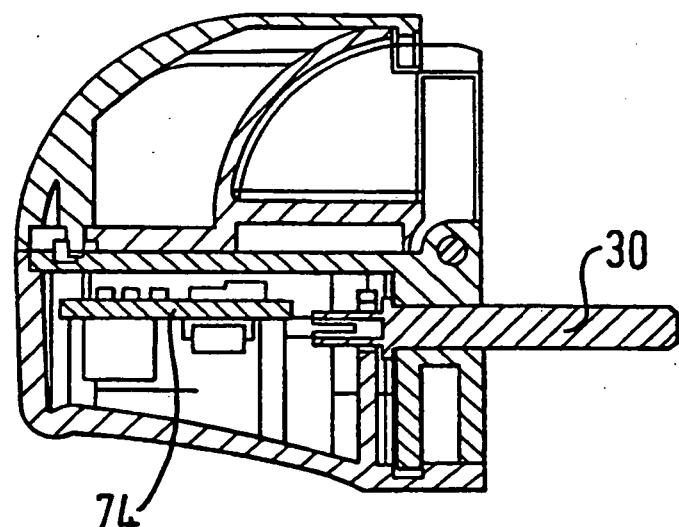


FIG.13

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- US 4629279 A [0002] [0003]