(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 478 172 B1**

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification : **19.04.95 Bulletin 95/16**

(51) Int. Cl.[6] : **H01R 13/52**

(21) Application number : **91308230.1**

(22) Date of filing : **09.09.91**

(54) **Splash-proof electrical in-line socket.**

(30) Priority : **27.09.90 GB 9021000**

(43) Date of publication of application : **01.04.92 Bulletin 92/14**

(45) Publication of the grant of the patent : **19.04.95 Bulletin 95/16**

(84) Designated Contracting States : **DE FR GB**

(56) References cited :
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Description

This invention relates to an electrical in-line socket which is splash-proof so that it is safe for use in an outdoor environment, for example as a cable connector for connecting an electric mains cable to a corresponding plug on a cable connected to an outdoor appliance. A recently issued British Standard, BS 6991 of 1990, specifies amongst other things that the socket be splash-proof and sufficiently rigid to withstand transverse stresses arising from the normal use of the socket with the plug. It is a purpose of the invention to provide a socket of this type which has a minimum number of component parts and is inexpensive to manufacture.

The invention provides a splash-proof electrical in-line socket comprising a two-piece elongate body enclosing and clamping rigidly an electric terminal insert adapted for connection to an electric cable extending into the elongate body, the body comprising a first unitary piece (preferably a one-piece moulding) having a rigid tubular end section from which depends, in the longitudinal direction of the socket, a first side wall, and a second unitary piece in the form of a second side wall whose edge mates with a corresponding edge of the first side wall and with an inner edge of the tubular end section to form a splash-proof enclosure, and the electric terminal insert being clamped between the opposed side walls and having an end portion containing electric terminals and projecting into the tubular end section. The socket is thus capable of receiving in its tubular end section the terminals of a correspondingly-shaped male plug to effect an electrical interconnection with the socket terminals whilst the plug is removably coupled to the rigid tubular end section.

The first unitary piece can be made with sufficient strength to resist bending stresses derived from the plug in use; an important feature of the invention in this regard is that the end section is tubular, i.e. it is not split lengthwise. The cross-sectional shape of the tubular section may be oval, or rectangular with radiussed corners, for example.

Preferably, the edges of the side walls mate with a tongue-and-groove joint in order to achieve splash-proofing.

Preferably, the three components of the socket are clamped together by a single connection member extending through the electric terminal insert.

Preferably, the electric terminal insert is rewireable and its cable-receiving terminals are accessible upon removal of the second piece of the socket.

Preferably, the electric terminal insert is formed so as to be a lengthwise push fit, conveniently a one-way snap fit, in the tubular end section from within the socket. This facilitates assembly of the socket.

Preferably at least the two-piece body is of electrically-insulating plastics material.

In order to close the end of the tubular end section to prevent the ingress of moisture in the absence of a plug, a closure member is preferably provided on the socket. Conveniently the end closure member comprises a flap pivoted adjacent an end edge of the tubular end section. The flap preferably has an edge which mates with the end edge of the tubular end section to form a splash-proof seal; conveniently also it has a handle to effect pivotal disengagement of the flap from the end edge (prior to fitting a plug into the socket in use).

The invention, in another aspect, provides a splash-proof electrical in-line connector assembly comprising a socket in accordance with the first aspect of the invention, and a correspondingly-shaped plug which is a removable push fit in the socket.

One example of a splash-proof in-line connector assembly embodying the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a side view of the assembled socket in line with the plug, ready for coupling together;

Figures 2a to 2g show a first unitary piece of the two-piece elongate body of a splash-proof electrical in-line socket embodying the invention;

Figure 2a being an underneath plan view,

Figure 2b being a longitudinal section on the line Z-Z of Figure 2a,

Figure 2c being a top plan view,

Figures 2d and 2e being opposite end views,

Figure 2f being a section on the line X-X of Figure 2a, and

Figure 2g being a part section on the line Y-Y of Figure 2a;

Figures 3a to 3e show a second unitary piece which, with the first unitary piece of Figures 2a to 2g, forms the two-piece elongate body,

Figure 3a being an underneath plan view,

Figure 3b being a longitudinal section on the line Z-Z of Figure 3a,

Figures 3c and 3d being opposite end views, and

Figure 3e being a part section on the line Y-Y of Figure 3a;

Figures 4a to 4e show an electric terminal insert adapted for insertion into the first unitary piece of Figures 2a to 2g to form, with the second unitary piece, the complete socket embodying the invention;

Figure 4a being a top plan view;

Figures 4b and 4c being opposite end views and Figures 4d and 4e being respectively a side elevation and a section on the line A-A of Figure 4a;

Figures 5a, 5b and 5c are respectively an underneath plan view, a side elevation and a top plan view of a cover flap adapted for pivotal connection to the first unitary piece of Figures 2a to 2g;

Figures 6a to 6d show an electric plug for connection in-line to the socket assembled from the four

components of Figures 2 to 5,

Figure 6a being a plan view partially broken away,

Figures 6b and 6c being opposite end views and

Figure 6d being a side elevation partially broken away.

An electrical in-line coupling system for mains supply to an outdoor appliance comprises; a short length of cable between a male plug, shown in Figures 6a to 6d, and the appliance; and an extension cable between a standard mains wall plug (not shown) and a female socket, of which four components are shown in Figures 2 to 5. The socket is splash-proof whether or not it is coupled to the plug, so as to resist moisture ingress in the outdoor environment.

With reference to Figures 2 to 5, the socket comprises a "three-quarter" unitary plastics insulative moulding 10, a "one-quarter" unitary plastics insulative moulding 20 which mates with the three-quarter moulding 10, an electric terminal insert in the form of an insulative plastics moulding 30 supporting metal conductive components, and an end closure flap 40, formed as a unitary insulative plastics moulding, for pivotal connection to the three-quarter moulding 10. The assembled socket is shown figuratively in Figure 1 connected to an electric cable 61. The corresponding plug 50 is connected to another cable 60.

The three-quarter moulding 10 has a tubular end section 13 with a generally rectangular cross-section but with rounded corners. One edge of the end section 13 is continued longitudinally to form a side wall 16 which is generally flat and rectangular but has a peripheral flange having a groove 14. The side wall 16 is moulded with a transverse projection 17 for a hand grip, and is centrally apertured at 11 for receiving a closure bolt 62 (Figure 1). The side wall 16 also has apertured projections 12 extending longitudinally for the pivotal mounting of the closure flap 40, which has corresponding stub projections on its pivot axis 41. A cable clamping arrangement is provided at the end remote from the tubular end section 13, and includes moulded recesses 15 for receiving clamping screws. A transverse intermediate wall depends from the side wall 16 and closes the inner end of the tubular end section 13, except for a generally rectangular opening which receives part of the electric terminal insert 30 into the end section 13, as described below.

The one-quarter moulding 20 is generally a mirror image of the side wall portion 16 of the three-quarter moulding 10, so that the two parts are complementary. The periphery has a tongue 22 which is received in the groove 14 of the three-quarter moulding 10 to form a splash-proof seal. The moulding 20 has a hand-grip projection 24 and a bolt-receiving aperture 23; at the end clamping the cable (61, Figure 1), an end wall has a semi-circular cut-out 21.

The electric terminal insert 30 has a rectangular-section block with a deeper, rearward portion and a shallower forward projection 35 whose outer surface is a push fit longitudinally through the generally rectangular opening in the intermediate wall of the three-quarter moulding 10. In this example, the push fit is one-way, by virtue of a pair of recesses 63 each of which co-operates with a corresponding projection 64 on the inner surface of the side wall 16. Thus when the insert is pushed in, it cannot easily be removed; this facilitates assembly. The wider block portion has a bore 31 at one end through which the clamping bolt 62 (Figure 1) passes so as to clamp rigidly together the socket components 10, 20, 30.

The wider, block portion is also bored at 32 to receive bolts for clamping metal terminal plates over the cable wires; an electrical connection is thus made, in use, between the cable wires and metal terminals 33 within the block 30. The terminals include female pins 34 extending longitudinally within the projection 35, which are shaped to receive male pins 53 of the plug 50 (Figure 6).

The closure flap 40 is a unitary plastics moulding having a flap portion 43 integral with an L-shaped handle portion 42 with short pivot stubs 41 at its elbow. It is free to pivot on the journals 12 of the three-quarter moulding 10 (Figure 2b) over an angle of about 90°, between an open position (Figure 1) and a closed position at which the flap 43 covers and seals the tubular end portion 13 of the socket. A raised portion 44 on the inside of the flap 43 corresponds to the inner shape of the tubular end portion 13 so that its side wall is a push fit to seal the periphery. A further projection 47 has a shoulder at such a longitudinal position as to engage a shoulder 63 on the plug body 50 only when the plug 50 is fully inserted into the socket 10, 20, 30, with the projection 52 within the tubular end portion 13. Thus the closure flap also serves to lock the plug and socket together; their coupling is releasable upon operation of the handle portion 42 to pivot the projecting wedge 47 clear of engagement. Although not shown, the closure flap is biased resiliently towards its closed position, preferably by a torsion spring.

The socket, once assembled, is of course rewireable by removing the one-quarter moulding 20 to gain ready access to the wider block portion of the insert 30, and to the cable end.

Claims

1. A splash-proof electrical in-line socket comprising a two-piece elongate body (10,20) enclosing and clamping rigidly an electric terminal insert (30) adapted for connection to an electric cable (61) extending into the elongate body (10,20) characterised in that the body comprises a first unitary piece (10) having a rigid tubular end sec-

tion (13) from which depends, in the longitudinal direction of the socket, a first side wall (16), and a second unitary piece (20) in the form of a second side wall (22) whose edge mates with a corresponding edge of the first side wall (16) and with an inner edge of the tubular end section to form a splash-proof enclosure, and the electric terminal insert (30) is clamped between the opposed side walls (16,22) and has an end portion containing electric terminals (33) and projecting into the tubular end section (13).

2. A socket according to Claim 1, in which the edges of the side walls (16,22) mate with a tongue-and-groove (22,14) joint.

3. A socket according to Claim 1 or Claim 2, in which the three components (10,20,30) of the socket are clamped together by a single connection member (62) extending through the electric terminal insert (30).

4. A socket according to Claim 1, 2 or 3, in which the electric terminal insert (30) is rewireable and its cable-receiving terminals (33) are accessible upon removal of the second piece (20) of the socket.

5. A socket according to any preceding claim, in which the electric terminal insert (30) is formed so as to be a lengthwise push fit in the tubular end section (13) from within the socket.

6. A socket according to any preceding claim, in which the two-piece body is of electrically-insulating plastics material.

7. A socket according to any preceding claim, in which a closure member (40) for the tubular end section (13) is provided on the socket.

8. A socket according to Claim 7, in which the end closure member (40) comprises a flap (43) pivoted adjacent an end edge of the tubular end section (13).

9. A socket according to Claim 8, in which the flap (43) has an edge (44) which mates with the end edge of the tubular end section (13) to form a splash-proof seal.

10. A socket according to Claim 9, in which the flap (43) has a handle (42) to effect pivotal disengagement of the flap (43) from the end edge (prior to fitting a plug into the socket in use).

11. A splash-proof electrical in-line connector assembly comprising a socket (10,20,30) in accordance with any preceding claim, and a correspondingly-shaped plug (50) which is a removable push fit in the socket.

Patentansprüche

1. Spritzwassergeschützteelektrische In-Line-Steckermanschette mit einem zweiteilig ausgebildeten länglichen Körper (10, 20), der einen elektrischen Anschluß-Einsatz (30) umgibt und fest einspannt, der für die Verbindung mit einem sich in den länglichen Körper (10, 20) erstreckenden Elektrokabel (61) ausgebildet ist, **dadurch gekennzeichnet**, daß der Körper ein erstes normiertes Bauteil (10) mit einem starren röhrenförmigen Endabschnitt (13), von dem sich in Längsrichtung der Steckermanschette eine erste Seitenwand (16) erstreckt, und ein zweites normiertes Bauteil (20) in Form einer zweiten Seitenwand (22) aufweist, deren Kante mit einer entsprechenden Kante der ersten Seitenwand (16) und mit einer inneren Kante des röhrenförmigen Endabschnittes zusammenpaßt, um ein spritzwassergeschütztes Gehäuse auszubilden, und daß der elektrische Anschluß-Einsatz (30) zwischen den gegenüberliegenden Seitenwänden (16, 22) eingespannt ist, einen Endbereich mit elektrischen Anschlüssen (33) hat und sich in den ringförmigen Endabschnitt (13) erstreckt.

2. Steckermanschette nach Anspruch 1, wobei die Kanten der Seitenwände (16, 22) mit einer Nut- und Federverbindung (22, 14) zusammenpassen.

3. Steckermanschette nach Anspruch 1 oder 2, wobei die drei Bauteile (10, 20, 30) der Steckermanschette durch ein einziges Verbindungs-Bauteil (62) zusammengehalten werden, das sich durch den elektrischen Anschluß-Einsatz (30) erstreckt.

4. Steckermanschette nach Anspruch 1, 2 oder 3, wobei der elektrische Anschluß-Einsatz (30) neu verdrahtet werden kann, und wobei auf seine die Kabel aufnehmenden Anschlüsse (33) zugegriffen werden kann, indem das zweite Bauteil (20) der Steckermanschette entfernt wird.

5. Steckermanschette nach den vorhergehenden Ansprüchen, wobei der elektrische Anschluß-Einsatz (30) wie eine Schiebepassung ausgebildet ist, die sich in Längsrichtung von der Steckermanschette in den ringförmigen Endabschnitt (13) erstreckt.

6. Steckermanschette nach den vorhergehenden

Ansprüchen, wobei der zweiteilig ausgebildete Körper aus einem elektrisch isolierenden Kunststoffmaterial besteht.

7. Steckermanschette nach den vorhergehenden Ansprüchen, wobei die Steckermanschette mit einem Verschluß-Bauteil (40) für den röhrenförmigen Endabschnitt (13) versehen ist.

8. Steckermanschette nach Anspruch 7, wobei das Ende des Verschluß-Bauteils (40) einen Klappe (43) aufweist, die gegen eine Endkante des röhrenförmigen Endabschnitts (13) geschwenkt werden kann.

9. Steckermanschette nach Anspruch 8, wobei die Klappe (43) eine Kante (44) aufweist, die mit der Endkante des röhrenförmigen Endabschnittes (13) zusammenpaßt, um eine spritzwassergeschützte Abdichtung zu bilden.

10. Steckermanschette nach Anspruch 9, wobei die Klappe (43) einen Handgriff (42) aufweist, um die Klappe (43) schwenkbar von der Endkante zu lösen (bevor ein Stecker in die Steckermanschette eingeschoben wird).

11. Spritzwassergeschützteelektrische In-Line-Verbindungsanordnung mit einer Steckermanschette (10, 20, 30) nach den vorhergehenden Ansprüchen und mit einem entsprechend ausgebildeten Stecker (50), der herausnehmbar in die Steckermanschette eingeschoben werden kann.

Revendications

1. Douille électrique disposée en ligne et étanche aux projections d'eau, comprenant un corps allongé en deux pièces (10, 20) enfermant et serrant rigidement une pièce rapportée intérieure (30) formant bornes électriques et destinée à être connectée à un câble électrique (61) pénétrant dans le corps allongé (10, 20), caractérisée en ce que le corps comprend une première pièce monobloc (10) ayant une section tubulaire rigide d'extrémité (13) dans le prolongement de laquelle est disposée, dans la direction longitudinale de la douille, une première cloison latérale (16), ainsi qu'une seconde pièce monobloc (20) ayant la forme d'une seconde cloison latérale (22) dont le bord s'accouple à un bord correspondant de la première cloison latérale (16) et à un bord intérieur de la première section d'extrémité de manière à former une enveloppe étanche aux projections d'eau et la pièce rapportée intérieure (30) formant bornes électriques est serrée entre les cloisons latérales opposées (16, 22) et comporte une partie d'extrémité contenant des bornes électriques (33) et pénétrant dans la section tubulaire d'extrémité (13).

2. Douille selon la revendication 1, dans laquelle les bords des cloisons latérales (16, 22) s'accouplent par un joint à languette et rainure (22, 14).

3. Douille selon la revendication 1 ou la revendication 2, dans laquelle les trois composants (10, 20, 30) de la douille sont serrés les uns contre les autres par un unique élément d'assemblage (62) passant à travers la pièce rapportée intérieure des bornes électriques (30).

4. Douille selon la revendication 1, 2 ou 3, dans laquelle la pièce rapportée intérieure (30) des bornes électriques peut être recâblée et ses bornes (33) logeant le câble sont accessibles par enlèvement de la seconde pièce (20) de la douille.

5. Douille selon l'une quelconque des revendications précédentes, dans laquelle la pièce rapportée intérieure formant bornes électriques (30) est conformée de manière à s'ajuster par poussée en longueur dans la section tubulaire d'extrémité (13) par l'intérieur de la douille.

6. Douille selon l'une quelconque des revendications précédentes, dans laquelle le corps en deux pièces est en matière plastique isolante de l'électricité.

7. Douille selon l'une quelconque des revendications précédentes, dans laquelle un élément (40) d'obturation de la section tubulaire d'extrémité (13) est monté sur la douille.

8. Douille selon la revendication 7, dans laquelle l'élément (40) d'obturation de l'extrémité consiste en une palette (43) montée à pivotement au voisinage d'un bord d'extrémité de la section tubulaire d'extrémité (13).

9. Douille selon la revendication 8, dans laquelle la palette (43) comporte un bord (44) qui s'accouple au bord d'extrémité de la section tubulaire d'extrémité (13), de manière à former un joint étanche aux projections d'eau.

10. Douille selon la revendication 9, dans laquelle la palette (43) comporte une manette (42) pour provoquer le dégagement par pivotement de la palette (43) du bord d'extrémité (avant l'insertion d'une prise mâle dans la douille à l'utilisation).

11. Ensemble connecteur électrique disposé en ligne, étanche aux projections d'eau et compre-

nant une douille (10, 20, 30) selon l'une quelconque des revendications précédentes et une prise mâle (50) de forme correspondante et qui s'ajuste de manière amovible par poussée dans la douille.

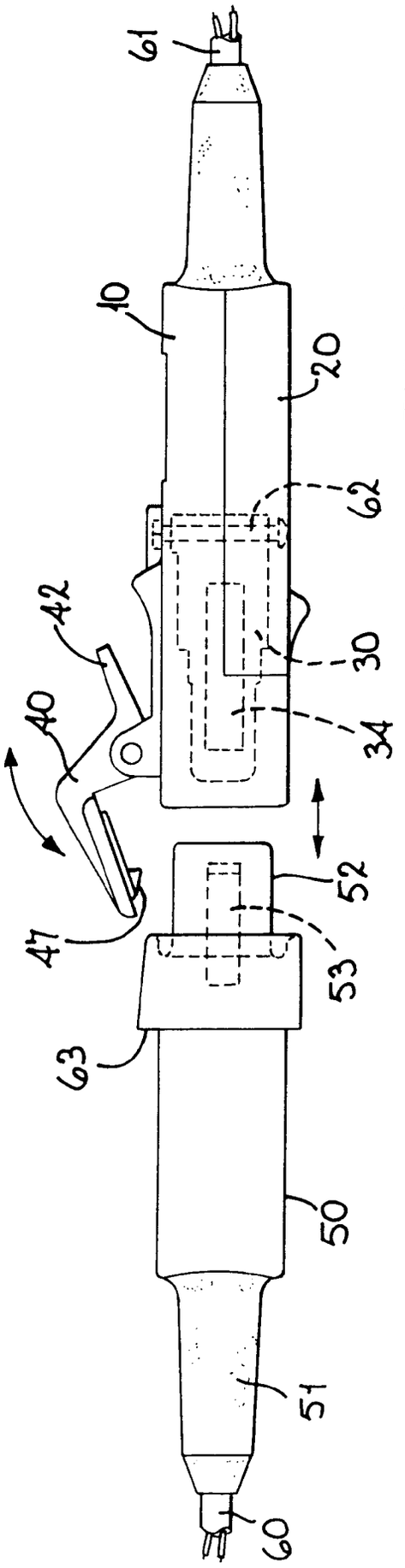

FIG. 1

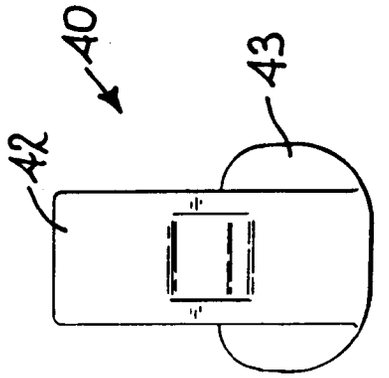

FIG. 5c

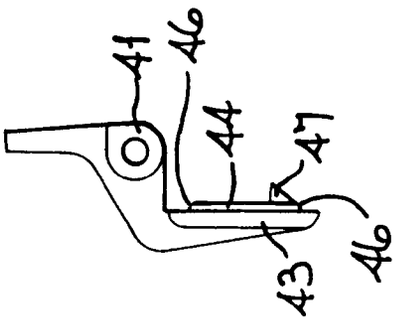

FIG. 5b

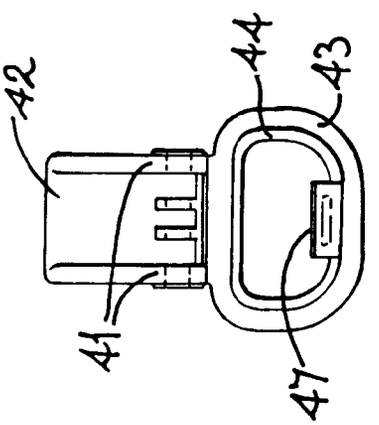

FIG. 5a

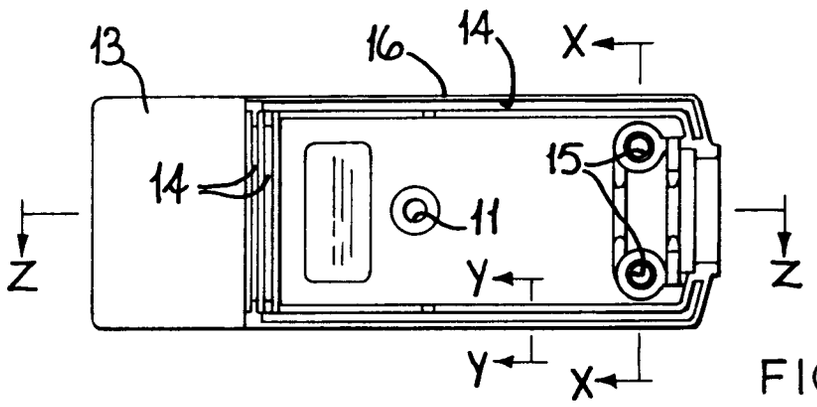

FIG. 2a

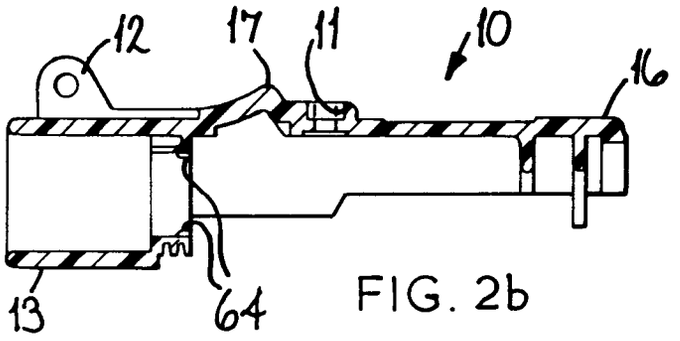

FIG. 2b

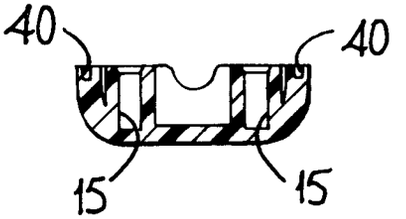

FIG. 2f

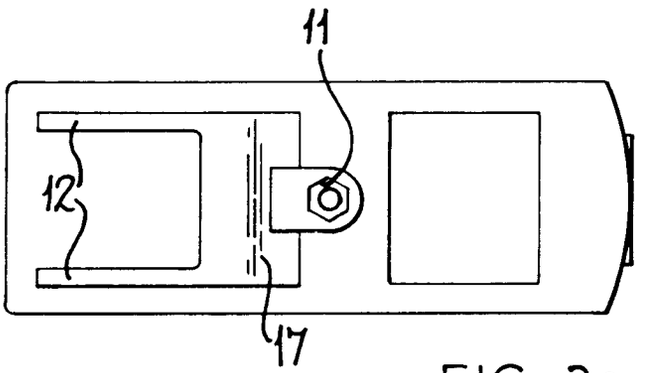

FIG. 2c

FIG. 2g

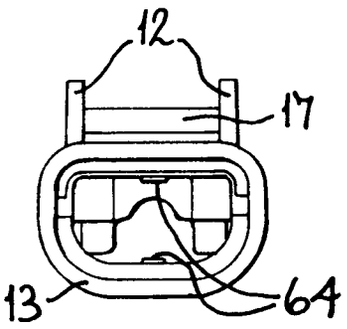

FIG. 2d

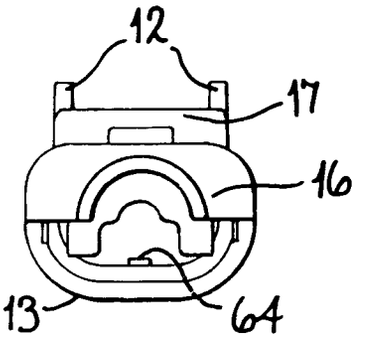

FIG. 2e

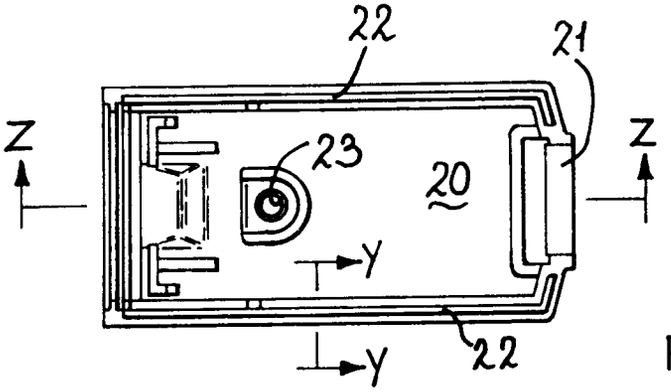

FIG. 3a

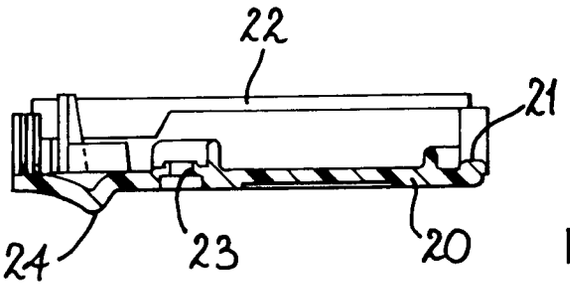

FIG. 3b

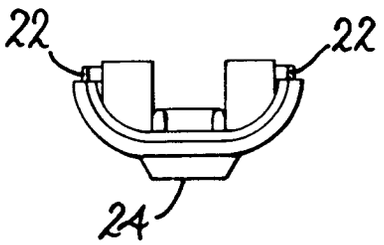

FIG. 3c

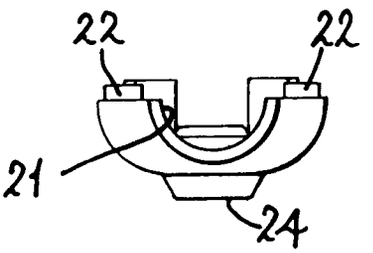

FIG. 3d

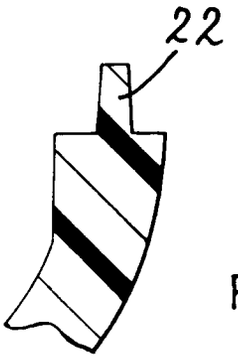

FIG. 3e

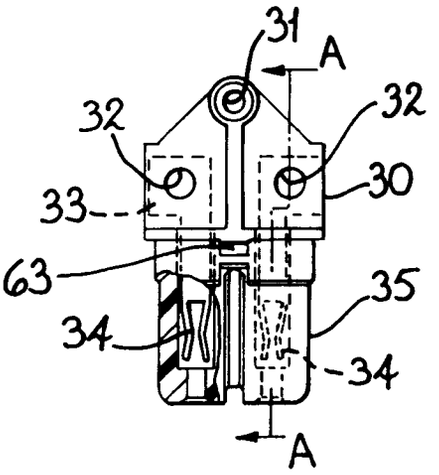

FIG. 4a

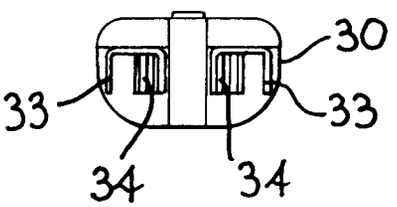

FIG. 4b

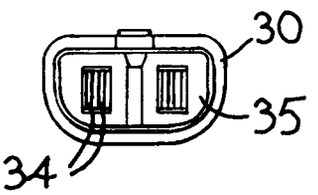

FIG. 4c

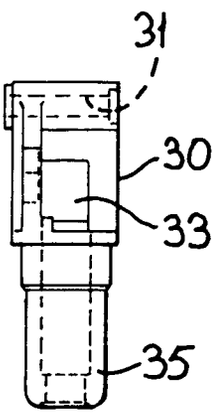

FIG. 4d

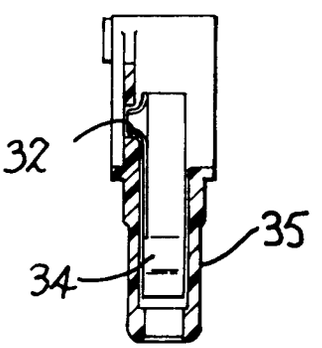

FIG. 4e

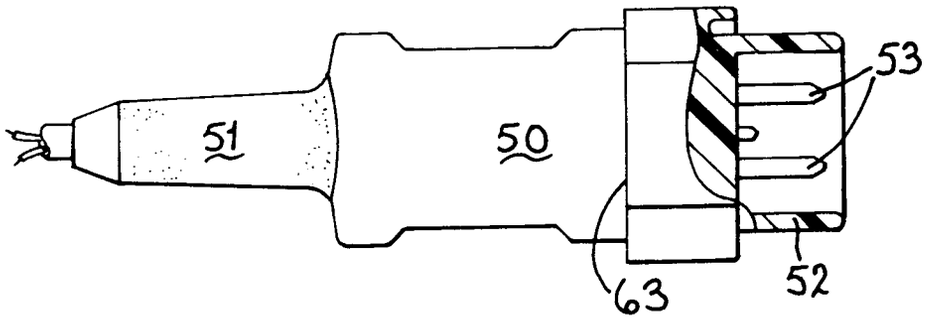

FIG. 6a

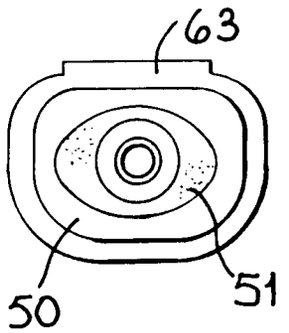

FIG. 6b

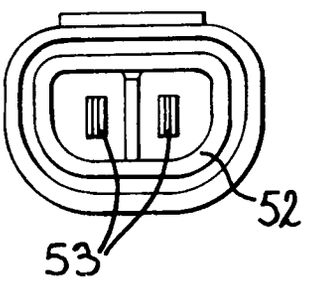

FIG. 6c

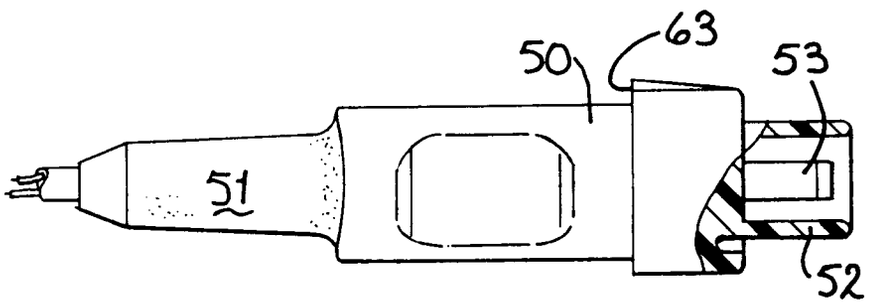

FIG. 6d