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(54) **Electrical connector**

Elektrischer Verbinder

Connecteur électrique

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(73) Proprietor: **Hozelock Limited**
Aylesbury Buckinghamshire HP17 8JD (GB)

(72) Inventor: **Dineen, Christopher John**
Aylesbury, Buckinghamshire HP21 8JD (GB)

(74) Representative: **Morton, Colin David et al**
Keith W Nash & Co.
Pearl Assurance House
90-92 Regent Street
Cambridge CB2 1DP (GB)

(56) References cited:
FR-A- 2 177 163
GB-A- 2 061 637

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Description

Field of the invention

This invention relates to a low voltage electrical connector.

Background to the invention

Electrical equipment for use outdoors, such as garden lighting, is for safety reasons operable on a low voltage (typically less than 50V) circuit derived from the mains supply through a step-down transformer. Commonly, several items of equipment will be operated on the low voltage circuit and there will often be a requirement to remove one or more such items, add a further item, or simply change the position of one or more items. This gives rise to a requirement for low voltage electrical connectors, whereby one low voltage electric cable can be electrically connected to another.

One known construction of low voltage electrical connector comprises two parts of electrically insulating material which can be fitted together by means of securing screws. The first part is permanently connected to a low voltage electric cable and incorporates elements of electrically conductive material in engagement with the respective conductors of said cable, said elements including spiked portions which protrude from the surface of said first part. A second low voltage electric cable is located against the protruding spikes of the first part of the connector, and the second part of the connector is secured to the first part by means of the securing screws to clamp the second electric cable between the two parts, thus causing the spikes to penetrate through the insulating covering of the second electric cable and effect an electrical connection between the two cables through said spiked elements.

A similar arrangement is disclosed in FR-A-2177163 where a two part connector has a first part of the connector permanently attached to an electrical cable and a separable second part. The first part has conductive spiked elements which protrude from the surface of the first electrical cable. The second part has channels in which a second electrical cable can be placed. The two parts are adapted to snap fit together to clamp the second cable into a position where the conductive spikes penetrate the second cable to effect electrical connection between the two cables.

The invention

According to the invention, there is provided a low voltage electrical connector formed in first an second parts of insulating material adapted to snap fit together, the first part being permanently connected to a first electric cable and incorporating conductive elements in engagement with the conductors of said electric cable, sai elements having respective spikes which protrude from the surface of said first part of the connector, characterised in that the two parts of the connector are elongate and assemble together with a hinging action at one end of the assembly and a pres fit action at the other end of the assembly to clamp a second electric cable between them with a lever action and thereby cause the said spikes to penetrate through the insulating covering of the second electric cable in order to effect an electrical connection between the two cables.

Preferably therefore, the spiked elements are located nearer the hinging end of the assembly than the end at which the two parts press fit together.

Both parts have formations at which the aforesaid hinging action and press fitting action are produced, and preferably the formations on at least one part, preferably the first part, are formed as pairs of laterally spaced upstands from the main body of said part at the respective ends thereof, defining between said formations on one side of the part and the formations on the other side a channel along which the second electric cable can be located to pass right through the connector from one end to the other.

In conjunctien with this last-mentioned feature, the two parts of the connector are preferably separable from one another, whilst also being capable of assembly into a hinging relationship. Thus, assuming the first electric cable is connected or adapted to be connected to an item of electrical equipment, the connector enables such item to be tapped into an existing low voltage power line (which thus constitutes the second electric cable) without any requirement to sever the power line.

The two separable parts of the connector are preferably held in loose association with one another by a flexible joining tag.

The first electric cable is preferably terminated within the first part of the electrical connector. Thus, in a preferred embodiment of the connector, the first part of the connector is moulded fistly with a cable-receiving blind aperture extending longitudinally into it from one end of said part, preferably the end at which the two part of the connector press fit together, and secondly with slots which extend transversely into said aperture adjacent its blind end, said slots receiving the aforesaid spiked elements as an irreversibly tight fit. The spiked elements are conveniently formed with prongs at their ends opposite to the spikes so that, when the spiked elements are driven into the slots, the prongs penetrate the insulating covering of the cable at the end of the first electric cable, which has been inserted into the aforesaid blind longitudinal aperture, thereby both permanently to anchor the first part of the connector to the end of said first electric cable and to effect engagement of said spiked elements with the conductors of said first electric cable.

Description of embodiment

A low voltage electrical connector in accordance with the invention is exemplified in the following descrip-

tion, making reference to the accompanying drawings, in which:-

Figure 1 shows the two part electrical connector in pictorial view, with the two parts separated;

Figure 2 is a transverse cross-section through the first part of the connector; and

Figures 3 to 6 show, in longitudinal cross-section, the sequence of steps involved in use of the connector to form an electrical connection between two electric cables.

Referring first to Figures 1 and 2, the connector comprises a first part 10 and a second part 12, both moulded of plastics insulating material, separable but held in loose association by a flexible joining tag 14.

The first part 10 of the connector comprises an elongate main body 16 having a blind longitudinal aperture 18 in which is received the end of a first low voltage electrical cable 20. The body 16 has on one face, referred to herein as the top, two upstanding side walls 22 which define a cable-receiving channel between them. The ends of the side walls 22 are formed with hook shaped formations, 24 and 26 respectively, for a purpose hereinafter described.

The body 16 is also formed with two slots extending from its top surface between the side walls 22 downwardly through the body to meet the longitudinal aperture 18 adjacent its blind end. These slots respectively receive as an irreversibly tight fit two elements 28 of conductive material which have prongs at one end and spikes at the other end. The prongs and spikes could be identical in form, but alternative terms are employed for the convenience of description. The two conductive elements 28 are driven downwardly into the slots, prongs first, so that these prongs penetrate the insulating covering at the end of the cable 20 inserted into the aperture 18, thereby both to anchor the first part 10 of the connector to the end of the cable and to engage the conductive elements with the conductors of said cable. The spikes 30 of the conductive elements remain upstanding from the base of the channel between the two side walls 22.

The second part 12 of the connector comprises a flat body 32 having cylindrical formation 34, 36 respectively for engagement with the hook formation 24, 26 of the first part of the connector. The second part 12 also has, at its end beyond the formation 36, a finger grip 38.

The arrangement is such that the second part 12 of the connector can be assembled to the first part 10 by bringing the cylindrical formation 34 into cooperation with the hook formation 24, thereby to form a hinge, and then turning the second part downwardly about the hinge to press fit the cylindrical formation 36 into the hook formation 26. The shape and dimensions of the assembly are such that the two parts assemble together, in the above-described manner, as a snap-fit.

The manner of use of the connector, to electrically connect the first low voltage electric cable 20 with another such cable, will be described with reference to Figures 3 to 6. First, however, it is mentioned that, in these figures, certain further features of the spiked conductive elements 28 can be seen.

Thus, with particular reference to Figure 3, the pronged end of each conductive element 28 comprises three prongs 40, including one prong for penetrating right through the first electric cable 20 to ensure strong anchorage of said cable. However, the spiked end of each element 28 comprises only the single spike 30 hitherto referred to. Immediately below this spike 30, each element is formed wih lands 42 which, by means of a suitable tool, enable the conductive elements 28 to be driven into the slots in the main body 16 of the first part 10 of the connector, during manufacture.

Figure 3 shows the connector with its two parts 10, 12 separated, ready for use to connect the first electric cable 20 to a second electric cable 44.

First, as shown in Figure 4, the connector 10, 12 and the second electric cable 44 are relatively positioned with the cable 44 partly entered into the channel between the side walls 22 of the first part of the connector.

In Figure 5, the cylindrical formation 34 of the second part of the connector has been engaged with the hook formation 24 of the first part of the connector to form a hinge, and, by means of finger pressure on the finger grip 38, the second part 12 is being turned about the hinge to urge the cylindrical formation 36 towards the hook formation 26. The second electric cable 44 is being pressed down into the channel between the side walls 22 of the first part of the connector, causing the spikes 30 of the conductive elements 28 to start to penetrate the insulating covering of the second electric cable.

Figure 6 shows the completed connection, the cylindrical formation 36 having been forced into cooperation with the hook formation 26 with a snap fitting action, clamping the second electric cable 44 between the two parts of the connector and driving the spikes 30 of the conductive elements 28 fully through the insulating covering of the second electric cable into engagement with the conductors of this cable. There is thus now established an electrical connection between the first electric cable 20 and the second electric cable 44.

A significant point to appreciate about the above-described arrangement is that, due to the fact that the hook formations 24, 26 are formed on the upstanding side walls 22 which define between them the channel for receiving the second electric cable, and also due to the separability of the two parts of the connector, it is possible to tap the first electric cable 20 into any chosen

point of the second electric cable 44 without any requirement to sever the second cable 44.

Thus, assuming the second electric cable 44 is a low voltage power line extending around an area in a garden, and the first electric cable 20 is connected or adapted to be connected, at its end remote from the above-described connector, to an electrical appliance such as a garden lamp, then the lamp can readily be tapped into the power line at any convenient point along said power line suited to the position at which the lamp is to be sited. Moreover, at a later time, the appliance can readily be disconnected from the power line and reconnected elsewhere along the line. The very small punctures left in the insulating covering of the power line by such a procedure are neither dangerous nor significantly detrimental.

Claims

1. A low voltage electrical connector formed in first (10) and second (12) parts of insulating material adapted to snap fit together, the first part (10) being permanently connected to a first electric cable (20) and incorporating conductive elements (28) in engagement with the conductors of said electric cable, said elements having respective spikes (30) which protrude from the surface of said first part of the connector, characterised in that the two parts of the connector are elongate and assemble together with a hinging action at one end of the assembly and a press fit action at the other end of the assembly to clamp a second electric cable (44) between them with a lever action and thereby cause the said spikes to penetrate through the insulating covering of the second electric cable (44) in order to effect an electrical connection between the two cables.

2. An electrical connector according to claim 1, characterised in that the spiked elements (30) are located nearer the hinging end of the assembly than the end at which the two parts press fit together.

3. An electrical connector according to claim 1 or claim 2, characterised in that both the first (10) and second (12) parts have formations (26, 24, 34, 36) at which the aforesaid hinging action and press fitting action are produced, and the formations (26, 24) on at least one part are formed as pairs of laterally spaced upstands from the main body of said part at least at the respective ends thereof, defining between said formations on one side of the part and the formations on the other side a channel along which the second electric cable (44) can be located to pass right through the connector from one end to the other.

4. An electrical connector according to claim 3, characterised in that the laterally spaced upstands (26 24) are formed on the first part of the connector.

5. An electrical connector according to claim 2 or claim 3, characteriseci in that the first and second parts of the connector are separable from one another, whilst also being capable of assembly into a hinging relationship.

6. An electrical connector according to claim 5, characterised in that the two separable parts of the connector are held in loose association with one another by a flexible joining tag (14).

7. An electrical connector according to any of claims 1 to 6, characterised in that the first electric cable (20) is terminated within the first part (10) of the electrical connector.

8. An electrical connector according to claim 6, characterised in that the first part (10) of the connector is moulded firstly with a cable-receiving blind aperture (18) extending longitudinally into it from one end of said part, and secondly with slots which extend transversely into said aperture adjacent its blind end, said slots receiving the aforesaid spiked elements as an irreversibly tight fit.

9. An electrical connector according to claim 8, characterised in that the spiked elements (28) are formed with prongs (40) at their ends opposite to the spikes (30) so that, when during manufacture the spiked elements (28) are driven into the slots, the prongs (40) penetrate the insulating covering of the first electric cable (20) inserted into the aforesaid blind longitudinal aperture (18), thereby both permanently to anchor the first part (10) of the connector to the end of said first electric cable and to effect engagement of said spiked elements with the conductors of said first electric cable.

Patentansprüche

1. Ein elektrischer Niederspannungsverbinder, ausgebildet in einem ersten Teil (10) und einem zweiten Teil (12) aus isolierendem Werkstoff, die im Schnappsitz zusammenpassen, wobei der erste Teil (10) mit einem ersten elektrischen Kabel (20) dauerhaft verbunden ist und mit den Leitern des elektrischen Kabels in Anlage befindliche leitende Elemente (28) enthält, die jeweils Dorne (30) aufweisen, die aus der Oberfläche des ersten Teils des Verbinders austreten, dadurch gekennzeichnet, daß die beiden Teile des Verbinders langgestreckt und über einen Anlenkvorgang an einem Ende und einen Preßsitzvorgang am anderen Ende der Anordnung zusammengebaut sind zum Einklemmen

eines zweiten elektrischen Kabels (44) zwischen sich mit einer Hebelwirkung und um dadurch die Dorne durch den isolierenden Mantel des zweiten elektrischen Kabels (44) zum Bewirken einer elektrischen Verbindung zwischen den beiden Kabeln durchtreten zu lassen.

2. Ein elektrischer Verbinder nach Anspruch 1, dadurch gekennzeichnet, daß die die Dorne aufweisenden Elemente (30) näher an dem Anlenkende der Anordnung als an dem Ende, an dem die beiden Teile im Preßsitz zusammenpassen, angeordnet sind.

3. Ein elektrischer Verbinder nach Anspruch 1 oder Anspruch 2, dadurch gekennzeichnet, daß sowohl der erste Teil (10) als auch der zweite Teil (12) Formationen (26, 24, 34, 36) aufweisen, an denen der vorgenannte Anlenk- und der vorgenannte Preßsitzvorgang bewirkt werden, und die Formationen (26, 24) an mindestens einem Teil als Paare von seitlich auseinanderliegenden, vom Hauptkörper des Teils mindestens an dessen jeweiligen Enden hochstehenden Teilen gebildet werden, die zwischen den Formationen auf einer Seite des Teils und den Formationen auf der anderen Seite einen Kanal bilden, entlang dem das zweite elektrische Kabel (44) zum glatten Durchtreten durch den Verbinder von einem Ende zum anderen angeordnet werden kann.

4. Ein elektrischer Verbinder nach Anspruch 3, dadurch gekennzeichret, daß die seitlich auseinanderliegenden hochstehenden Teile (26, 24) auf dem ersten Teil des Verbinders ausgebildet sind.

5. Ein elektrischer Verbinder nach Anspruch 2 oder Anspruch 3, dadurch gekennzeichnet, daß der erste und der zweite Teil des Verbinders voneinander trennbar und gleichzeitig in einer Schwenkbeziehung zusammenbaubar sind.

6. Ein elektrischer Verbinder nach Anspruch 5, dadurch gekennzeichnet, daß die beiden trennbare Teile des Verbinders durch ein flexibles Verbindungsband (14) in einer lockeren Verbindung miteinander gehalten werden.

7. Ein elektrischer Verbinder nach irgendeinem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß das erste elektrische Kabel (20) in dem ersten Teil (10) des elektrischen Verbinders angeschlossen ist.

8. Ein elektrischer Verbinder nach Anspruch 6, dadurch gekennzeichnet, daß der erste Teil (10) des Verbinders zuerst mit einer ein Kabel aufnehmenden Sacköffnung (18) geformt wird, die in Längsrichtung von einem Ende des Teils in ihn verläuft, und zweitens mit Schlitzen, die am Blindende der Öffnung quer in diese verlaufen, wobei die Schlitze die vorstehend erwähnten, mit Dornen versehenen Elemente in einem irreversiblen Festsitz aufnehmen.

9. Ein elektrischer Verbinder nach Anspruch 8, dadurch gekennzeichnet, daß die mit den Dornen versehenen Elemente (28) an ihren den Dornen (30) gegenüberliegenden Enden mit Zinken (40) versehen sind, so daß, wenn die mit Dornen versehenen Elemente (28) während des Zusammenbaus in die Schlitze getrieben werden, die Zinken (40) den isolierenden Mantel des in die vorgenannte Sacklängsöffnung (18) eingesetzten ersten elektrischen Kabels (20) durchdringen, um damit den ersten Teil (10) des Verbinders am Ende des ersten elektrischen Kabels dauerhaft zu verankern und eine Anlage der mit den Dornen versehenen Elemente an den Leitern des ersten elektrischen Kabels zu bewirken.

Revendications

1. Un connecteur électrique basse tension, formé des première (10) et seconde (12) parties en matériau isolant, adaptées pour s'emboîter ensemble par enclenchement, la première partie (10) étant en permanence connectée à un premier câble électrique (20) et contenant des éléments conducteurs (28) engagés dans les conducteurs dudit câble électrique, lesdits éléments ayant des pointes respectives (30) qui dépassent de la surface de la dite première partie du connecteur, caractérisé en ce que les deux parties du connecteur sont allongées et s'assemblent selon un mécanisme de charnière à une extrémité de l'assemblage et selon un mécanisme d'ajustage serré à l'autre extrémité de l'assemblage pour fixer un second câble électrique (44) entre elles avec un mouvement de levier et de cette façon faire pénétrer les dites pointes au travers de l'enveloppe isolante du second câble électrique (44) de manière à établir une connexion électrique entre les deux câbles.

2. Un connecteur électrique, selon la revendication 1, caractérisé en ce que les éléments pointus (30) sont placés plus près de l'extrémité formant charnière de l'assemblage que de l'extrémité où les deux parties s'ajustent de façon serrée.

3. Un connecteur électrique selon la revendication ou la revendication 2, caractérisé en ce que, à la fois, les première (10) et seconde (12) parties portent des structures (26, 24, 34, 36) sur lesquelles les susdits mouvements de charnière et d'ajustage ser-

ré se produisent, et les structures (26, 24) sont formées, sur au moins une partie, comme des paire d'avancées latéralement espacées, issues du corps principal de la dite partie, au moins aux extrémités respectives de celle-ci, définissant entre les dites structures d'un côté de la partie et les structures de l'autre côté, un canal, le long duquel le second câble électrique (44) peut être logé pour traverser le connecteur de part en part.

4. Un connecteur électrique, selon la revendication 3, caractérisé en ce que les avancées latéralement espacées (26, 24) sont formées sur la première partie du connecteur.

5. Un connecteur électrique, selon la revendication 2 ou la revendication 3, caractérisé en ce que, les première et seconde parties du connecteur sont séparables l'une de l'autre, tout en pouvant, en même temps, être assemblées par une articulation.

6. Un connecteur électrique selon la revendication 5, caractérisé en ce que les deux parties séparables du connecteur sont maintenues en association lâche_l'une avec l'autre par une patte de jonction flexible (14).

7. Un connecteur électrique selon l'une quelconque des revendications 1 à 6, caractérisé en ce que le premier câble électrique (20) se termine à l'intérieur de la première partie (10) du connecteur électrique.

8. Un connecteur électrique selon la revendication 6, caractérisé en ce que la première partie (10) du connecteur est moulée, premièrement, avec une ouverture borgne (18) pour recevoir un câble, s'étendant longitudinalement dans celle-ci depuis une extrémité de la dite partie, et deuxièmement, avec des fentes qui s'étendent transversalement dans ladite ouverture, de façon adjacente à son extrémité fermée, les dites fentes recevant les susdites pointes de façon ajustée et irréversible.

9. Un connecteur électrique selon la revendication 8, caractérisé en ce que les éléments pointus (28) sont formés de dents (40) à leurs extrémités opposées aux pointes (30) de sorte que, pendant la fabrication, quand les éléments pointus (28) sont enfoncés dans les fentes, les dents (40) pénètrent l'enveloppe isolante du premier câble électrique (20), inséré dans la susdite ouverture longitudinale borgne (18), pour ainsi, à la fois et de façon permanente, ancrer la première partie (10) du connecteur à l'extrémité dudit premier câble électrique, et réaliser l'engagement des éléments pointus dans les conducteurs dudit premier câble électrique.

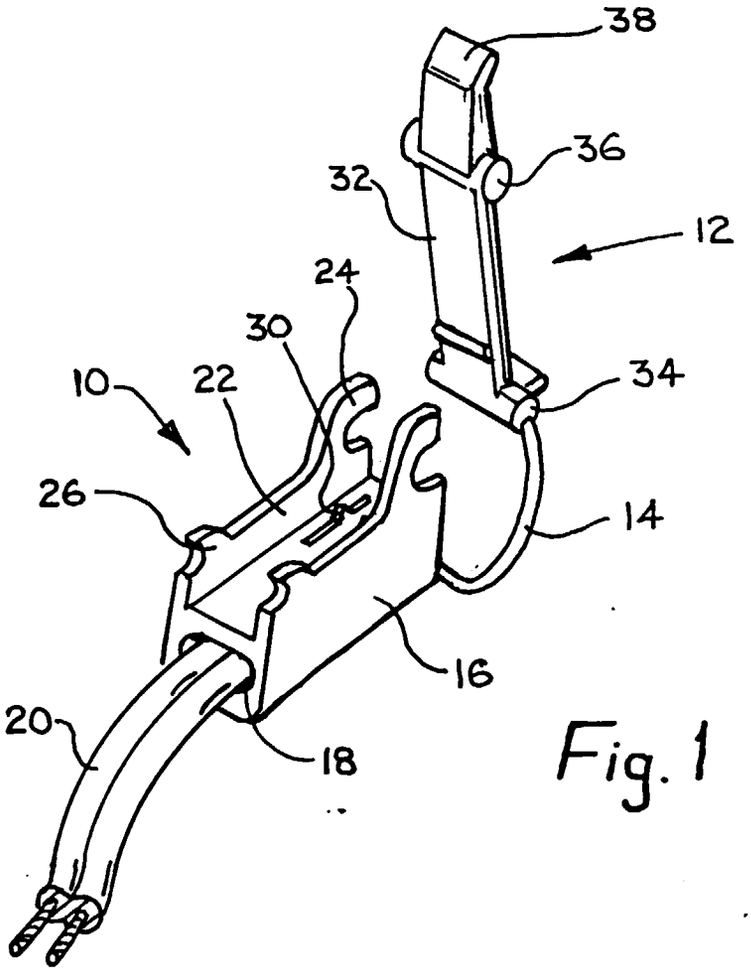


Fig. 1

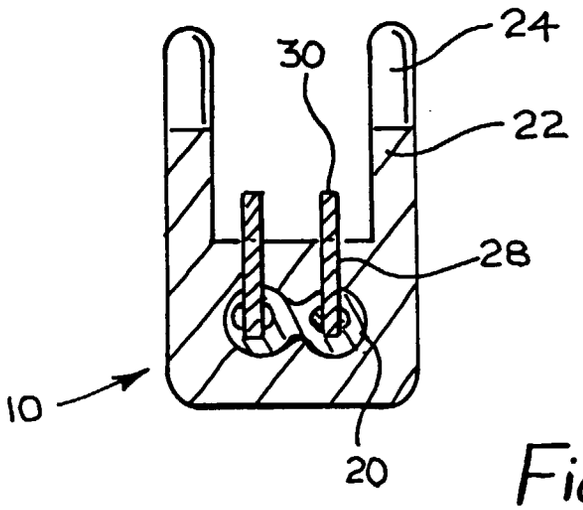


Fig. 2

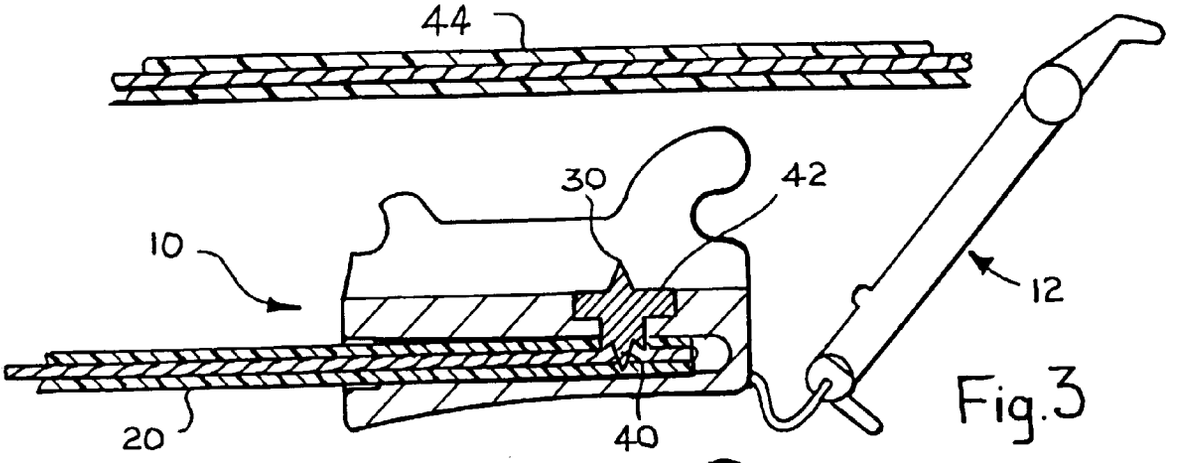


Fig.3

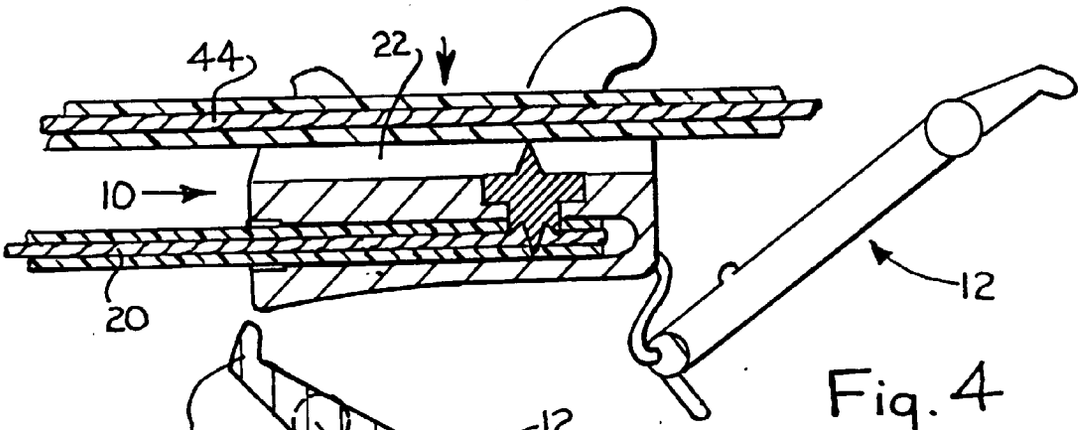


Fig.4

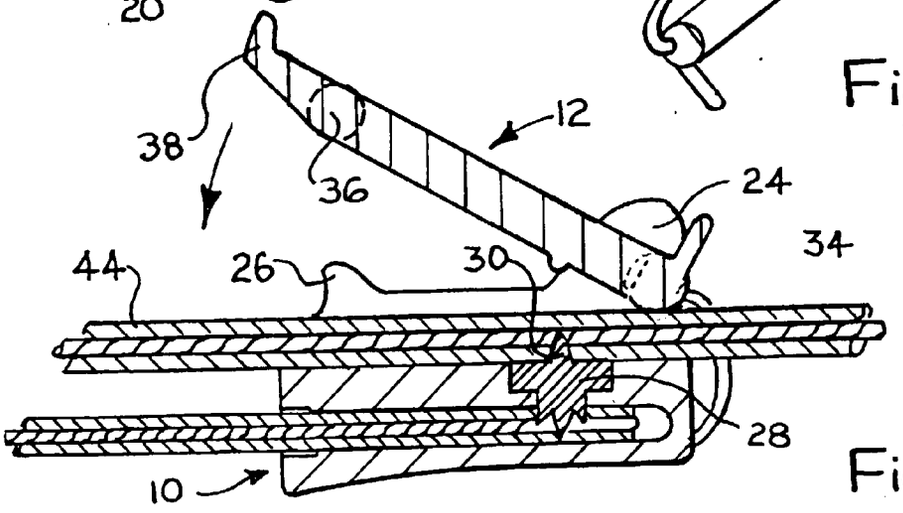


Fig.5

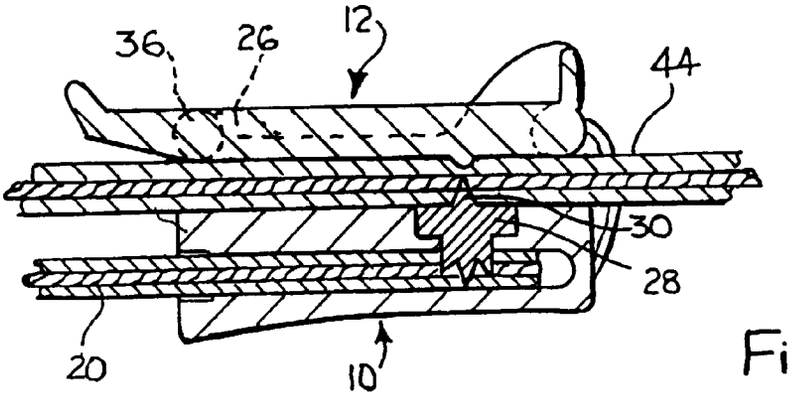


Fig.6