



⑫ **EUROPEAN PATENT SPECIFICATION**

④⑤ Date of publication of patent specification :
22.05.91 Bulletin 91/21

⑤① Int. Cl.⁵ : **H01R 4/24, H01R 4/50**

②① Application number : **87903581.4**

②② Date of filing : **08.05.87**

⑧⑥ International application number :
PCT/US87/01055

⑧⑦ International publication number :
WO 87/07773 17.12.87 Gazette 87/28

⑤④ **AN ELECTRICAL CONNECTOR AND AN ELECTRICAL TERMINAL.**

③⑩ Priority : **02.06.86 GB 8613299**

④③ Date of publication of application :
15.06.88 Bulletin 88/24

④⑤ Publication of the grant of the patent :
22.05.91 Bulletin 91/21

⑧④ Designated Contracting States :
DE FR GB IT NL

⑤⑥ References cited :
DE-A- 1 963 789
FR-A- 1 169 034
FR-A- 2 300 431
GB-A- 958 818
GB-A- 1 178 405

⑦③ Proprietor : **AMP INCORPORATED**
P.O. Box 3608 470 Friendship Road
Harrisburg Pennsylvania 17105 (US)

⑦② Inventor : **GRELLA, Georg**
Haendelstrasse 21
W-6100 Darmstadt-Wixhausen (DE)
Inventor : **PLOESSER, Hartmuth, Georg,**
Friedrich
Wiesenstrasse 29
W-6147 Lautertal 2 (DE)

⑦④ Representative : **Warren, Keith Stanley et al**
BARON & WARREN 18 South End Kensington
London W8 5BU (GB)

EP 0 270 602 B1

Note : Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid (Art. 99(1) European patent convention).

Description

This invention relates to an electrical connector and to an electrical terminal.

There is described in GB-A-1,522,863, an electrical connector comprising an electrically insulating housing having walls defining a terminal receiving cavity, the housing having an open end and an opposite end, two opposed walls of the housing being formed with a wire receiving slot extending from said open end towards said opposite end and an electrical terminal comprising a pair of juxtaposed wire gripping plates connected in face to face relationship by a bight of the terminal material, the terminal being insertable into the cavity through said open end with the bight leading, to make electrical connection with a wire extending through said wire receiving slots.

This known connector is used, for example, for connecting the magnet wire of an electric motor stator to an electrical lead. The plates are formed with slots into which the wire is forced as the terminal is inserted into the cavity. The wire is accordingly subjected to frictional wear by the edges of the slots.

The present invention is intended to provide such a connector, and a terminal therefor, which is suitable for connecting a fine wire, for example of 0.2 mm to 0.05 mm in diameter, for example of a field coil of a small electric motor or solenoid, to an electrical lead.

According to one aspect of the invention, an electrical connector as defined in the second paragraph of this specification, is characterized by a clip which is slidable along the plates and towards the bights, to drive the plates relatively towards each other to compress the wire between them, following the insertion of the terminal into the cavity and the insertion of the wire through the wire receiving slots and between the plates.

Thus, the wire is only engaged by the plates, in a direction substantially at right angles to the longitudinal axis of the wire, so that the wire is not subjected to frictional engagement by the plates during the connecting operation.

For guiding the clip in relation to the plates, one plate may be provided with an extension which projects beyond the other plate in a direction away from the bight, said extension having embossed longitudinal edge portions which are engageable with guide portions of the clip. These guide portions of the clip may be in the form of opposed beads projecting inwardly of the clip from end walls thereof so that each embossed edge portion of the extension is engageable with a rear wall of the clip and with one of said beads which extend in the insertion direction of the clip.

In order to allow the clip to be pushed to a home position about the plates, the clip may be provided with recesses extending from the leading edge thereof so as to receive the wire.

For movement of a free portion of the other plate towards the one plate, the other plate may be bowed towards the one plate, so as to be contiguous therewith at the crest of the bow to provide a pivotal axis for said other plate.

In order to predetermine the extent to which the clip can be slid along the plates, towards the bight, the cavity may have a reduced cross section first portion remote from the open end, for receiving the bight, and an enlarged cross section second portion for receiving the clip, a shoulder defined by the housing between the first and the second portions of the cavity serving to limit the movement of the clip towards the bight.

In order to maintain the integrity of the connection between the wire and the terminal, the clip may have a projection which is engageable with the wall of the second portion of the cavity to secure the clip therein, the terminal having a projection in the vicinity of the bight, for engagement with a wall of the first portion of the cavity, to secure the terminal therein.

Where the wire is a varnish insulated wire, as is usual in the case of magnet wires, at least one of the plates is provided with serrations facing the other plate, for piercing said insulation as the wire is compressed between the plates.

According to another aspect of the invention, an electric terminal comprising a pair of juxtaposed wire gripping plates connected in face to face spaced relationship by a bight of the terminal material, the plates having free edges which face away from the bight and one of the plates having an extension projecting away from the bight and beyond the other plate, is characterized in that the other plate is bowed towards the one plate in the vicinity of the bight, so as to be contiguous with the other plate at the crest of the bow, the other plate having serrations formed in its surface facing the one plate and extending from the free edge of the other plate towards the bight.

For a better understanding of the invention and to show how it may be carried into effect, reference will now be made by way of example to the accompanying drawings in which :

FIGURE 1 is an exploded, perspective view of an electrical connector for making connection with a fine magnet wire ;

FIGURE 2 is a perspective view, shown partly in section, of the connector when about to be connected to the magnet wire ;

FIGURE 3 is a similar view to that of Figure 2, but showing the connector after it has been connected to the magnet wire ;

FIGURE 4 is an enlarged, mainly sectional view through the connector as shown in Figure 2 ;

FIGURE 5 is an enlarged, mainly sectional view of the connector as shown in Figure 3 ; and

FIGURE 6 is a view taken on the lines 6-6 of Figure 5.

The connector which is generally referenced 2, comprises an insulating housing 4 having side walls 6, end walls 8, and a base wall 10 defining a terminal receiving cavity 12. The housing has an open end 14, the opposed end walls 8 of the housing each being formed with a wire receiving slot 16 extending from the open end 14 towards the base wall 10. A one piece electrical terminal 17 comprising a pair of juxtaposed wire gripping plates 18 and 20 connected in face to face spaced relationship by a bight 22 of the terminal material, is insertable into the cavity 12 through the open end 14 of the housing 4, with the bight 22 leading.

A clip 24 is slidable along the plates 18 and 20, towards the bight 22, from the position in which the clip 24 is shown in Figures 2 and 4 and that in which it is shown in Figures 3, 5 and 6, to drive the plates 18 and 20 relatively towards each other to compress between them a fine magnet wire W, following the insertion of the terminal 17 into the cavity 12 and the subsequent insertion of the wire W into the wire receiving slots 16 and between the plates 18 and 20 as shown in Figure 2.

The plate 18 has an extension 26 which projects beyond the plate 20 to provide a guide for the clip 24, which is first pushed over the extension 26 as shown in Figure 2 prior to the insertion of the terminal 17 into the cavity 12. A circular opening 27 in the extension 26 serves for receiving an electrical lead wire (not shown) to be soldered to the extension 26. A free end edge 29 of the extension 26 faces away from the bight 22. The extension 26 has embossed longitudinal edge portions 28 each of which is slidably engaged between a rear wall 34 of the clip 24 and a respective bead 30 which projects inwardly of the clip 24 from an end wall 32 thereof. The clip 24 has two rudimentary front walls 36 which are connected to the rear wall 34 by the side walls 32. The side walls 32 are formed with recesses in the form of blind slots 48, which are precisely aligned with one another for receiving the wire W as the clip 24 is moved from its Figures 2 and 4 to its Figures 3, 5 and 6 positions, thereby to allow the clip 24 to be pushed fully home so as tightly to compress the wire W between the plates 18 and 20.

The plate 20 is bowed towards the plate 18 in the vicinity of the bight 22 so as to be contiguous with the plate 18 at the crest 40 of the bow. For piercing the usual varnish insulation V, which is provided on the magnet wire W, the plate 20 has serrations 42, of keystone shape, formed in its surface 44 which faces the plate 18, the serrations 42 extending from a free end edge 46 of the plate 20 towards the bight 22.

The cavity 12 has a reduced cross section first portion 48 (best seen in Figure 4) which is remote from the open end 14 and receives the bight 22, and an enlarged portion 50 for receiving the clip 24, a shoulder 52 defined by the housing 4, between the cavity portions 48 and 50 serving to limit the movement of

the clip 24 towards the bight 22.

For securing the integrity of the connection between the terminal 16 and the wire W, the clip 24 has a resilient projection 54 at the lower end of each front wall 36 for engagement with the internal wall 56 of the cavity portion 50, as shown in Figure 5, thereby to restrain withdrawal of the clip 24 therefrom. The terminal 17 is provided with projecting barbs 58 on the longitudinal edges of the plates 18 and 20, in the vicinity of the bight 22 for engaging the wall 60 of the portion 48 of the cavity 12, to restrain withdrawal of the terminal 16 therefrom.

Claims

1. An electrical connector comprising an electrically insulating housing (4) having walls (6 and 8) defining a terminal receiving cavity (12), the housing (4) having an open end (14) and an opposite closed end (10), opposed side walls (8) of the housing (4) each being formed with a wire receiving slot (16) extending from said open end (14) towards said opposite closed end (10), and an electrical terminal (17) comprising a pair of juxtaposed wire gripping plates (18 and 20) connected in face to face spaced relationship by a bight (22) of the terminal material, the terminal (17) being insertable into the cavity (12) through said open end (14) with the bight (22) leading, to make electrical connection with a wire (W) extending through said wire receiving slots (16); characterized by a clip (24) which is slidable along the plates (18 and 20) towards the bight (22) to drive the plates (18 and 20) relatively towards each other to compress the wire (W) between them, following the insertion of the terminal (17) into the cavity (12) and the insertion of the wire (W) into the wire receiving slots (16) and between the plates (18 and 20).

2. A connector according to claim 1, characterized in that an extension (26) of one plate (18) projects beyond the other plate (20) in a direction away from the bight (22) to provide a guide for the clip (24) and has embossed longitudinal edge portions (28) engageable with guide portions (30, 34) of the clip (24).

3. A connector according to claim 2, characterized in that the clip has a pair of end walls (32) with opposed beads (30) projecting inwardly of the clip (24), each embossed edge portion (28) of the extension (26) being engageable with a rear wall (34) of the clip (24) and with one of the beads (30).

4. A connector according to claim 1, characterized in that the clip (24) is formed with recesses for receiving the wire (W) as the clip is slid towards the bight (22).

5. A connector according to claim 1, characterized in that one of the plates (20) is bowed towards the other plate (18) in the vicinity of the bight (22) so

as to be contiguous with the one plate (18) at the crest of the bow (40).

6. A connector according to claim 1, characterized in that the cavity (12) has a reduced cross-section first portion (48) remote from said open end (14), for receiving the bight (22) and an enlarged second portion (50) for receiving the clip (24), a shoulder (52) defined between the first and second portions (48 and 50) of the cavity (12) serving to limit the movement of the clip (24) towards the bight (22).

7. A connector according to claim 6, characterized in that the clip (24) has a projection (54) for engaging a wall (56) of the second portion (50) of the cavity (12), to secure the clip (24) therein, the terminal (17) having a projection (58) engageable with a wall (60) of the first portion (48) of the cavity (12) to secure the terminal (17) therein.

8. A connector according to claim 1, characterized in that one of the plates (20) is provided with insulation piercing serrations (42) for piercing varnish insulation (V) on the wire (W) as the wire (W) is compressed between the plates (18 and 20).

9. An electrical terminal comprising a pair of juxtaposed wire gripping plates (18 and 20) connected in face to face spaced relationship by a bight (22) of the terminal material, the plates having free end edges (46 and 47) facing away from the bight (22), an extension (26) of the one plate (18) projecting in a direction away from the bight (22) and beyond the other plate (20); characterized in that the other plate (20) is bowed towards the one plate (18) in the vicinity of the bight (22) so as to be contiguous with the one plate (18) at the crest (40) of the bow, the other plate (20) having serrations (42) formed in its surface (44) facing the one plate (18) and extending from the free end edge (46) of the other plate (20) towards the bight (22).

Ansprüche

1. Elektrischer Verbinder mit einem elektrisch isolierenden Gehäuse (4), das Wände (6 und 8) besitzt, die einen Anschluß-Aufnahmehohlraum (12) umgrenzen, wobei das Gehäuse (4) ein offenes Ende (14) und ein gegenüberliegendes geschlossenes Ende (10) besitzt und einander gegenüberliegende Seitenwände (8) des Gehäuses (4) jeweils mit einem Drahtaufnahmeschlitz (16) ausgebildet sind, der sich von dem offenen Ende (14) zu dem gegenüberliegenden geschlossenen Ende (10) hin erstreckt, und mit einem elektrischen Anschluß (17), der zwei nebeneinander angeordnete Platten (18 und 20) zum Ergreifen eines Drahtes umfaßt, die durch eine aus dem Anschlußmaterial bestehende Krümmung (22) so miteinander verbunden sind, daß sich ihre Flächen im Abstand gegenüberstehen, wobei der Anschluß (17) in den Hohlraum (12) durch das offene Ende (14) mit der

Krümmung (22) voraus einführbar ist, um eine elektrische Verbindung mit einem Draht (W) herzustellen, der sich durch die Drahtaufnahmeschlitz (16) erstreckt, gekennzeichnet durch eine Schelle (24), die längs der Platten (18 und 20) zu der Krümmung (22) hin verschiebbar ist, um die Platten (18 und 20) aufeinanderzuzutreiben, um den Draht (W) zwischen ihnen zusammenzudrücken, nachdem der Anschluß (17) in den Hohlraum (12) eingeführt worden ist und der Draht (W) in die Drahtaufnahmeschlitz (16) und zwischen die Platten (18 und 20) eingeführt worden ist.

2. Verbinder nach Anspruch 1, dadurch gekennzeichnet, daß eine Verlängerung (26) einer Platte (18) über die andere Platte (20) hinaus in einer Richtung vorsteht, die von der Krümmung (22) weggerichtet ist, um eine Führung für die Schelle (24) abzugeben, und daß diese Verlängerung erhabene Längskanten-Teile (28) aufweist, die mit Führungsteilen (30, 34) der Schelle (24) in Eingriff treten können.

3. Verbinder nach Anspruch 2, dadurch gekennzeichnet, daß die Schelle zwei Endwände (32) mit einander gegenüberliegenden zur Innenseite der Schelle (24) vorstehenden Wülsten (30) aufweist, wobei jeder erhabene Randteil (28) der Verlängerung (26) mit einer Rückwand (34) der Schelle (24) und mit einem der Wülste (30) in Eingriff treten kann.

4. Verbinder nach Anspruch 1, dadurch gekennzeichnet, daß die Schelle (24) mit Ausnehmungen ausgebildet ist, um den Draht (2) aufzunehmen, wenn die Schelle zur Krümmung (22) hin geschoben wird.

5. Verbinder nach Anspruch 1, dadurch gekennzeichnet, daß eine der Platten (20) in der Nähe der Krümmung (22) zur anderen Platte (18) hin gebogen ist, um die andere Platte (18) am Scheitel der Biegung (40) zu berühren.

6. Verbinder nach Anspruch 1, dadurch gekennzeichnet, daß der Hohlraum (12) einen ersten Teil (48) mit vermindertem Querschnitt aufweist, der vom offenen Ende (14) entfernt liegt, um die Krümmung (22) aufzunehmen, sowie einen vergrößerten zweiten Teil (50) zur Aufnahme der Schelle (24), wobei eine zwischen dem ersten und dem zweiten Teil (48 und 50) des Hohlraums (12) abgegrenzte Schulter (52) dazu dient, die Bewegung der Schelle (24) zur Krümmung (22) hin zu begrenzen.

7. Verbinder nach Anspruch 6, dadurch gekennzeichnet, daß die Schelle (24) einen Vorsprung (54) zum Eingriff mit einer Wand (56) des zweiten Teils (50) des Hohlraums (12) aufweist, um die Schelle (24) in diesem Hohlraum zu befestigen, und daß der Anschluß (17) einen Vorsprung (58) zum Eingriff mit einer Wand (60) des ersten Teils (48) des Hohlraums (12) aufweist, um den Anschluß (17) in diesem Hohlraum zu befestigen.

8. Verbinder nach Anspruch 1, dadurch gekennzeichnet, daß eine der Platten (20) mit Vorsprüngen (42) zum Durchdringen von Isolationsmaterial verse-

hen ist, um die Lackisolation (V) auf dem Draht (W) zu durchstoßen, wenn der Draht (W) zwischen den Platten (18 und 20) zusammengedrückt wird.

9. Elektrischer Anschluß mit zwei einander benachbarten Platten (18 und 20) zum Ergreifen eines Drahtes, die vermittelt eines aus dem Anschlußmaterial bestehenden gebogenen Teils (22) im Abstand voneinander mit einander gegenüberliegenden Flächen verbunden sind, wobei die Platten freie Endkanten (46 und 47) aufweisen, die von dem gebogenen Teil (22) wegweisen, und wobei eine Verlängerung (26) der einen Platte (18) in einer von dem gebogenen Teil (22) wegweisenden Richtung über die andere Platte (20) hinaus vorsteht, dadurch **gekennzeichnet**, daß die andere Platte (20) zu der einen Platte (18) in der Nachbarschaft des gebogenen Teils (22) so hingebogen ist, daß sie mit der anderen Platte (18) am Scheitel (40) der Biegung in Berührung steht, daß die andere Platte (20) Vorsprünge (42) aufweist, die in ihrer Oberfläche (44) ausgebildet sind, die der einen Platte (18) gegenüberliegt und sich von der freien Endkante (46) der anderen Platte (20) zu dem gekrümmten Teil (22) hin erstreckt.

Revendications

1. Connecteur électrique comportant un boîtier électriquement isolant (4) ayant des parois (6 et 8) définissant une cavité (12) de réception de borne, le boîtier (4) ayant une extrémité ouverte (14) et une extrémité fermée opposée (10), des parois latérales opposées (8) du boîtier (4) étant formées chacun de façon à présenter une fente (16) de réception de fil s'étendant de ladite extrémité ouverte (14) vers ladite extrémité fermée opposée (10), et une borne électrique (17) comportant deux plaques juxtaposées (18 et 20) de prise de fil reliées dans une disposition espacée et face à face par un coude (22) de la matière de la borne, la borne (17) pouvant être insérée dans la cavité (12) à travers ladite extrémité ouverte (14), le coude (22) en premier, pour réaliser une connexion électrique avec un fil (W) s'étendant à travers lesdites fentes (16) de réception de fil ; **caractérisé par** une pince (24) qui peut glisser le long des plaques (18 et 20) vers le coude (22) pour entraîner les plaques (18 et 20) relativement l'une vers l'autre afin de comprimer le fil (W) entre elles, à la suite de l'insertion de la borne (17) dans la cavité (12) et de l'insertion du fil (W) dans les fentes (16) de réception de fil et entre les plaques (18 et 20).

2. Connecteur selon la revendication 1, **caractérisé en ce qu'un** prolongement (26) d'une première plaque (18) fait saillie au-delà de l'autre plaque (20) dans une direction s'éloignant du coude (22) pour former un guide pour la pince (24) et comporte des parties de bords longitudinaux estampées (28) pouvant

être engagées avec des parties de guidage (30, 34) de la pince (24).

3. Connecteur selon la revendication 2, **caractérisé en ce que** la pince comporte deux parois extrêmes (32) ayant des nervures opposées (30) faisant saillie à l'intérieur de la pince (24), chaque partie de bord estampée (28) du prolongement (26) pouvant être engagée avec une paroi arrière (34) de la pince (24) et avec l'une des nervures (30).

4. Connecteur selon la revendication 1, **caractérisé en ce que** la pince (24) est formée de façon à présenter des évidements destinés à recevoir le fil (W) pendant que la pince est glissée vers le coude (22).

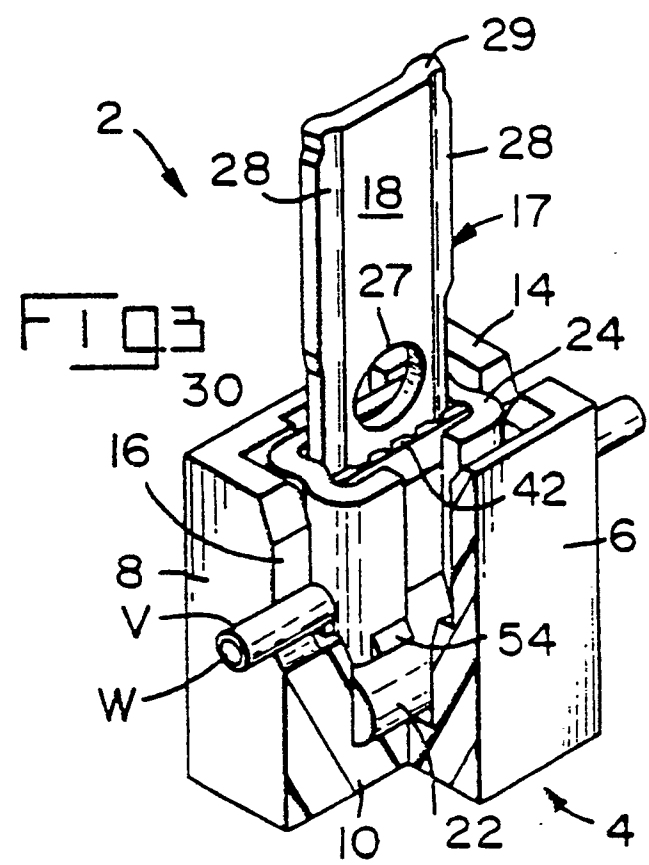
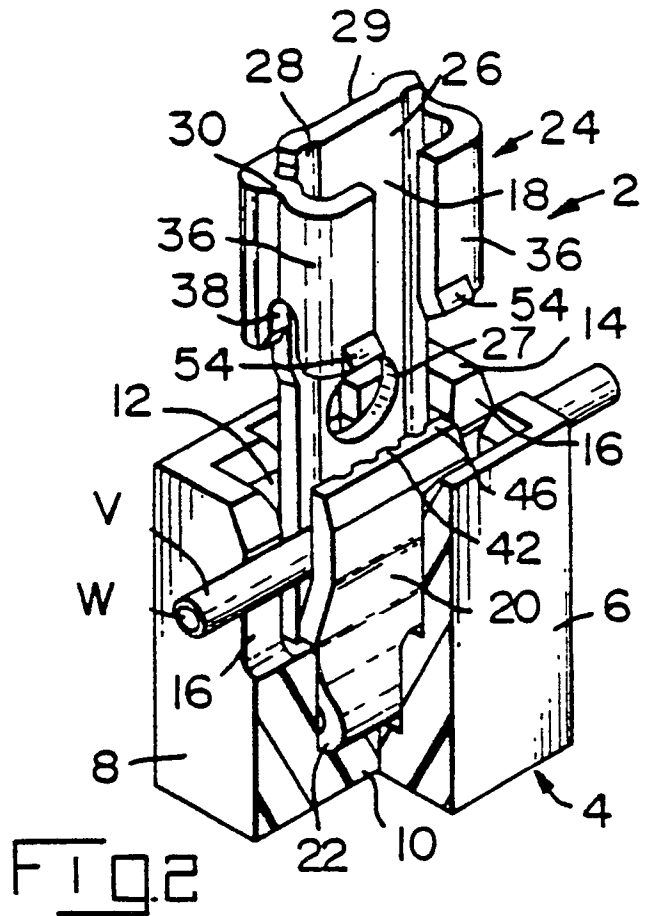
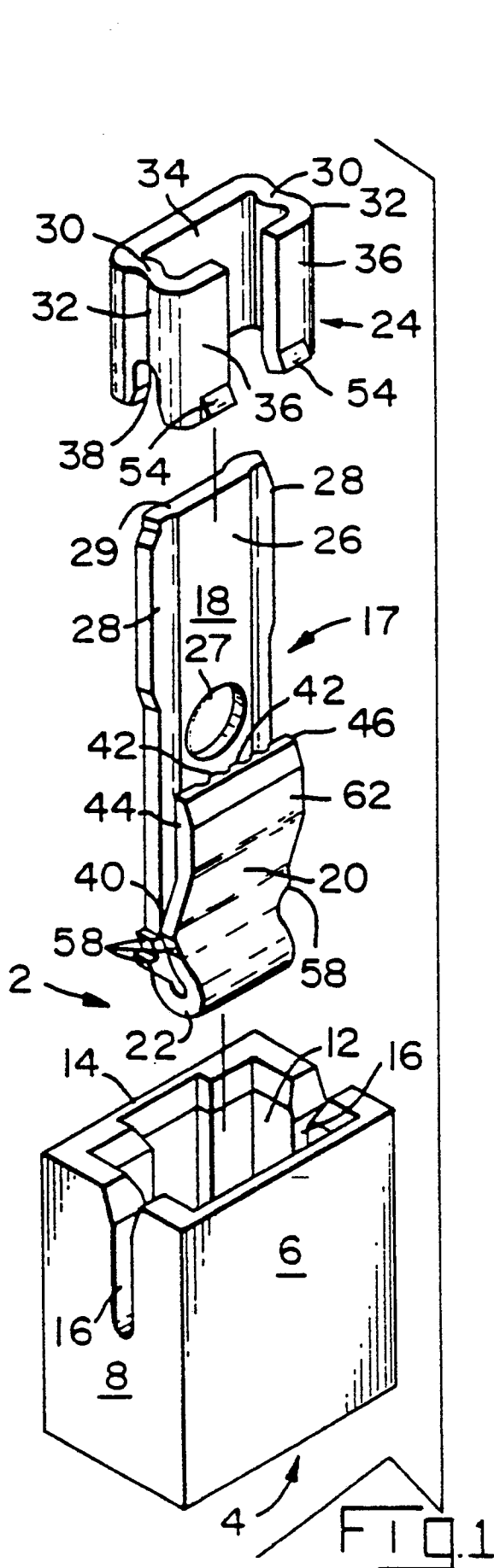
5. Connecteur selon la revendication 1, **caractérisé en ce qu'une** première des plaques (20) est bombée vers l'autre plaque (18) au voisinage du coude (22) afin d'être contiguë à la première plaque (18) à la crête du bombement (40).

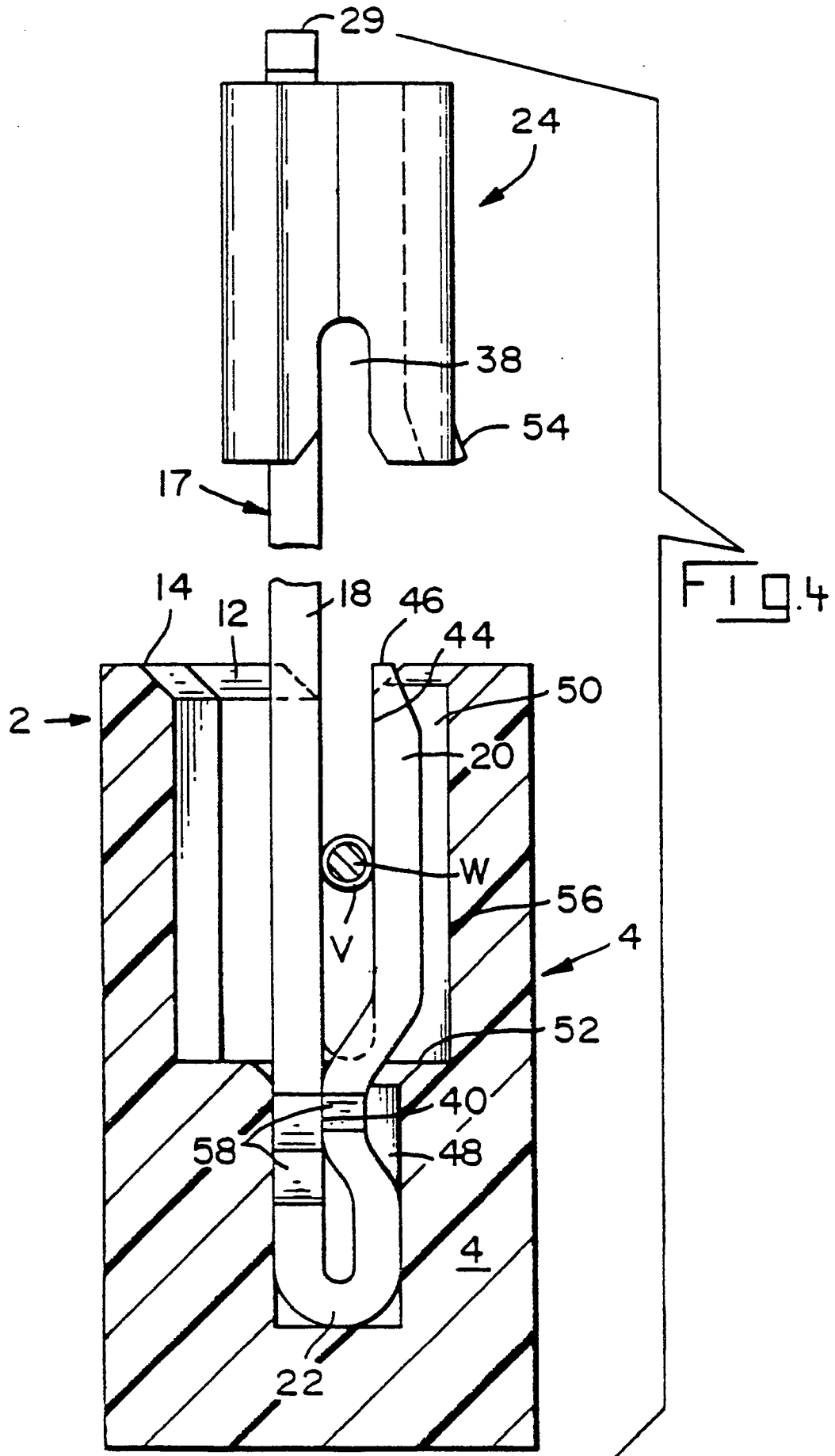
6. Connecteur selon la revendication 1, **caractérisé en ce que** la cavité (12) comporte une première partie (48) de section transversale réduite, éloignée de ladite extrémité ouverte (14), destinée à recevoir le coude (22) et une seconde partie élargie (50) destinée à recevoir la pince (24), un épaulement (52), défini entre les première et seconde parties (48 et 50) de la cavité (12), servant à limiter le mouvement de la pince (24) vers le coude (22).

7. Connecteur selon la revendication 6, **caractérisé en ce que** la pince (24) comporte une saillie (54) destinée à engager une paroi (56) de la seconde partie (50) de la cavité (12), pour fixer la pince (24) dans celle-ci, la borne (17) comportant une saillie (58) pouvant être engagée avec une paroi (60) de la première partie (48) de la cavité (12) pour fixer la borne (18) dans celle-ci.

8. Connecteur selon la revendication 1, **caractérisé en ce que** l'une des plaques (20) est pourvue de dentelures (42) de perçage d'isolant destinées à percer un vernis isolant (V) situé sur le fil (W) lorsque le fil (W) est comprimé entre les plaques (18 et 20).

9. Borne électrique comportant deux plaques juxtaposées (18 et 20) de prise de fil reliées dans une disposition face à face et espacée par un coude (22) de la matière de la borne, les plaques ayant des bords extrêmes libres (46 et 47) tournés à l'écart du coude (22), un prolongement (26) d'une première plaque (18) faisant saillie dans une direction s'éloignant du coude (22) et au-delà de l'autre plaque (20) ; **caractérisée en ce que** l'autre plaque (20) est bombée vers la première plaque (18) au voisinage du coude (22) afin d'être contiguë à la première plaque (18) à la crête (40) du bombement, l'autre plaque (20) comportant des dentelures (42) formées dans sa surface (44) faisant face à la première plaque (18) et s'étendant du bord extérieur libre (46) de l'autre plaque (20) vers le coude (22).





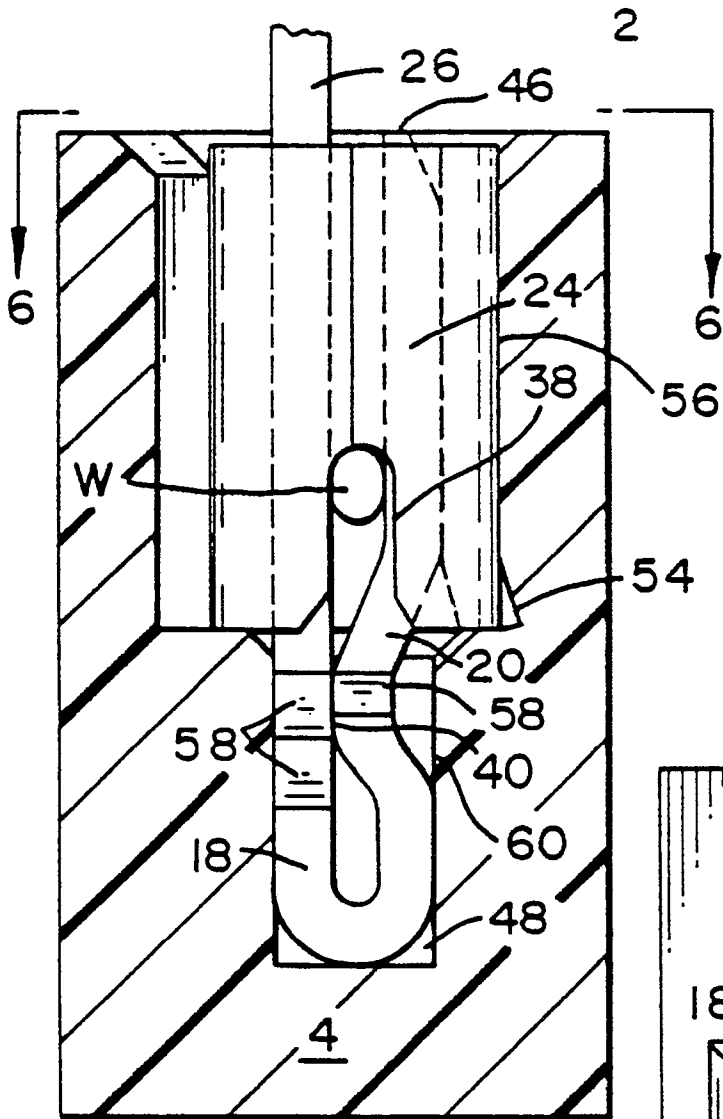


FIG. 5

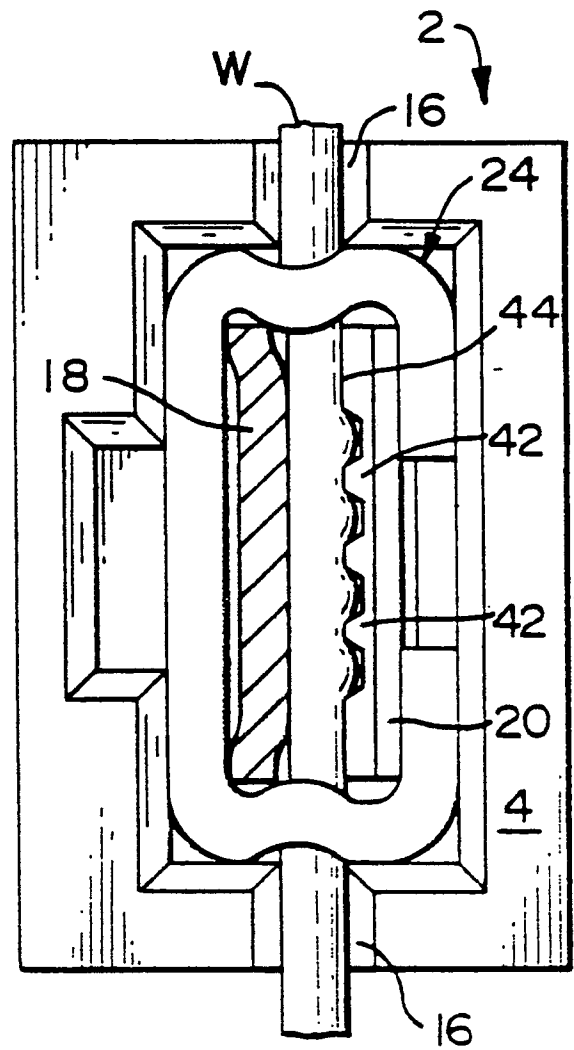


FIG. 6