

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

0 390 865 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **15.09.93** (51) Int. Cl.⁵: **H01R 13/11, H01R 13/18**

(21) Application number: **89901242.1**

(22) Date of filing: **05.12.88**

(86) International application number:
PCT/US88/04309

(87) International publication number:
WO 89/05531 (15.06.89 89/13)

(54) **ELECTRICAL SOCKET TERMINAL.**

(30) Priority: **07.12.87 GB 8728575**

(43) Date of publication of application:
10.10.90 Bulletin 90/41

(45) Publication of the grant of the patent:
15.09.93 Bulletin 93/37

(84) Designated Contracting States:
DE FR GB IT NL SE

(56) References cited:
EP-A- 0 191 539
DE-A- 3 540 869
DE-U- 8 608 199

(73) Proprietor: **THE WHITAKER CORPORATION**
Suite 450, 4550 New Linden Hill Road
Wilmington, Delaware 19808(US)

(72) Inventor: **HASS, Jurgen**
Hermannstrasse 9
D-6106 Erzhausen(DE)
Inventor: **HOTEA, Gheorghe**
AM Felsenkeller 17
D-6103 Griesheim(DE)
Inventor: **SIEGEL, Günter**
Laerchenweg 35
D-6369 Niederdorffelden(DE)

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

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).

EP 0 390 865 B1

Description

This invention relates to an electrical socket terminal for mating with an electrical pin.

There is described in the specification of DE-U-8608199.3, an electrical socket terminal comprising an elongate stamped and formed metal socket having a tubular base from one end of which projects a pair of elongate contact springs, which extend in a direction away from said base and have contact surfaces which are proximate to a forward end of the socket, remote from the base, and which extend towards each other to grip an electrical pin inserted between the contact surfaces from said forward end.

It is an object of the present invention to provide such a socket terminal, in which the contact force exerted by the contact surfaces against the pin can readily and accurately be predetermined.

According to the present invention, therefore, an electrical socket terminal as defined in the second paragraph of this specification is characterized in that each contact spring is of substantially L-shaped cross section, and thus has two parts extending transversely of each other as seen in cross section, each part being formed with one of said contact surfaces, the two parts of each contact spring being divided by a slot extending longitudinally of the contact spring, between the contact surfaces thereof and said base. The said contact force is determined by the length of said slots which can accurately be stamped out of a sheet metal blank from which the socket terminal is to be formed.

The two parts of each contact spring preferably extend at right angles to each other and are preferably of identical dimensions, the pin being of square cross section, the contact surfaces being smoothly arcuate.

According to an embodiment of the invention, each slot extends for the whole distance between the contact surface and the base. The base is preferably of square cross section, each contact spring extending from the forward ends of two adjacent side walls of the base. The socket terminal is preferably provided with a protective sleeve which acts to restrain overstress of the contact springs, should the terminal be mated with an oversized pin or a pin be inserted into the socket in misalignment therewith.

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 a side view of an electrical socket terminal provided with a protective sleeve;

FIGURE 2 is a side view of a socket terminal;

FIGURE 3 is a top plan view of the socket terminal;

FIGURE 4 is a view taken on the lines 4-4 of Figure 1;

FIGURE 5 is a view taken on the lines 5-5 of Figure 1;

FIGURE 6 is a side view of the protective sleeve;

FIGURE 7 is a top plan view of the protective sleeve;

FIGURE 8 is a front end view of the protective sleeve;

FIGURE 9 is a fragmentary side view of the forward end of the socket terminal;

FIGURE 10 is a view taken on the lines 10-10 of Figure 9;

FIGURE 11 is a fragmentary view taken on the lines 11-11 of Figure 10;

FIGURE 12 is a view taken on the lines 12-12 of Figure 9;

FIGURE 13 is a view taken on the lines 13-13 of Figure 9;

FIGURE 14 is a view taken on the lines 14-14 of Figure 2;

FIGURE 15 is a front end view of the socket terminal showing, in cross section, an electrical pin mated with the socket terminal;

FIGURE 15A is a fragmentary side view showing the leading end portion of the pin; and

FIGURE 16 is a plan view of a sheet metal blank from which the socket terminal was formed.

As shown in Figures 1, 4 and 5, a socket terminal 2 is provided with a protective metal sleeve 4.

The socket terminal 2 comprises, as best seen in Figures 2 and 3, a stamped and formed metal socket 6 and a wire connecting portion 8 joined to the socket 6 by a transition portion 9, the terminal 2 having been formed from a sheet metal blank 10 which is shown in Figure 16.

The socket 6 comprises a substantially square cross-section; tubular base 12 of constant cross-sectional area, from the forward end 13 of which extends a pair of elongate contact springs 14, formed from portions 14' of the blank 10. The base 12 is formed to its square cross-sectional shape from a portion 12' of the blank 10, and has a seam 16 defined by opposite edges 17' of said portion 12'. Each contact spring 14 extends from a respective pair of adjacent edges 15 and 19 (Figure 14) at the forward end 13 of the base 12. As will be apparent from Figures 4 and 5, each contact spring is substantially L-shaped as seen in cross section, comprising two identical planar parts 18 and 20, so that the contact springs 14 are of substantially square overall cross section, as seen in Figures 5, 10, 12 to 14 and 15. Each contact spring 14 has formed in both of its parts 18 and 20, a contact

boss 22 projecting inwardly of the socket 6 at a position remote from the base 12 and proximate to the forward end 24 of the socket 6. Each boss 22 defines a smoothly arcuate, part-spherical contact surface 26, the surfaces 26 being arranged in precisely opposed pairs and being constantly spaced about the internal periphery of the socket 6, as best seen in Figures 5, 10, 12, 14 and 15. Between the contact bosses 22 and the base 12, each contact spring 14 is longitudinally divided by a slot 28, as will be apparent from a study of slots 28' in the blank 10. Thus, the parts 18 and 20 of each contact spring 14 are connected together, by a fold 21, at the contact bosses 22 and between the bosses 22 and the end 24, the parts 18 and 20 also being connected at the base 12. The contact springs 14 are substantially parallel to one another between the base 12 and the end 24 and are arranged in rotational symmetry.

The wire connecting portion 8 comprises a substantially U cross section wire barrel 30 for crimping about the stripped electrically conductive core of an insulated electrical lead (not shown) and a pair of upstanding ears 32 for crimping about the insulation of the lead, the transition portion 9 also being of substantially U-shaped cross section. The portions of the blank from which the barrel 30 and ears 32, were formed, are referenced 30' and 32', respectively, in Figure 16.

The protective sleeve 4 is, as best seen in Figures 4, 5 and 8, of substantially square cross section and was stamped and formed from a single piece of sheet metal, as was the socket terminal 2. The sleeve 4 has struck from its upper, as seen in Figures 4, 6 and 8, wall 36, a locking tongue 38 having a free end 39 for engaging a shoulder in a cavity in an insulating housing (not shown for the purpose of retaining the socket terminal 2 therein. One side wall 40 of sleeve 4 projects above the wall 36 to provide a keying plate 42 for reception in a groove in the housing, for the purpose of properly orienting the terminal 2 with respect thereto. The plate 42 extends slightly above the free end 39 and thus affords some protection for the locking tongue 38. The forward end 37 of the sleeve 4 has projecting therefrom, obliquely inwardly of the sleeve 4, four retaining flanges 44 and at its rear end 45, a pair of opposed clinching ears 46. The sleeve 4 is assembled to the socket terminal 2 by inserting the latter with its forward end 24 leading, through the rear end 45 of the sleeve 4 until the forward end 24 abuts the flanges 44, and then clinching the ears 46 about the transition portion 9 forwardly of a pair of upstanding projections 48 thereof. The sleeve 4 is thus fixedly attached to the terminal 2 since the ears 46 lie between the projections 48 and the base 12 of the terminal 2.

When a square cross section electrical pin P having a tapered leading end portion T as shown in Figure 15A, is inserted through the forward end 24 of the terminal 2. Each of the four sides of the pin P is engaged by a respective contact surface 26, as shown in Figure 15, so that the parts 18 and 20 of each spring 14 are splayed slightly apart, flexing resiliently about the fold 21. By virtue of the slots 28, the connected parts 18 and 20 of the contact springs 14 can flex apart from one another without undue resistance, so that the insertion force of the pin P and the contact force exerted by the contact surfaces 26 against the pin P are held to an acceptable level.

Said contact and insertion forces can easily and accurately be predetermined for given pin cross-sectional dimensions by appropriately selecting the dimensions of the slots 28' in the blank 10.

The contact force exerted by the surfaces 26 against the sides of the pin P should be made high enough to provide satisfactory electrical contact between the surfaces 26 and the sides of the pin P without the insertion force of the pin P being unduly high.

The flanges 44 of the sleeve 4 act to restrain overstress of the contact springs 14 should an oversized pin be inserted into the socket 6 or should a pin be inserted into the socket 6 in misalignment therewith.

Preferably, the base 12 is laser welded, at positions x indicated in broken lines 14 in Figure 3, to provide a more stable support for the contact springs 14, the sleeve 4 also being preferably laser welded at positions Y indicated in broken lines in Figures 6 and 7, for improved protection of the contact springs 14 against overstressing.

Claims

1. An electrical socket terminal (2) comprising an elongate stamped and formed metal socket (6) having a tubular base (12) from one end (13) of which projects a pair of elongate contact springs (14), which extend in a direction away from said base (12) and have contact surfaces (26) proximate to a forward end (24) of the socket (6), remote from the base (12), and which extend towards each other to grip an electrical pin (P) inserted between the contact surfaces (26) from said forward end (24); characterized in that each contact spring (14) is of substantially L-shaped cross section and thus has two parts (18 and 20) extending transversely of each other as seen in cross section, each part (18 and 20) being formed with one of said contact surfaces (26), the two parts (18 and 20) of each contact spring (14) being divided by a slot (28) extending longitudinally

of the contact spring (14), between the contact surfaces (26) thereof, and said base (12).

2. A terminal according to claim 1, characterized in that said contact springs (14) are two in number and are arranged in rotational symmetry. 5
3. A terminal according to claim 1 or 2, characterized in that the parts (18 and 20) of each contact spring (14) extend at right angles to each other and are of equal dimensions. 10
4. A terminal according to claim 1, 2 or 3, characterized in that each slot (28) extends from a position proximate to the contact surfaces (26) of the respective contact spring (14), up to said base (12). 15
5. A terminal according to any one of the preceding claims, characterized in that the contact surfaces (26) are constantly spaced from each other about the internal periphery of the socket (6). 20
6. A terminal according to any one of the preceding claims, characterized in that the tubular base (12) is of square cross section, each contact spring (14) extending from adjacent forward edges (15 and 19) of the base (12). 25
7. A terminal according to any one of the preceding claims, characterized in that the socket is surrounded by a protective sleeve (4) which is of square cross section and which is secured to said base (12), a wall (36) of the sleeve (4) having a locking tongue (38) struck out therefrom and projecting obliquely away from said wall (36), an adjacent wall (40) of the sleeve (4) having a keying extension (42) projecting therefrom at right angles to the first wall (36) and extending beyond the free end (39) of the locking lance (38). 30
8. A terminal according to claim 7, characterized in that at one end thereof the sleeve (4) has extending obliquely from each wall thereof and inwardly of the sleeve (4), a flange (44) projecting over said forward end (24) of the socket (6) to restrain overstress of the contact springs (14). 35
9. A terminal according to claim 8, characterized in that a wire connecting portion (8) extending from the opposite end of the socket (6) is connected thereto by a transition portion (9) of the socket terminal (2), the sleeve (4) having a pair of ears (46) clinched to the transition por- 40

tion (9).

10. A terminal according to any one of the preceding claims, characterized in that said base (12) has been laser welded better to support the contact springs (14). 45
11. A terminal according to claim 7, characterized in that the protective sleeve (4) has been laser welded better to restrain overstress of the contact springs (14). 50

Patentansprüche

1. Elektrischer Buchsenanschluß (2) mit einer länglichen gestanzten und geformten Metallbuchse (6) mit einer rohrförmigen Basis (12), Von deren einem Ende (13) ein Paar längliche Kontaktfedern (14) vorstehen, die sich in einer Richtung von der Basis (12) weg erstrecken und Kontaktflächen (26) aufweisen, die dem vorderen Ende (24) der Buchse (6) benachbart, von der Basis (12) abgelegen, sind und die sich aufeinander zu erstrecken, um einen zwischen die Kontaktflächen (26) von dem vorderen Ende (24) aus eingesetzten elektrischen Stift (P) zu erfassen, **dadurch gekennzeichnet**, daß jede Kontaktfeder (14) einen im wesentlichen L-förmigen Querschnitt aufweist und somit zwei Teile (18 und 20) aufweist, die sich gesehen im Querschnitt quer zueinander erstrecken, wobei jeder Teil (18 und 20) mit einer der Kontaktflächen (26) ausgebildet ist und die beiden Teile (18 und 20) jeder Kontaktfeder (14) durch einen Schlitz (28) unterteilt sind, der sich in Längsrichtung der Kontaktfeder (14) zwischen deren Kontaktflächen (26) und der Basis (12) erstreckt. 55
2. Anschluß nach Anspruch 1, **dadurch gekennzeichnet**, daß die Kontaktfedern (14) zwei Federn sind und rotationssymmetrisch angeordnet sind.
3. Anschluß nach Anspruch 1 oder 2, **dadurch gekennzeichnet**, daß sich die Teile (18 und 20) jeder Kontaktfeder (14) unter rechten Winkeln zueinander erstrecken und gleiche Abmessungen aufweisen.
4. Anschluß nach Anspruch 1, 2 oder 3, **dadurch gekennzeichnet**, daß sich jeder Schlitz (28) von einer Stelle in der Nähe der Kontaktflächen (26) der zugehörigen Kontaktfeder (14) aus zu der Basis (12) hin erstreckt.
5. Anschluß nach irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet**,

daß die Kontaktflächen (26) um den inneren Umfang der Buchse (6) konstant von einander beabstandet sind.

6. Anschluß nach irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet**, daß die rohrförmige Basis (12) einen quadratischen Querschnitt aufweist, wobei sich jede Kontaktfeder (14) von benachbarten vorderen Rändern (15 und 19) der Basis (12) erstreckt. 5
10
7. Anschluß nach irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet**, daß die Buchse von einer Schutzhülse (4) umgeben ist, die einen quadratischen Querschnitt aufweist und an der Basis (12) befestigt ist, wobei eine Wand (36) der Hülse (4) eine Verriegelungszunge (38) aufweist, die dort ausgestanzt ist und schräg von der Wand (36) weg vorsteht, und eine benachbarte Wand (40) der Hülse (4) eine Verkeilungsverlängerung (42) aufweist, die von dort unter rechten Winkeln zu der ersten Wand (36) vorsteht und sich über das freie Ende (39) der Verriegelungszunge (38) hinaus erstreckt. 15
20
8. Anschluß nach Anspruch 7, **dadurch gekennzeichnet**, daß die Hülse (4) an ihrem einen Ende einen sich schräg von jeder Wand weg und zum Inneren der Hülse (4) erstreckenden Flansch (44) aufweist, der über das vordere Ende (24) der Buchse (6) vorsteht, um eine Überbeanspruchung der Kontaktfedern (14) zu verhindern. 25
9. Anschluß nach Anspruch 8, **dadurch gekennzeichnet**, daß ein Kabelanschlußabschnitt (8), der sich von dem gegenüberliegenden Ende der Buchse (6) aus erstreckt, dort mittels eines Übergangsabschnitts (9) des Buchsenanschlusses (2) angeschlossen ist, wobei die Hülse (4) ein Paar Ohren (46) aufweist, die an dem Übergangsabschnitt (9) angepreßt sind. 30
35
40
10. Anschluß nach irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet**, daß die Basis (12) zur besseren Abstützung der Kontaktfedern (14) lasergeschweißt ist. 45
11. Anschluß nach Anspruch 7, **dadurch gekennzeichnet**, daß die Schutzhülse (4) zur besseren Verhinderung einer Überlastung der Kontaktfedern (14) lasergeschweißt ist. 50

Revendications

1. Borne électrique (2) à douille comportant une douille métallique allongée découpée et for-

mée (6) ayant une base tubulaire (12) d'une extrémité (13) de laquelle font saillie une paire de ressorts de contact allongés (14) qui s'étendent dans une direction s'éloignant de ladite base (12) et qui ont des surfaces de contact (26) proches d'une extrémité avant (24) de la douille (6), éloignée de la base (12), et qui s'étendent l'une vers l'autre pour pincer une broche électrique (P) insérée entre les surfaces de contact (26) depuis ladite extrémité avant (24) ; caractérisée en ce que chaque ressort (14) de contact est de section transversale de forme sensiblement en L et comporte donc deux parties (18 et 20) s'étendant transversalement l'une à l'autre telles que vues en coupe transversale, chaque partie (18 et 20) étant formée de façon à présenter l'une desdites surfaces de contact (26), les deux parties (18 et 20) de chaque ressort (14) de contact étant séparées par une fente (28) s'étendant longitudinalement au ressort (14) de contact, entre ses surfaces (26) de contact, et ladite base (12).

2. Borne selon la revendication 1, caractérisée en ce que lesdits ressorts de contact (14) sont au nombre de deux et sont agencés en symétrie de rotation. 25
3. Borne selon la revendication 1 ou 2, caractérisée en ce que les parties (18 et 20) de chaque ressort (14) de contact s'étendent à angle droit entre elles et sont de dimensions égales. 30
4. Borne selon la revendication 1, 2 ou 3, caractérisée en ce que chaque fente (28) s'étend depuis une position proche des surfaces de contact (26) du ressort de contact respectif (14) jusqu'à ladite base (12). 35
40
5. Borne selon l'une quelconque des revendications précédentes, caractérisée en ce que les surfaces de contact (26) sont espacées de façon constante l'une de l'autre le long de la périphérie intérieure de la douille (6). 45
6. Borne selon l'une quelconque des revendications précédentes, caractérisée en ce que la base tubulaire (12) est de section transversale carrée, chaque ressort (14) de contact s'étendant à partir de bords avant adjacents (15 et 19) de la base (12). 50
7. Borne selon l'une quelconque des revendications précédentes, caractérisée en ce que la douille est entourée d'un manchon protecteur (4) qui est de section transversale carrée et qui est fixée à ladite base (12), une paroi (36) du

manchon (4) comportant une languette (38) de verrouillage qui est découpée dans cette paroi et qui fait saillie obliquement à l'écart de ladite paroi (36), une paroi adjacente (40) du manchon (4) comportant une saillie (42) de clavetage qui en fait saillie perpendiculairement à la première paroi (36) et qui s'étend au-delà de l'extrémité libre (39) de la languette (38) de verrouillage.

5

10

8. Borne selon la revendication 7, caractérisée en ce que, à l'une de ses extrémités, le manchon (4) comporte, s'étendant obliquement de chacune de ses parois et vers l'intérieur de ce manchon (4), une ailette (44) qui fait saillie au-dessus de ladite extrémité avant (24) de la douille (6) afin de s'opposer à une contrainte excessive des ressorts de contact (14).

15

9. Borne selon la revendication 8, caractérisée en ce qu'une partie (8) de connexion de fil s'étendant depuis l'extrémité opposée de la douille (6) est reliée à celle-ci par une partie (9) de transition de la borne à douille (2), le manchon (4) comportant deux pattes (46) agrafées sur la partie (9) de transition.

20

25

10. Borne selon l'une quelconque des revendications précédentes, caractérisée en ce que ladite base (12) a été soudée au laser pour mieux supporter les ressorts (14) de contact.

30

11. Borne selon la revendication 7, caractérisée en ce que le manchon protecteur (4) a été soudé au laser pour mieux s'opposer à une contrainte excessive des ressorts (14) de contact.

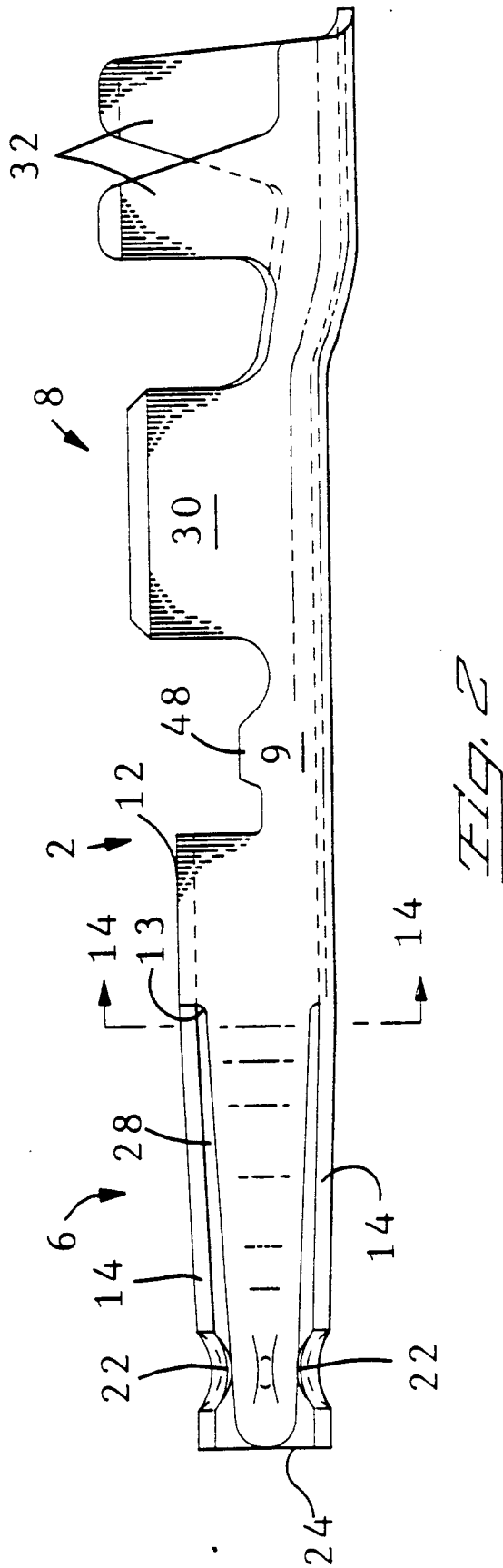
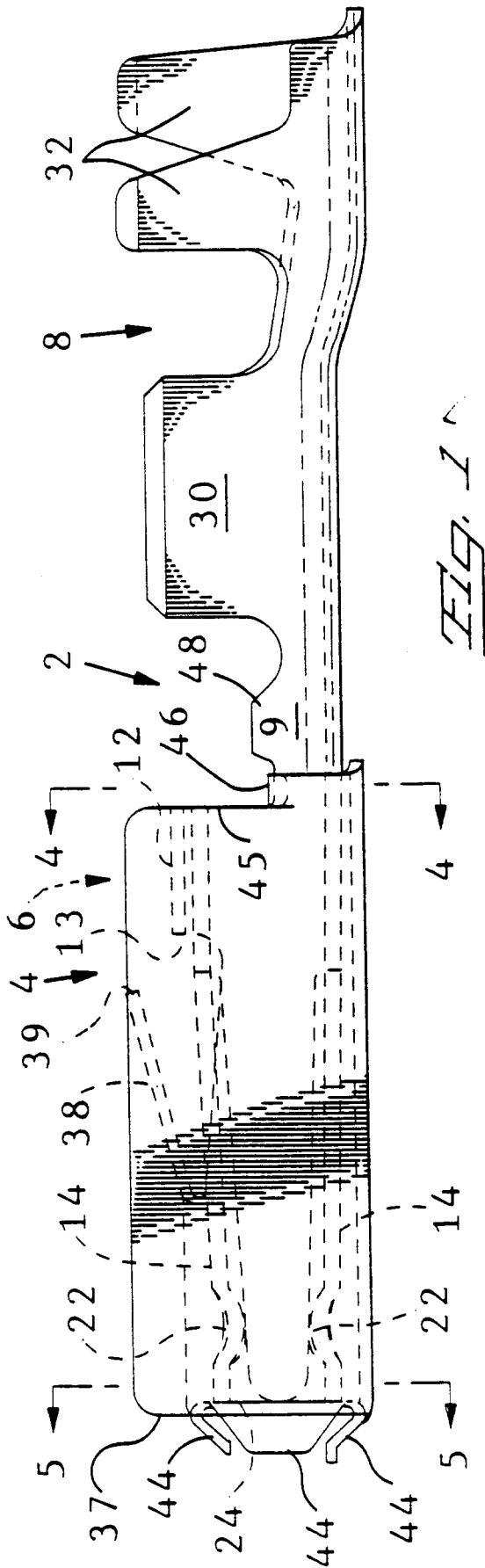
35

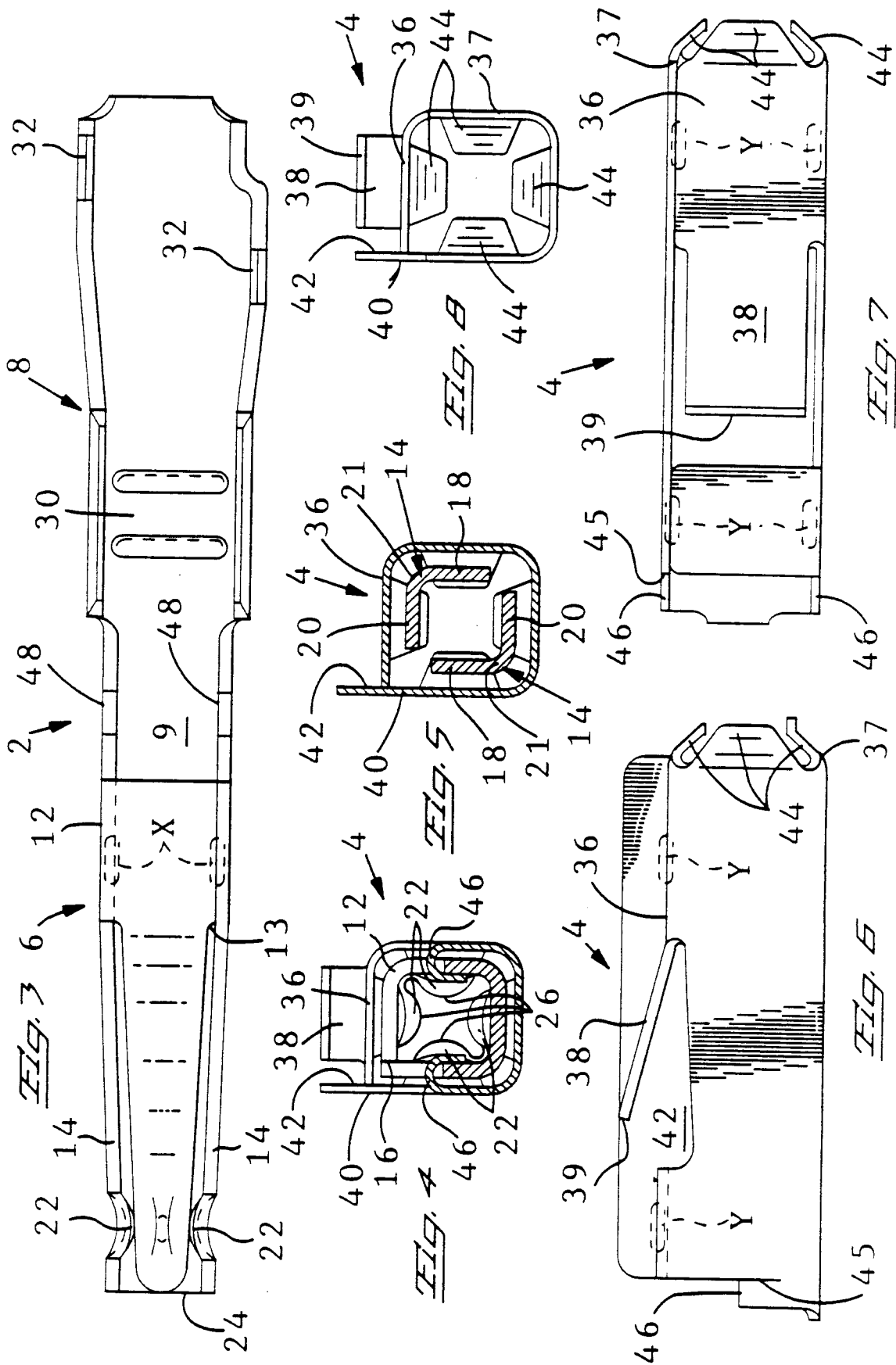
40

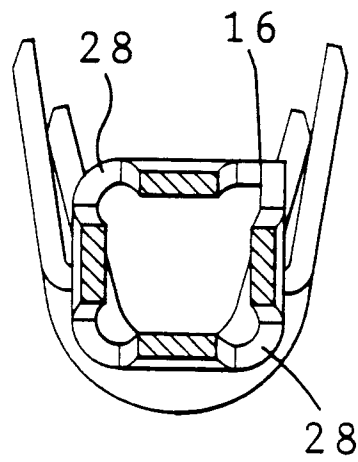
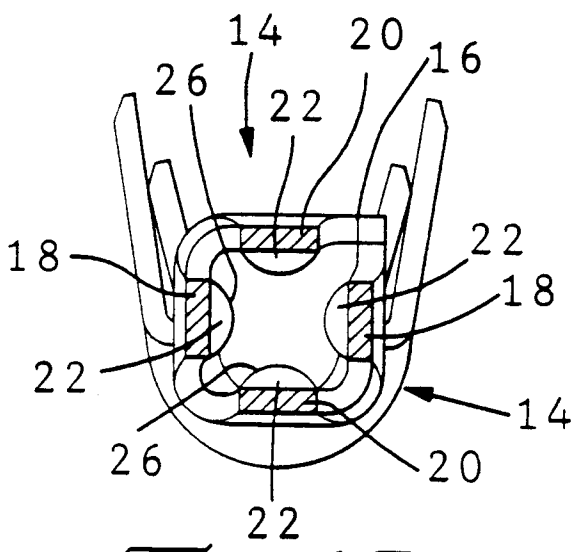
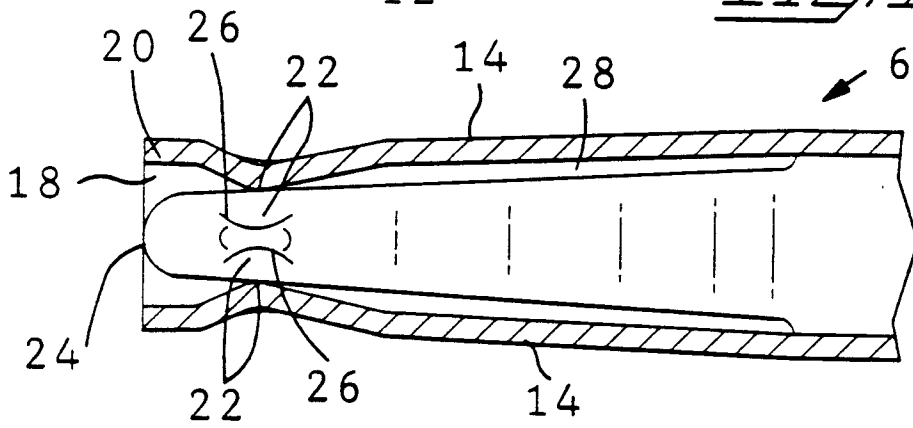
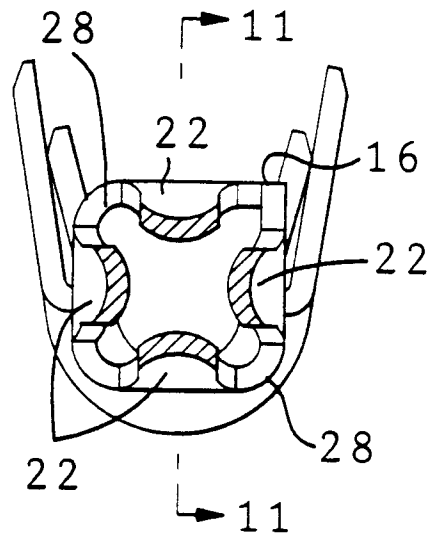
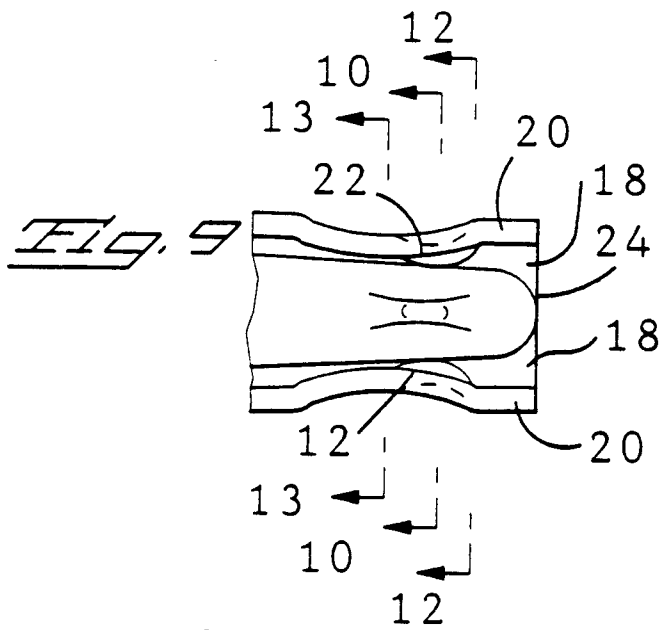
45

50

55







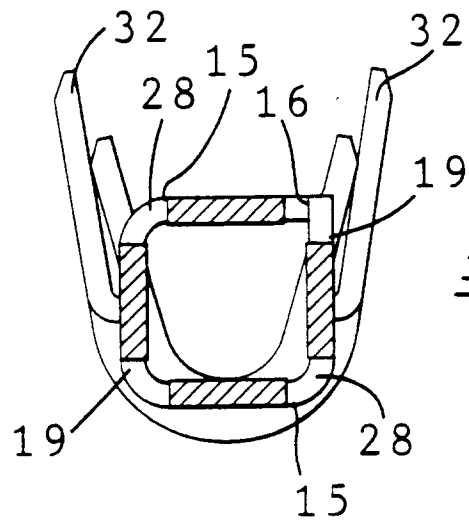


Fig. 14

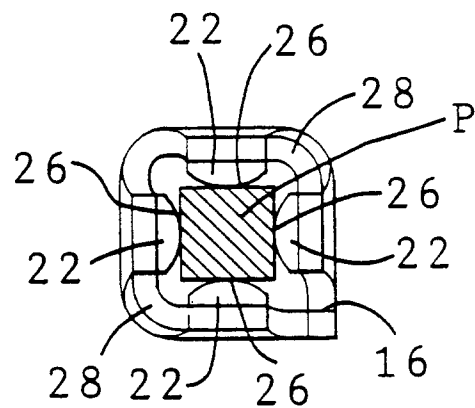
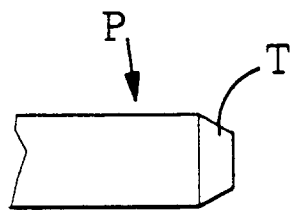


Fig. 15

Fig. 15 A

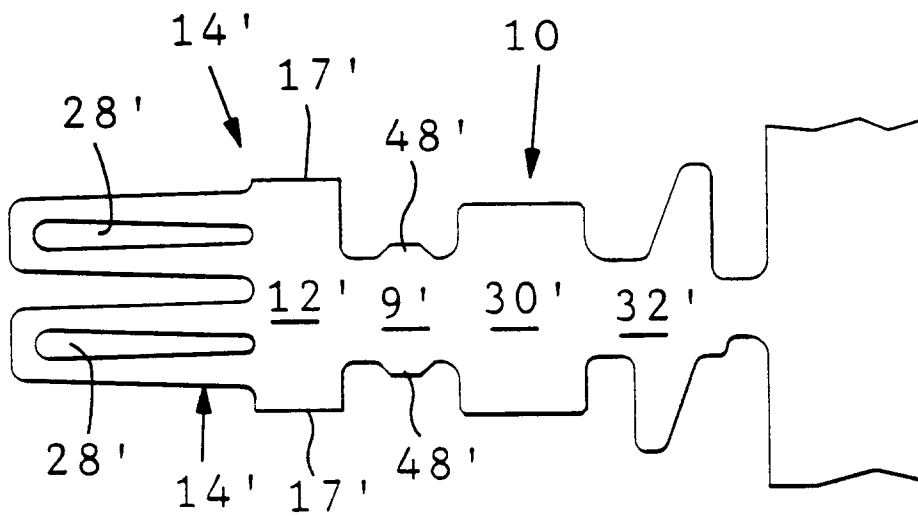


Fig. 16