

EUROPEAN PATENT APPLICATION

Application number: 84302507.3

Int. Cl.³: **H 01 R 13/115**

Date of filing: 12.04.84

Priority: 18.04.83 US 485763
23.12.83 US 564670

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Date of publication of application:
24.10.84 Bulletin 84/43

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BE DE FR GB IT NL SE

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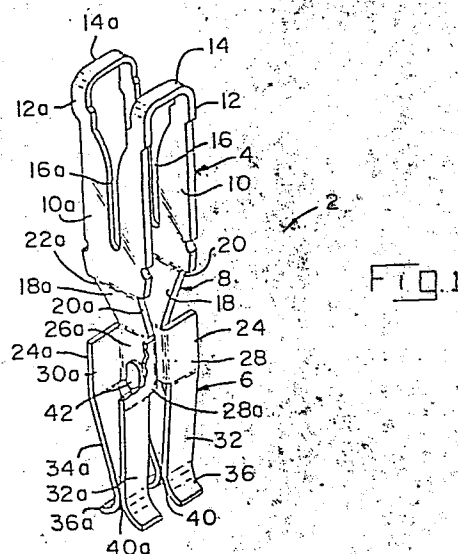
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Wire-slot type electrical terminal intended for mating with a terminal tab.

Stamped and formed electrical terminal (2) has a conductor-receiving portion (4) at one end and a mating or contact portion (6) at the other end. A transition section (8) is provided between the conductor-receiving portion (4) and the contact portion (6), the transition section comprising flat plates (18, 18a) which extend from the aligned parallel plates (10, 10a) of the conductor-receiving portion and slope towards a medial plane which is parallel to and between the plates of the conductor-receiving portion. The contact portion (6) comprises first (32, 34) and second (32a, 34a) pairs of contact arms which extend from the flat inclined plates (18, 18a) of the transition section (8) and which are joined at their ends by U-shaped sections (24, 24a) which are in back-to-back relationship. A locking ear (42) secures the U-shaped sections to each other.



WIRE-SLOT TYPE ELECTRICAL TERMINAL
INTENDED FOR MATING WITH A TERMINAL TAB

This invention relates to electrical terminals of the type having aligned parallel plate-like members at one end and
5 conductor-receiving slots in the plate-like members and two pairs of contact arms at the other ends thereof with a transition section between the plate-like members and the contact portion.

U.S. Patent 4,159,158 describes a sheet metal electrical terminal comprising parallel spaced apart plate-like members
10 which have aligned conductor-receiving slots. The terminal further has a contact portion comprising side-by-side arms that extend from the plate-like members and which engage a complementary contact terminal when the two terminals are mated. Terminals of the type shown in U.S. Patent 4,159,158
15 have come into widespread usage and are highly regarded for the reason that a conductor can be connected to the terminal by merely moving the conductor laterally of its axis and into the conductor-receiving slots. A variety of tools and automatic machines have been developed for connecting individual
20 conductors to terminals contained in an insulating housing. Terminals of the general type described in the above-identified U.S. patent thus permit manufacture of electrical harnesses at minimum cost and in a variety of forms.

Presently available terminals of the general type shown in
25 U.S. Patent 4,159,158 are somewhat limited as regards the characteristics of the contact portion of the terminal. The terminal shown in that patent has a contact portion comprising side-by-side arms which receive a complementary terminal post between their opposed surfaces. Because of the manner in
30 which these terminals are manufactured, the side-by-side arms cannot conveniently be resiliently biased against each other and the terminal is therefore limited with regard to the amount of contact force which can be developed when the terminal is mated with a complementary terminal. Under some circumstances, a
35 relatively high contact force is required and existing terminals of

the type shown in U.S. Patent 4,159,158 are incapable of satisfying the requirement of a high contact force.

In accordance with one aspect thereof, the invention is directed to the achievement of a terminal of the general type disclosed in U.S. Patent 4,159,158 having contact arms which are resiliently biased against each other thereby to provide a relatively high contact force when the terminal is mated with a complementary terminal.

A further shortcoming of terminals of the general type shown in U.S. Patent 4,159,158 is that when such terminals are assembled to a multiconductor connector, the terminals must be positioned in side-by-side spaced apart relationship and the contact portions of the terminals are such that the connector cannot be designed to be mated with a plurality of simple terminal tabs which are disposed in parallel planes with each terminal located relatively close to its immediate neighbors. It is common practice in the manufacture of many electrical devices to provide simple rectangular tabular tabs in spaced apart relationship with the tabs in parallel planes and a connector for an array of tabs must be capable of being mated with the tabs.

In accordance with a further aspect thereof, the present invention is directed to the achievement of a terminal which can be assembled to a connector housing and which can be mated with closely spaced terminal tabs in side-by-side relationship with the tabs in parallel spaced apart planes.

The invention comprises a stamped and formed electrical terminal of the type having a conductor-receiving end and a contact end, a conductor-receiving portion which extends from the conductor-receiving end, a contact portion which extends from the contact end, and a transition portion which is between the conductor-receiving portion and the contact portion. The conductor-receiving portion comprises first and second aligned flat plate-like members which are connected to each other, the plate-like members having aligned conductor-receiving slots so that a conductor can be moved laterally of its axis and into the

conductor-receiving slots. The transition portion and the contact portion extend from the first and second plate-like members. The terminal is characterized in that the transition portion comprises first and second extensions of the plate-like members and first and second U-shaped sections. The first and second extensions extend from the first and second plate-like members convergently towards a medial plane that is parallel to, and between, the first and second plate-like members. Each of the U-shaped sections comprises a web and sidewalls, the webs extending from the extensions and being on each side of the medial plane. The sidewalls extend away from the medial plane. The contact portion comprises first and second pairs of contact arms which extend from the sidewalls of the first and second U-shaped sections. The arms of each pair of contact arms have free ends which have opposed contact zones whereby a conductor which is in the conductor-receiving slots will lie in the plane of a terminal tab which is inserted between the contact zones of the first and second pairs of contact arms.

A further embodiment is characterized in that the transition sections are secured to each other by an ear which extends from the web of one of the U-shaped sections and which is interlocked with the web of the other U-shaped section.

FIGURE 1 is a perspective view of an electrical terminal in accordance with the invention;

FIGURE 2 is a perspective view of a flat blank from which the terminal of Figure 1 is produced by forming operations;

FIGURES 3, 4 and 5 are views similar to Figure 2 but illustrating the successive forming operations which are performed on the blank prior to bending the blank into the shape of the finished terminal; and

FIGURE 6 is a view showing a plurality of terminal tabs on a support, such as a circuit board, and showing a connector containing terminals in accordance with the invention in alignment with the terminal tabs.

Referring first to Figure 1, a terminal 2 in accordance with the invention is of stamped and formed sheet metal, such as brass, and has a conductor-receiving portion 4, a contact or mating portion 6, and a transition section 8 which is between the conductor-receiving portion and the contact portion.

The conductor-receiving portion comprises a pair of parallel plate-like members 10, 10a which are connected together at their upper ends 12 (as viewed in Figure 1) by spaced-apart connecting straps 14. The plate-like members are provided with aligned wire-receiving slots 16, 16a so that a wire 50 can be connected to the terminal by moving the wire laterally of its axis and into the slots as shown in Figure 6.

The transition section 8 comprises first and second flat extensions 18, 18a of the first and second plate-like members 10, 10a. The extensions 18, 18a are inclined inwardly towards each other and towards a medial plane which extends parallel to the planes of the plate-like members 10, 10a and is midway between the plate-like members. The extensions 18, 18a have converging side edges 20, 20a and 22, 22a which are integral with the flat web portions 26, 26a of U-shaped sections 24, 24a. The U-shaped sections have sidewalls 28, 30, 28a, 30a extending from the webs 26, 26a, the sidewalls extending in opposite directions from the side edges of the web portions. The web portions are parallel to each other and are on each side of, and adjacent to, the medial plane.

First and second pairs of contact arms 32, 34, 32a, 34a extend from the sidewalls of the U-shaped sections 24, 24a to the free ends 36, 36a of the terminal. The arms of each pair are inclined towards each other and are against each other in the vicinity of contact zones 40, 40a. The portions which extend beyond the contact zones are curved outwardly and away from each other to facilitate mating of the terminal with a terminal tab 52.

Terminals as shown in Figure 1 are produced by stamping and forming as shown in Figures 2 to 5. In these Figures, the

same reference numerals, differentiated by prime marks, are used to indicate the portions of the blank as are used to identify the parts of the finished terminal.

5 The terminals are produced in the form of continuous strip with the ends of each blank 2' integral with carrier strips 44, 44a. In addition it will be understood that each terminal is connected to the next adjacent terminals in the strip by additional carrier strips which extend from the connecting strips 14', Figure 2. These additional connecting strips or carrier
10 strips are not shown in the interest of clarity and facility. In the forming operation, the contact arms 32', 34', 32a', 34a' are first bent upwardly from the plane of the blank and the outer ends of the arms are curled downwardly as viewed in Figure 3. Thereafter, the triangular extensions 18', 18a' are bent as shown
15 in Figure 4 so that the U-shaped sections 24', 24a' are disposed in a plane which is parallel to but beneath the plane of the central portion of the blank. Thereafter, the sidewalls of the blank are bent upwardly as shown in Figure 5 to bring the contact zones 40, 40a against each other. When the final
20 bending operation is carried out as shown in Figure 5, the arms will be resiliently biased against each other so that a relatively high contact force will be achieved when the terminal is mated with a terminal tab 52.

In the final forming operation, the terminal is bent along
25 bend lines 46, 46a to place the first and second plate-like members 10, 10a in parallel spaced apart planes. Advantageously, a latching ear 42 extends from the web 26' and, after the final bending operation, this latching ear is bent through an angle of 180 degrees as shown in Figure 1 so that
30 the two sections of the terminal will be latched to each other.

Terminals as shown in Figure 1 are used with an insulating housing 48 that has the capability of accommodating a plurality of terminals 2 in side-by-side spaced apart relationship. As shown in Figure 6, the terminal tabs for which the terminal 2 is
35 intended are usually positioned in parallel spaced apart planes on

a support member 54. By virtue of the fact that the terminal 2 receives a tab 52 which is in a plane extending through the aligned slots 16, 16a, the terminals can be placed on relatively close centers in the connector housing 48.

5 It will be apparent from the foregoing that terminals in accordance with the invention can be produced by relatively simple stamping and forming operations involving only forming of the arms 32, 34, 32a, 34a, bending of the sidewalls as shown in Figure 5, and then bending of the first and second plate-like
10 members to produce the terminal in Figure 1. It should be noted that the sidewalls 28, 30, 28a, 30a extend at an angle of substantially 90 degrees to their respective webs 26, 26a and this sidewall bending operation is carried out after the flat transition sections 18, 18a are bent downwardly as shown in
15 Figure 3. All of these bending operations can be carried out with relative ease in a progressive stamping and forming die. There is no necessity for forming operations which require the production of complex shapes in the transition zone.

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CLAIMS:

1. A stamped and formed electrical terminal (2) of the type having a conductor-receiving end and a contact end, a conductor-receiving portion (4) extending from the conductor-receiving end and a contact portion (6) extending from the contact end, and a transition portion (8) between the conductor-receiving portion and the contact portion, the conductor-receiving portion (4) comprising first and second aligned flat plate-like members (10, 10a) which are connected to each other, the plate-like members having aligned conductor-receiving slots (16, 16a) so that a conductor (50) can be moved laterally of its axis and into the conductor-receiving slots, the transition portion (8) and the contact portion (6) extending from the first and second plate-like members (10, 10a), the terminal being characterized in that:

the transition portion (8) comprises first (18) and second (18a) extensions of the plate-like members (10, 10a) and first and second U-shaped sections (24, 24a), the first and second extensions (18, 18a) extending from the first and second plate-like members (10, 10a) convergently towards a medial plane that is parallel to, and between, the first and second plate-like members,

each of the U-shaped sections (24, 24a) comprising a web (26, 26a) and sidewalls (30, 30a), the webs extending from the extensions (18, 18a) and being on each side of the medial plane, the sidewalls (30, 30a) extending away from the medial plane,

the contact portion (6) comprising first and second pairs (32, 34, 32a, 34a) of contact arms which extend from the sidewalls (28, 30, 28a, 30a) of the first and second U-shaped sections, the arms of each pair of contact arms having free ends (36), the free ends having opposed contact zones (40) whereby

a conductor (50) which is in the conductor-receiving slots (16, 16a) will lie in the plane of a terminal tab (52) which is inserted

between the contact zones (40) of the first and second pairs of contact arms (32, 34, 32a, 34a).

2. A stamped and formed electrical terminal (2) as set forth in Claim 1 characterized in that the transition sections (8) are secured to each other.

3. A stamped and formed electrical terminal (2) as set forth in Claim 2 characterized in that the transition sections (8) are secured to each other by an ear (42) extending from the web (26) of one of the U-shaped sections (24) which is interlocked with the web (26a) of the other U-shaped section (24a).

4. A stamped and formed electrical terminal (2) as set forth in either of Claims 1 or 3 characterized in that the first and second plate-like members (10, 10a) are connected to each other by connecting straps (14, 14a) which extend between, and are integral with, the first and second plate-like members.

5. A stamped and formed electrical terminal (2) as set forth in Claim 4 characterized in that the first and second extensions (18, 18a) are flat and each extension has convergent side edges (20, 22, 20a, 22a).

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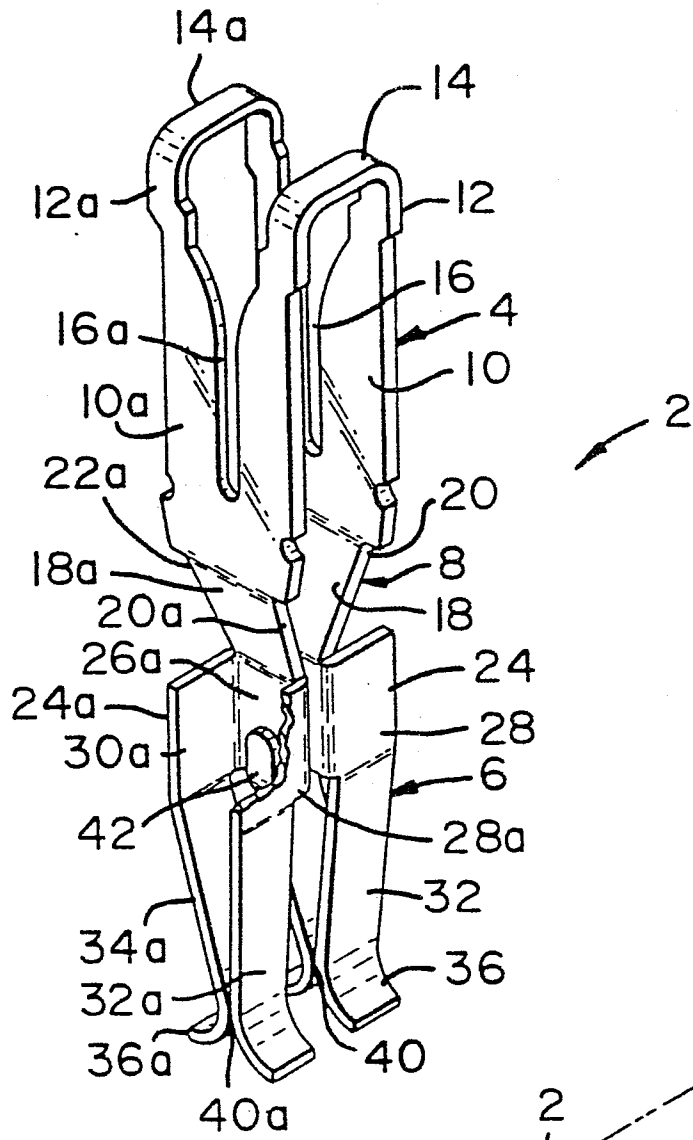


FIG. 1

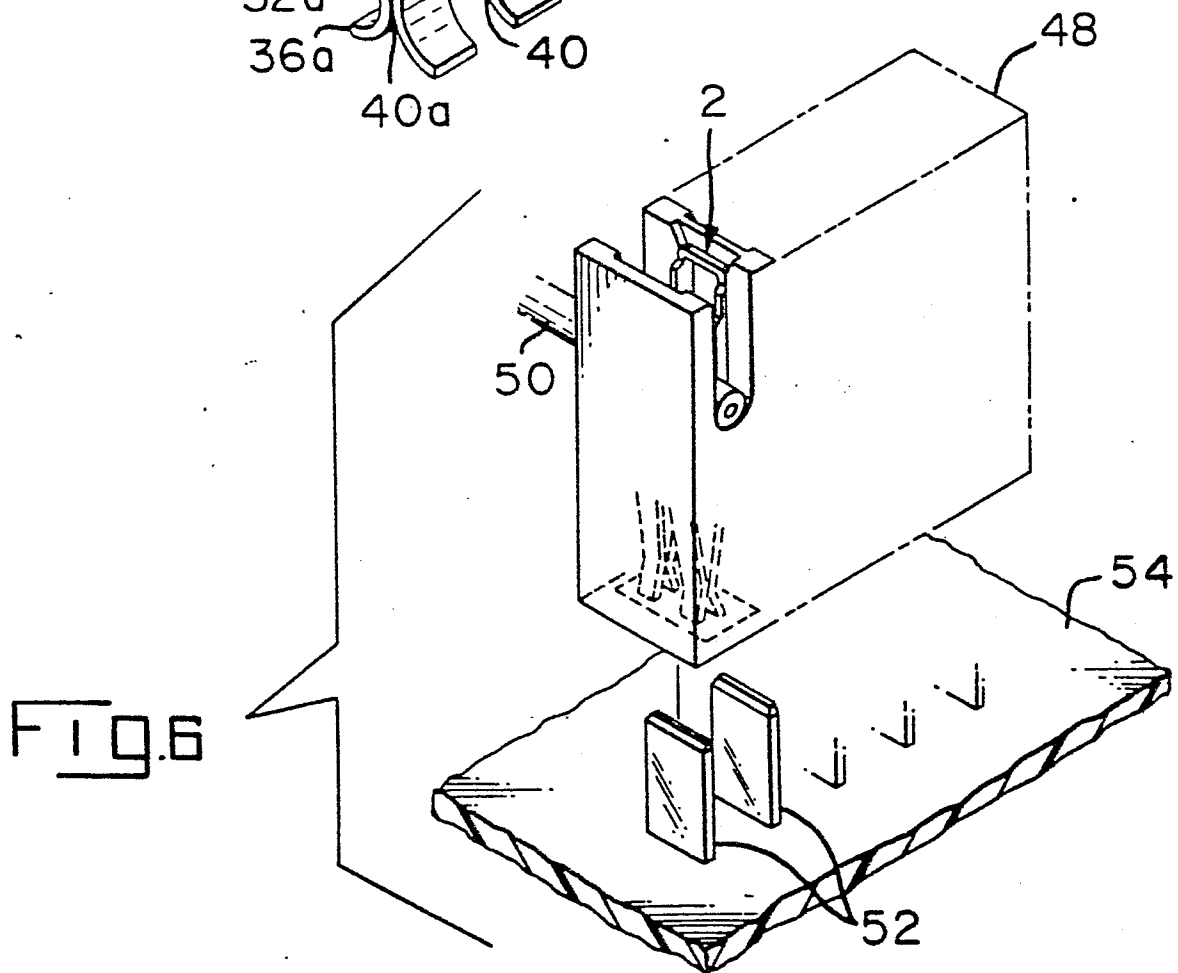
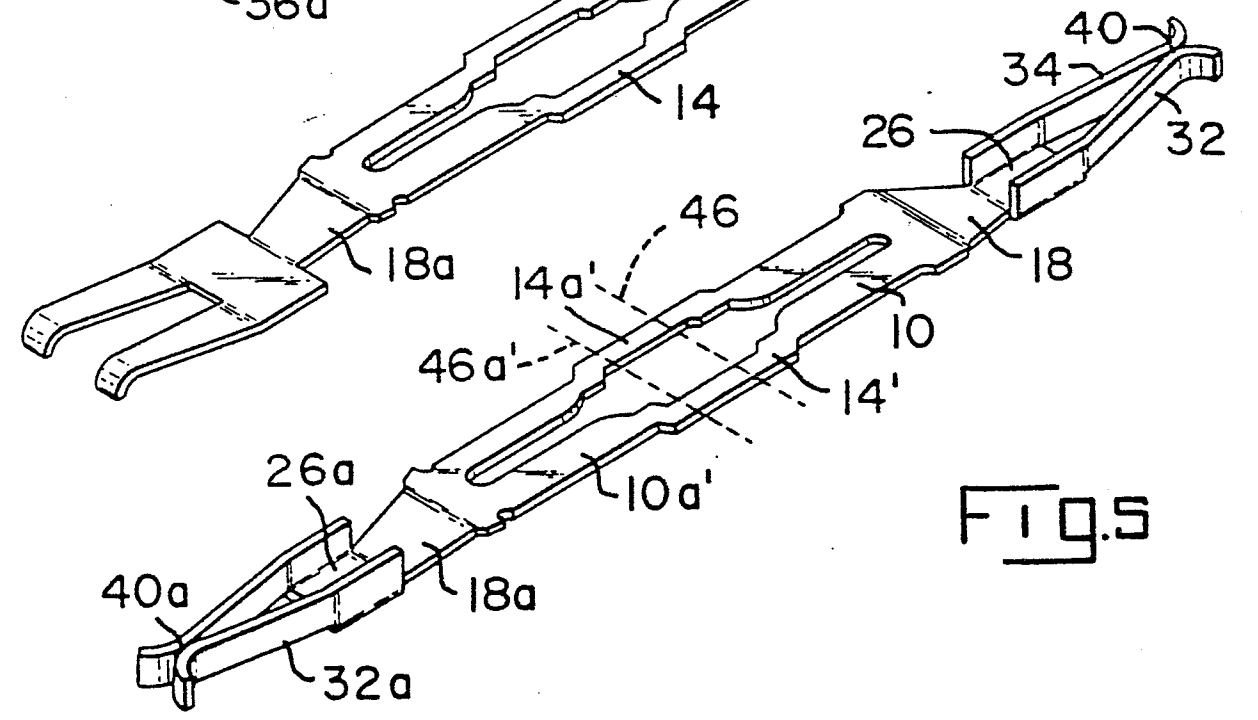
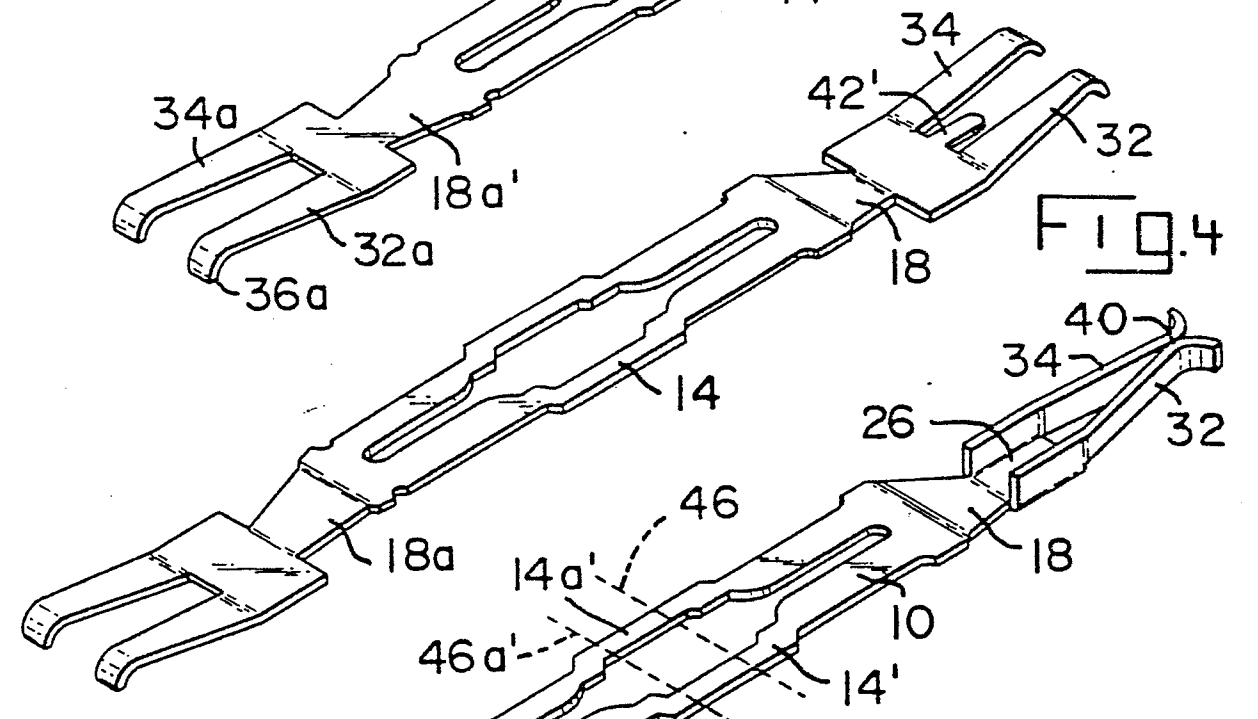
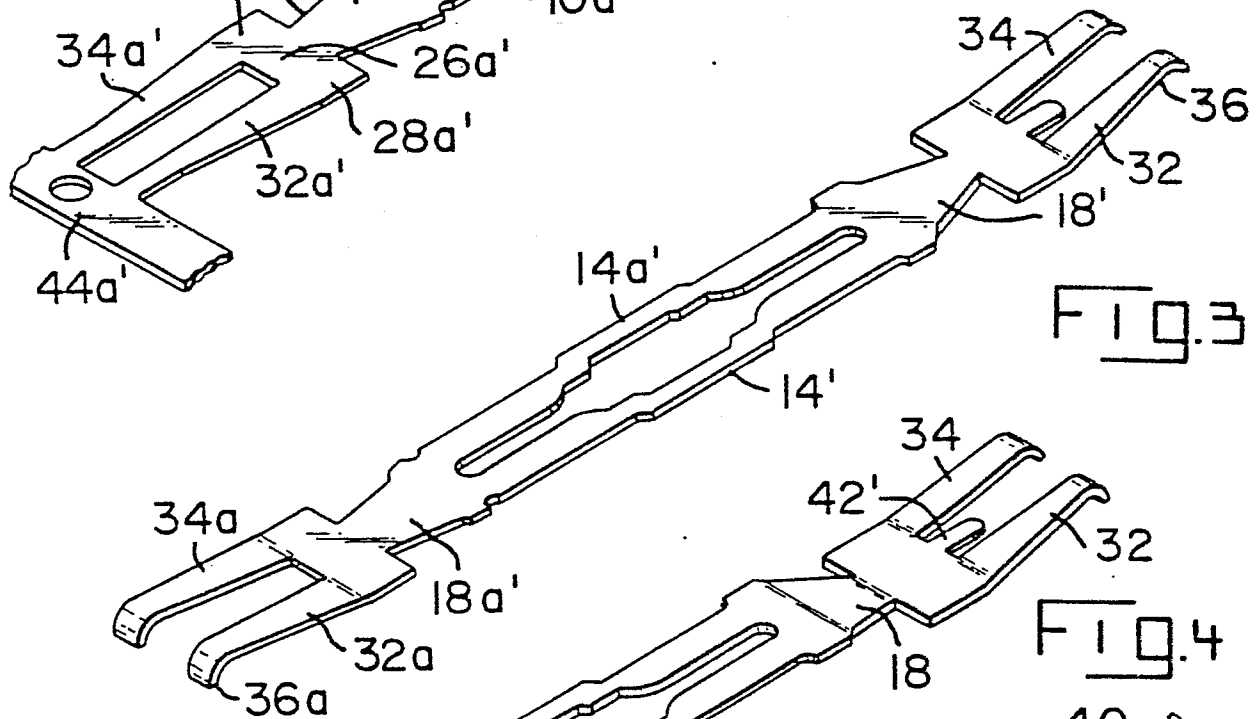
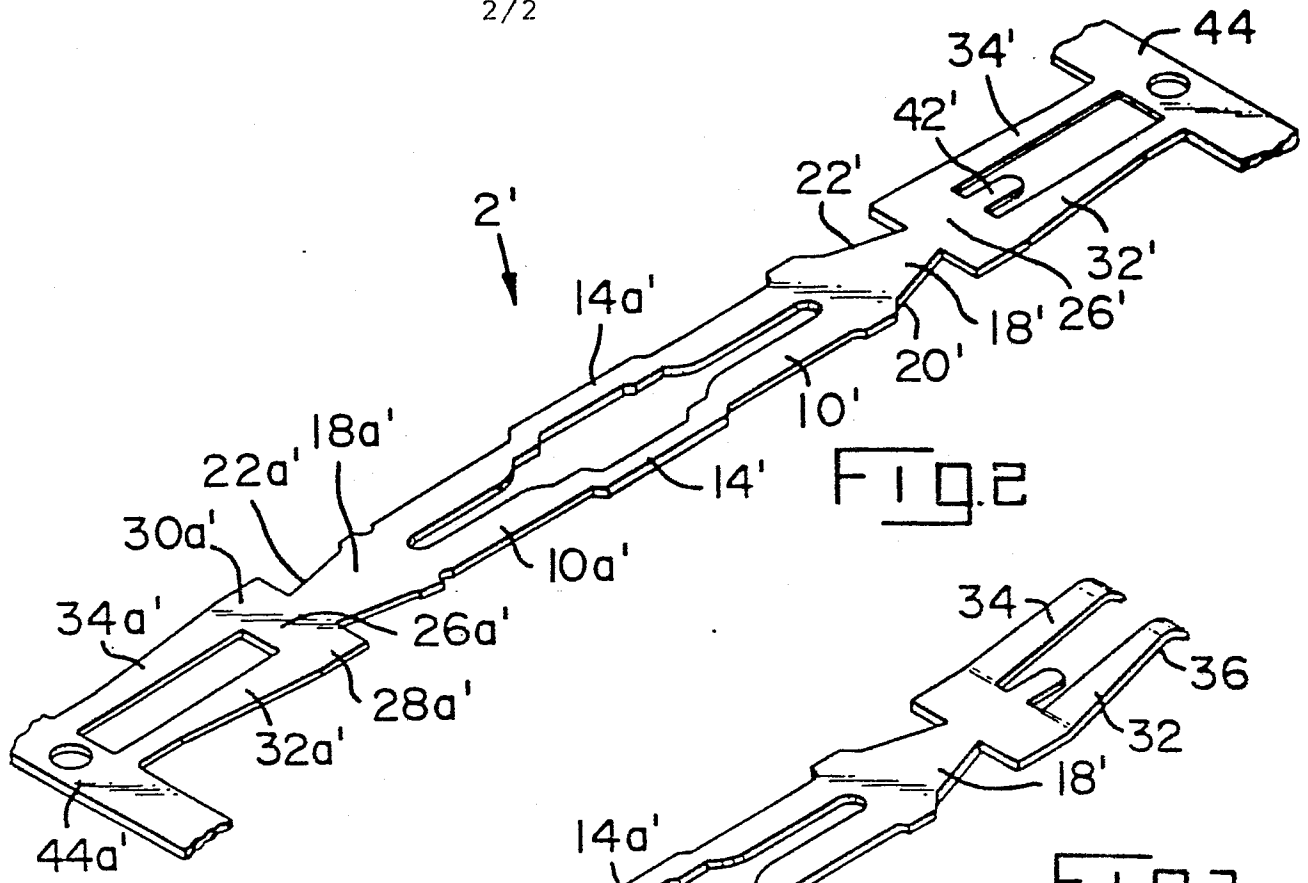


FIG. 6





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 7)
A	EP-A-0 013 308 (GROTE & HARTMANN) * Page 1, line 19 - page 2, line 11; figures *	1	H 01 R 13/115
A	GB-A-2 050 712 (SOURIAU) * Figure 5 *	1	
A	GB-A-2 084 814 (UTILUX PTY.)		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 7)
			H 01 R
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 06-06-1984	Examiner RAMBOER P.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>& : member of the same patent family, corresponding document</p>			