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(54) Low insertion force receptacle contact.

(57) An electrical receptacle contact (2) includes a mating section (4), a crimp section (6) and a strain relief section (8). The mating section (4) includes a base section (10) having a central section (22), and contact arms (20) stamped therefrom. The receptacle mating section (4) further includes two upstanding sidewalls (12) which are curled to form radiused sections (14). Contact arms (16) extend from the radiused sections (14) and are thereafter reversely bent once again to form radiused portions (18).

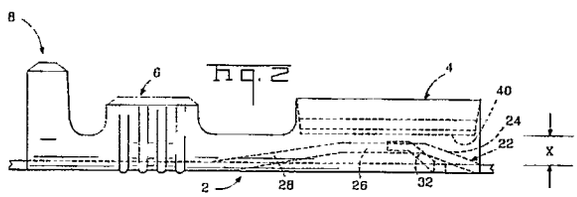

Fig. 2

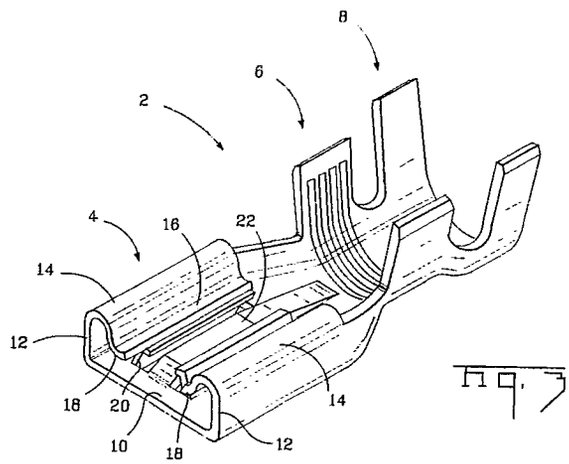

Fig. 3

EP 0 429 177 A1

LAW INSERTION FORCE RECEPTACLE CONTACT

The subject invention relates to a low insertion force terminal and more particularly to a receptacle contact which is profiled to receipt a mating flat tab contact.

There is shown in U.S. Patent 4,448,468 an electrical receptacle which is profiled to receive a flat tab contact. This contact shows a base section having sidewalls extending from the base portion which are curled back upon themselves. At the ends of the curled sidewalls are free edge portions. A latching tongue 26 is stamped from the base portion and includes an upwardly formed boss 40 which is profiled to lock in place in a through hole in the tab contact. The base portion also includes portions 38 which are located on each side of the tongue 26 and upstand toward, and closely spaced from, the free edge portions 24, thereby to increase the mating contact force with the tab contact. The latching tongue 40 is stamped from the base metal and is only integrally connected at the front fixed section 28. The rear of the latch member 26 is bent downwardly to form an ear 23 having a free end 34, which is movable to disengage the tab from the receptacle.

While the above mentioned receptacle contact is an acceptable design for increasing the mating contact force, the insertion force, due to the sliding friction over the large surface areas, remains high.

It is therefore an object of the invention to provide for an electrical receptacle contact having a high contact force, yet a low insertion force.

It is a further object of the invention to improve the wiping action between the receptacle and mating tab contact.

It is a further object to improve the lead-in to the receptacle to prevent stubbing.

The object of the invention was accomplished by designing an electrical contact of the type comprising a base section with upper arms upstanding from the base section and thereafter curled around downwardly towards the base portion. The contact is characterized in that the base portion of the terminal includes a stamped out central section which is axially extending along the base section, the central section being integral with the base section at the front and the rear, the central section comprising a front upwardly sloping section.

In the preferred embodiment the base section further includes contact arms stamped from the base section, which flank the central section. The arms are angled upwardly and bent at a position proximate the free end of the contact arms forming a radiused contact portion. The underside of the contact arm sections contains a dimple, which is on the axial centerline of the radiused contact portion which provides a line contact on the inner surface of the radiused contact portion. The front edges of the contact arms extend at an angle relative to the axial centerline, and sloping towards the central section from front to rear, such that every axial distance along the front edge of the contact arms is lower than the same representative axial distance along the sloped surface of the central section.

In the preferred embodiment, the free ends of the upper arms are reversely bent upwardly to form downwardly facing radiused contact portions. The outer surface of the upper arms includes a dimple at the tangent of the upper radiused portions which defines an axial line contact on the inner surface of the upper radiused portions. Preferably, the beginning of the front sloped section is axially proximate to the front edges of the upper arms. The central section further includes a flat section axially beyond the front sloped section, with a downwardly sloped section from the flat section returning to the base section.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings, in which:-

FIGURE 1 is a top plan view of the receptacle contact of the invention;

FIGURE 2 is a side plan view of the receptacle contact of the invention;

FIGURE 3 is an isometric view of the receptacle contact of the invention;

FIGURE 4 is a front plan view of the receptacle contact;

FIGURE 5 is a cross-sectional view through lines 5-5 of Figure 1;

FIGURE 6 is a cross-sectional view through lines 6-6 of Figure 7;

FIGURE 7 is a bottom plan view of the stamped flat blank.

With reference first to Figure 3, the electrical receptacle 2 comprises a mating front end section 4, a crimp section 6, and a strain relief section 8. The front mating section 4 includes a base section 10 with integral side walls 12 upstanding from the base section 10. The side wall sections 12 are then reversely bent to form radius sections 14, which project resilient arm sections 16 towards the base section 10. The resilient arm sections 16 are once again reversely bent upwardly which forms a downwardly extending arcuate contact section 18.

As shown in Figure 7, the contact is stamped from a blank sheet of metal to include flat stamped out arms 20′ which flank the central section 22′, and wing sections 30. It should be noted that the arms 20′ include dimples 34, while the wings 30 include dimples 36, formed by coining the metal,

thereby producing axial projections on the inside surfaces of the contact terminal 2. As best shown in Figure 6, the dimples 34 produce inner surfaces 38, while the dimples 36 produce inner surfaces 40.

With reference now to Figure 2, the receptacle 2, as stamped and formed from the flat blank shown in Figure 7, includes a central section 22 comprising an upward ramped section 24, a generally flat section 26, and a downwardly sloped section 28. As best shown in Figures 4 and 5, the flat base section 10 further includes contact arms 20 extending upwardly towards the axial centerline of the contact with free ends (Figure 5) bent downwardly, thereby forming radiused portions 23. The contact arms are formed such that the dimples 34 are on the axial centerline of the bend line between the arms 20 and the free ends. This positions the projections 38 on the inner surface of the contact at the bend line of the contact arms. Likewise, the dimples 36 are on the axial centerline of the tangent of the radiused portions 28 which positions the projections 40 in a downwardly facing direction, as shown best in Figure 5. In each case, the dimples 34, 36 produce a well defined linear contact surface along the direction of the mating tab insertion. It should be noted that the flat section 26 of the central section 22 is slightly higher, in the vertical direction (as viewed in Figure 4) than the upper contact surfaces 38.

The end result to the aforementioned design is that the receptacle has a low insertion force, has a high contact force, has excellent wiping action and has a good lead-in surface to prevent stubbing. With respect first to the lead-in surface, reference is made first to Figure 2, where the upward ramp section 24 is shown in side phantom. It should be noted that the resilient arm sections 16 extend almost all the way to the front of the terminal, that is very proximate to the position where the slope of the ramped section 24 begins. This provides for a large insertion area or target X (Figure 2) in which to insert the terminal.

Once the tab section is between the surfaces 24 and 38, continued insertion of the tab contact will force the tab contact to ride up the ramp 24 and into contact with the upper contact line surfaces 38. It should be noted from Figures 1, 2 and 7, that the sheared edge surfaces 32 begin at a root section 42 which is axially behind the front edge of either the base portion 10, or the resilient arms 16. The sheared edges 32 are also sheared at an angle relative to the axial centerline, the slope of the angle projecting towards the centerline or the central section 22, from the front of the terminal to the rear of the terminal. These sheared edges 32 being angled as described, prevent the tab from butting them upon insertion of the tab into the receptacle, because as shown in Figure 2, at any given axial distance along the sheared edge 32, the vertical height of the ramped surface 24 is always higher; thus the tab will ride on the ramp 24, not butt against the sheared edge 32.

With reference to Figures 2 and 5, it should be noted that the length of the central section 22 is much longer than that of the arms 16 and 20; which provides that the central section 22 is quite flexible, while the contact arms 16 and 20 are rather stiff. Thus, upon insertion of the tab into the receptacle 2, the central section 22 will flex downwardly, allowing the tab contact to make contact with the contact surfaces 38. Thus the insertion force is reduced, because the insertion force is generally along the surfaces 38 and 40, which are linear contact surfaces.

Claims

1. A stamped and formed electrical contact (2) of the type comprising a base section (10) with upper arms (16) upstanding from the base section and thereafter curled around downwardly towards the base section (10), the contact (2) being characterized in that:
the base section (10) of the terminal includes a stamped out central section (22) which is axially extending along the base section (10), the central section (22) being integral with the base section (10) at the front and the rear, the central section (22) comprising a front upwardly sloping section (24).

2. The contact (2) of claim 1, characterized in that the base section (10) further includes contact arms (20) stamped from the base section (10), which flank the central section (22).

3. The contact (2) of claim 2, characterized in that the arms (20) are angled upwardly and bent at a position proximate the free end of the contact arms (20) forming a radiused contact portion.

4. The contact (2) of claim 3, characterized in that the underside of each contact arm (20) contains a dimple (34), which is on the axial centerline of the radiused contact portion which provides a line contact on the inner surface of the radiused contact portion.

5. The contact (2) of claim 1, characterized in that the front edges (32) of the contact arms (20) extend at an angle relative to the axial centerline, and sloping towards the central section from front to rear.

6. The contact (2) of claim 5, characterized in that every axial distance along the front edges (32) of the contact arms (20) is lower than the same representative axial distance along the sloping section (24) of the central section (22).

7. The contact (2) of any of claims 1-6 characterized in that the free ends of the upper arms (16) are reversely bent upwardly to form downwardly facing radiused contact portions (18).

8. The contact (2) of claim 7 characterized in that the outer surface of the upper arms (16) includes a dimple at the tangent of the upper radiused portions which defines an axial line contact on the inner surface of the upper radiused contact portions (18).

9. The contact (2) of any of claims 1-8 characterized in that the beginning of the front sloping section (24) is axially proximate to the front edges of the upper arms (16).

10. The contact (2) of any of claims 1-9 characterized in that the central section (22) further includes a flat section (26) axially beyond the front sloping section (24), with a downwardly sloped section (28) from the flat section returning to the base section (10).

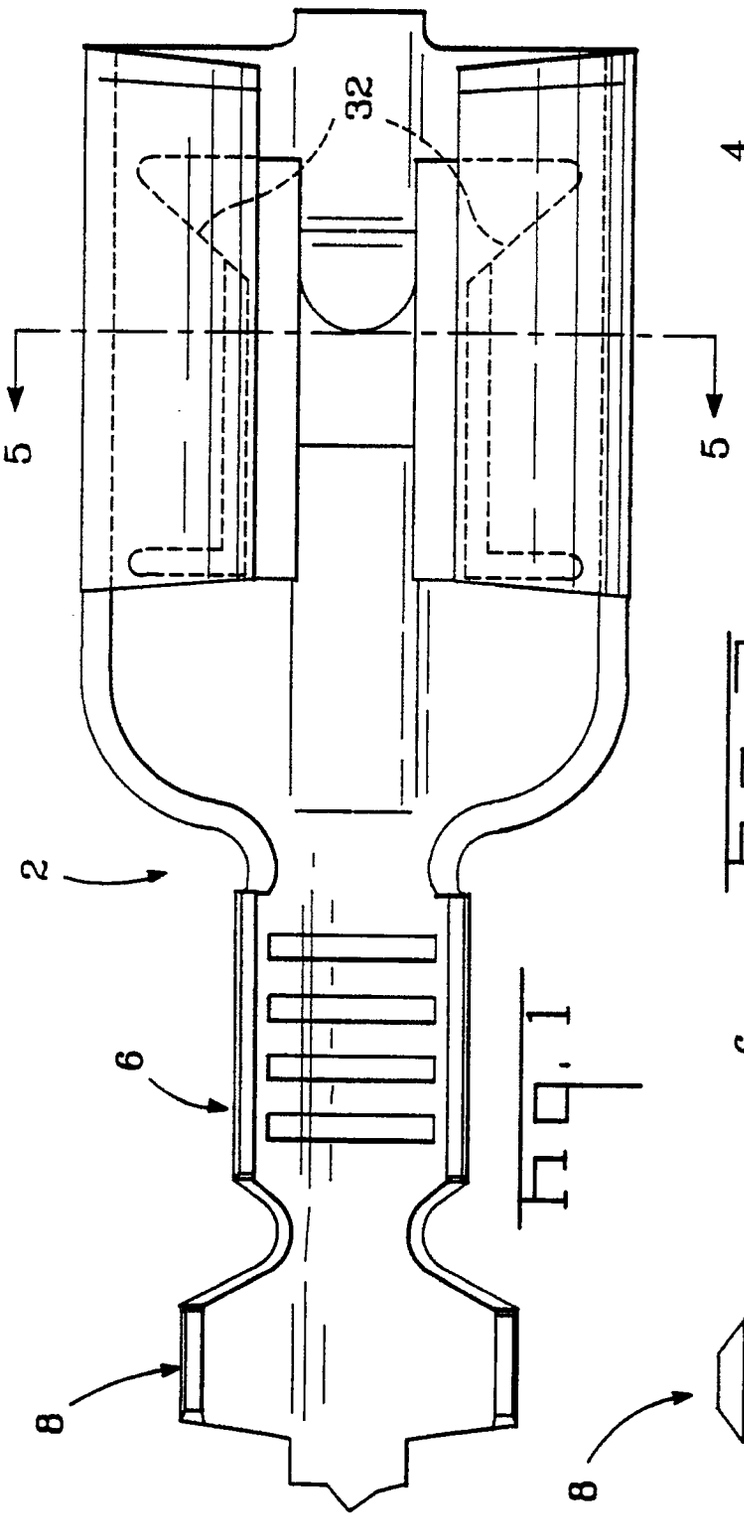

Fig. 1

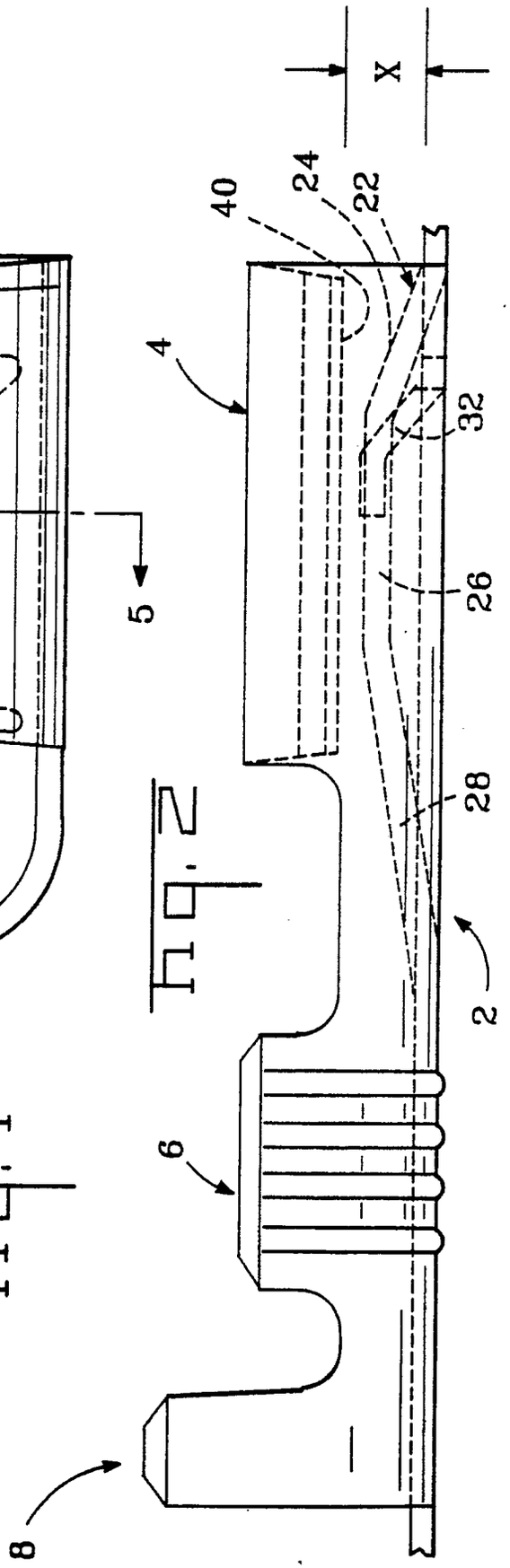

Fig. 2

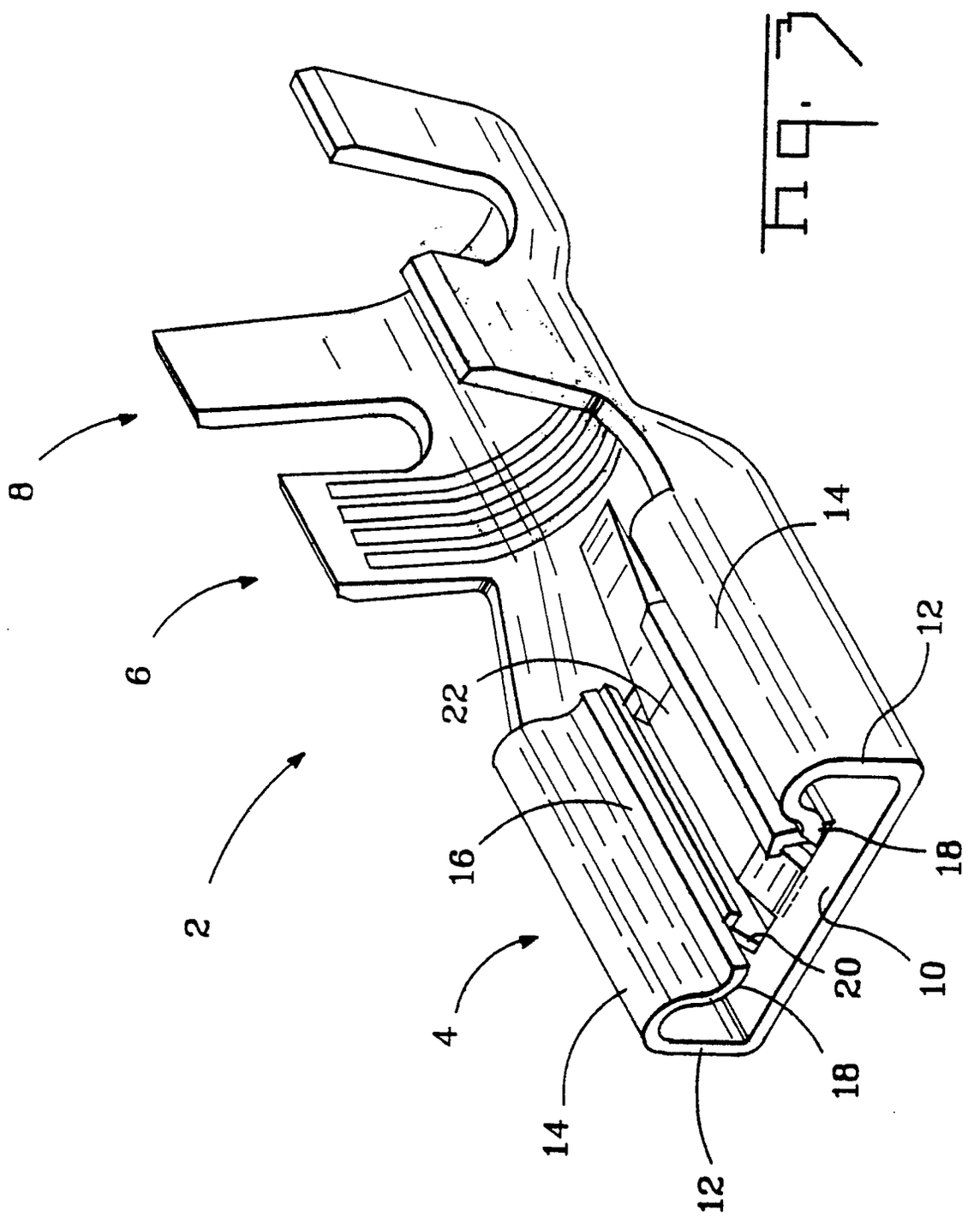

Fig. 1

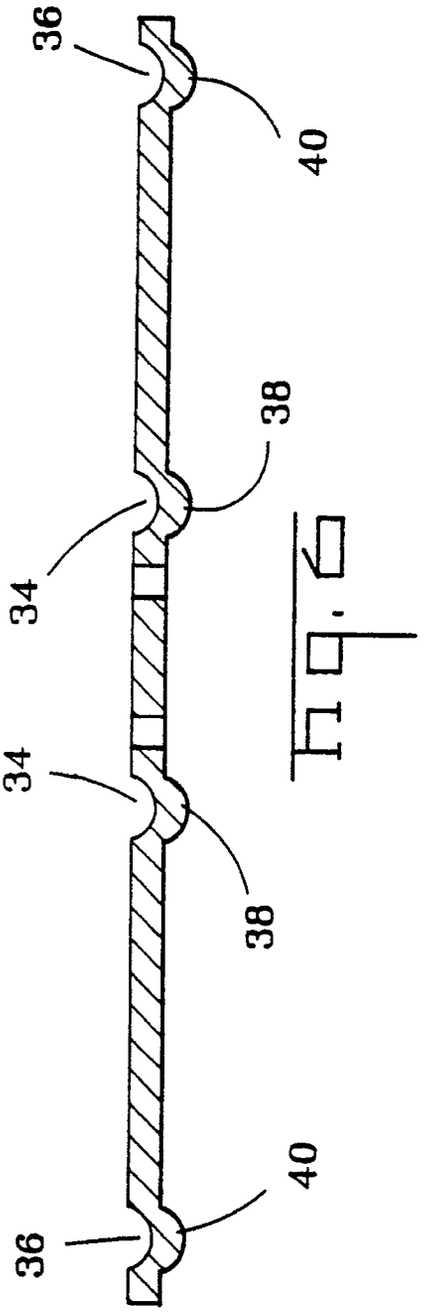

Fig. 6

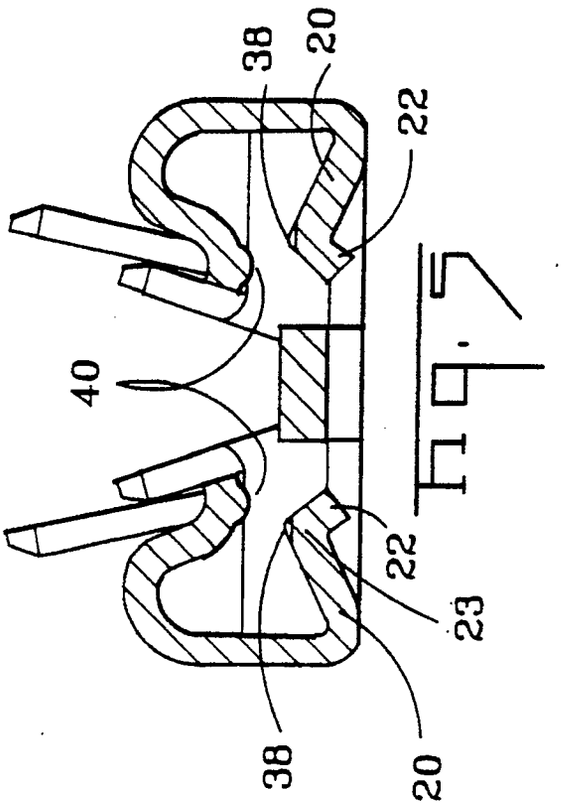

Fig. 5

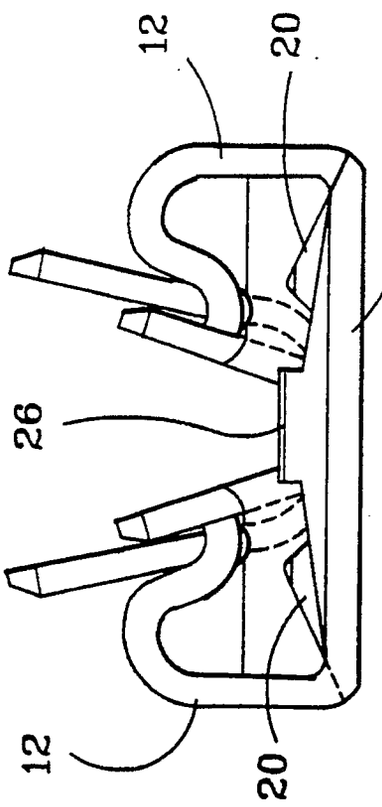

Fig. 4

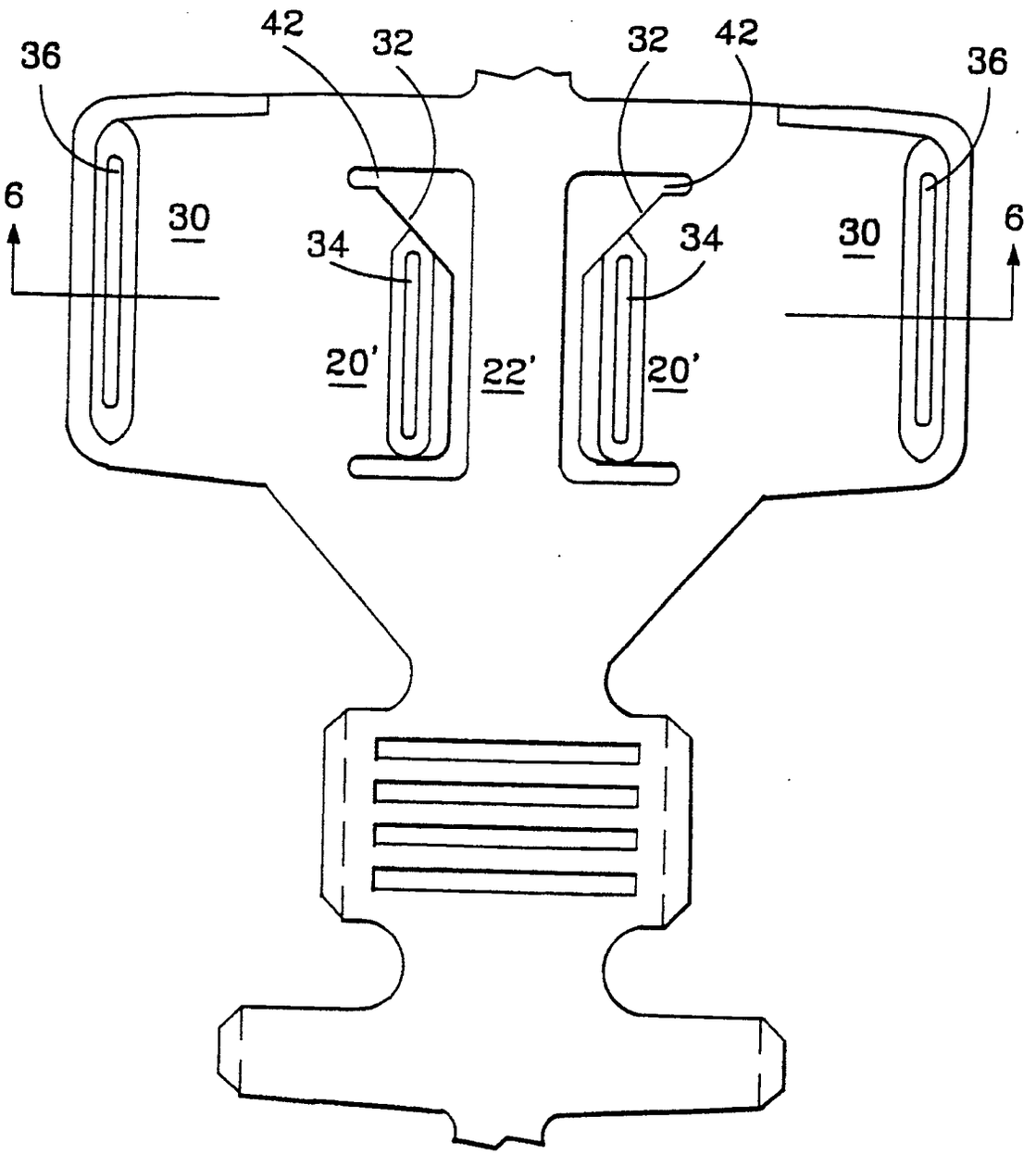

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number

EP 90 31 1548

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.5)
X	US-A-4 423 921 (HALL) * column 1, paragraph 3; figure 2 *	1-10	H 01 R 13/20
X,D	US-A-4 448 468 (COLDREN) * column 3, lines 15 - 34; figures 1, 4 *	1-10	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H 01 R

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	06 February 91	SIBILLA S.E.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same catagory
A: technological background
O: non-written disclosure
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E: earlier patent document, but published on, or after the filing date
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