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54 **Low insertion force receptacle contact.**

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Description

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

There is shown in U.S. Patent 4,448,468 an electrical receptacle contact which is profiled to receive a flat tab. This contact has a base section having side-walls 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 is stamped from the base portion and includes an upwardly formed boss which is profiled to lock in place in a through hole in the tab contact. The base portion also includes portions which are located on each side of the tongue and upstand toward, and closely spaced from, the free edge portions, thereby to increase the mating contact force with the tab. The latching tongue is stamped from the base metal and is only integrally connected at the front fixed section. The rear of the latch member is bent downwardly to form an ear having a free end, 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 contact and mating tab.

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

The present invention consists in stamped and formed electrical contact for receiving an electrical tab, of the type comprising a base section with upper contact arms upstanding from the base section and thereafter curled around downwardly towards the base section, wherein; the base section 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, the central section comprising a front upwardly sloping section, characterized in that the upper contact arms have axially extending contact lines for guiding the tab such that the tab insertion force is generally along the axially extending contact lines; and in that the central section is integral with the base section at the rear and comprises a flat surface adapted to be flexed downwardly by the tab, the front upwardly sloping section and the forward ends of the upper contact arms providing a large tab insertion area.

In the preferred embodiment the base section further includes lower contact arms stamped from the base section and which flank the central section.

Each of the lower contact arms is angled upwardly and is bent at a position proximate to the free end of the lower contact arm forming a radiused contact portion. The underside of each lower contact arm defines a dimple, which is on the axial centerline of the radiused contact portion and provides line contact for the tab, on the inner surface of the radiused contact portion. The front edges of the lower contact arms extend at an angle relative to the axial centerline, and slope towards the central section from front to rear, such that every axial distance along the front edge of the contact lower arms is lower than the same representative axial distance along the sloped surface of the central section.

Also, in the preferred embodiment, the free ends of the upper contact arms are reversely bent upwardly to form downwardly facing radiused contact portions. The outer surface of each upper contact arm defines a dimple at the tangent of the radiused portion of the upper contact arm, which dimple defines axial line contact for the tab on the inner surface of the downwardly facing radiused portion. Preferably, the beginning of the front sloped section is axially proximate to the front edges of the upper contact arms. The central section further includes a flat section located axially beyond the front sloped section with a downwardly sloped rear section extending from the flat section 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 tab receptacle contact of said embodiment;

FIGURE 2 is a side view of the receptacle contact;

FIGURE 3 is an isometric view of the receptacle contact;

FIGURE 4 is a front 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; and

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

With reference first to Figure 3, an electrical tab receptacle contact 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 flat base section 10 with integral side walls 12 upstanding from the base section 10. The side walls 12 are then reversely bent to form radiused upper arms 14, having resilient upper arm sections 16 projecting towards the base section 10. Each resilient arm section 16 is once again reversely bent upwardly to form a downwardly extending arcuate contact section 18.

As shown in Figure 7, the contact 2 is stamped from a blank sheet of metal to include flat stamped out

arms 20' which flank a 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 2. As best shown in Figure 6, the dimples 34 produce projecting, axial inner line contact surfaces 38, while the dimples 36 produce projecting axial inner line contact surfaces 40.

With reference now to Figure 2, the receptacle contact 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 lower contact arms 20 extending upwardly towards the axial centerline of the contact 2 with free ends (Figure 5) bent downwardly, thereby forming radiused portions 23. The contact arms 20 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 contact surfaces 38 on the inner surface of the contact 2 at the bend line of the lower contact arms 20. Likewise, the dimples 36 are on the axial centerline of the tangent of the radiused portions 23, which positions the contact surfaces 40 in a downwardly facing direction, as shown best in Figure 5. In each case, the dimples 34, 36 produce well defined linear contact surfaces along the direction of insertion of the mating tab. 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 inner contact surfaces 38.

The receptacle contact 2, as described above, has a low insertion force, a high contact force, excellent wiping action and 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 mating tab.

Once the tab is between the surfaces 24 and 28, continued insertion of the tab will force the tab to ride up the ramped section 24 and into contact with the inner line contact surfaces 38. It should be noted from Figures 1, 2 and 7, that sheared edges 32 begin at a root section 42 which is axially behind the front edge of either the base section 10, or the resilient arm sections 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 receptacle contact 2 to the rear of the contact 2. These sheared edges 32, being angled as described, prevent the tab

from butting them upon insertion of the tab into the contact 2, because as shown in Figure 2, at any given axial distance along the sheared edges 32, the vertical height of the ramped section 24 is always higher; thus the tab will ride on the ramped section 24, not butt against the sheared edges 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 arm sections 16 and lower contact arms 20; which provides that the central section 22 is quite flexible, while the contact arm sections 16 and arms 20 are rather stiff. Thus, upon insertion of the tab into the contact 2, the central section 22 will flex downwardly, allowing the tab to make contact with the line 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) for receiving an electrical tab, of the type comprising a base section (10) with upper contact arms (14) upstanding from the base section and thereafter curled around downwardly towards the base section (10), wherein;

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, the central section (22) comprising a front upwardly sloping section (24), characterized in that the upper contact arms (14) have axially extending contact lines (40) for guiding the tab such that the tab insertion force is generally along the axially extending contact lines (40); and in that the central section (22) is integral with the base section (10) at the rear and comprises a flat surface adapted to be flexed downwardly by the tab, the front upwardly sloping section (24) and the forward ends of the upper contact arms (14) providing a large tab insertion area.

2. The contact (2) of claim 1, characterised in that the base section (10) further includes lower contact arms (20) stamped from the base section (10) and which flank the central section (22).
3. The contact (2) of claim 2, characterised in that each of the lower contact arms (20) is angled upwardly and is bent at a position proximate to the free end of the lower contact arm (20) to provide a radiused contact portion (38).
4. The contact (2) of claim 3, characterised in that

the underside of each lower contact arm (20) defines a dimple (34) which is on the axial centerline of the radiused contact portion (38) and provides line contact for the tab, on the upper surface of the lower contact arm (20).

5. The contact (2) of claim 2, 3 or 4, characterised in that the front edges (32) of the lower contact arms (20) extend at an angle relative to the axial centerline, and slope towards the central section (22) from front to rear.

6. The contact (2) of claim 5, characterised in that every axial distance along the front edges (32) of the lower 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 one of claims 1 to 6, characterised in that the free ends of the upper contact arms (14) are reversely bent upwardly to form downwardly facing radiused contact portions (18).

8. The contact (2) of claim 7, characterised in that the outer surface of each upper contact arm (14) defines a dimple (36) at the tangent of the radiused contact portion (18) of said arm (14) which dimple (36) defines axial line contact for the tab, on the inner surface of the downwardly facing radiused contact portion (18).

9. The contact (2) of any one of claims 1 to 8, characterised in that the beginning of the front sloping section (24) is axially proximate to the front edges of the upper contact arms (14).

10. The contact (2) of any one of claims 1 to 9, characterised in that the central section (22) further includes a flat section (26) located axially beyond the front sloping section (24), a downwardly sloped rear section (28) extending from the flat section (26) to the base section (10).

Patentansprüche

1. Gestanzter und geformter elektrischer Kontakt (2) zur Aufnahme einer elektrischen Lasche mit einem Bodenabschnitt (10) mit oberen Kontaktarmen (14), die von dem Bodenabschnitt nach oben vorstehen und die danach nach unten auf den Bodenabschnitt (10) zu umgebogen sind, wobei der Bodenabschnitt (10) des Anschlusses einen ausgestanzten zentralen Abschnitt (22) aufweist, der sich axial längs des Bodenabschnitts (10) erstreckt, wobei der zentrale Abschnitt (22) einstückig mit dem Bodenabschnitt

(10) an dem vorderen Ende ausgebildet ist, wobei der zentrale Abschnitt (22) einen vorderen, nach oben geneigten Abschnitt (24) aufweist, dadurch **gekennzeichnet**, daß die oberen Kontaktarme (14) sich axial erstreckende Kontaktlinien (40) zum Führen der Lasche derart haben, daß die Lascheneinsetzkraft allgemein längs der sich axial erstreckenden Kontaktlinien (40) verläuft, und daß der zentrale Abschnitt (22) einstückig mit dem Bodenabschnitt (10) am hinteren Ende ausgebildet ist und eine flache Oberfläche aufweist, die durch die Lasche nach unten gebogen werden kann, wobei der vordere, nach oben geneigte Abschnitt (24) und die vorderen Enden der oberen Kontaktarme (14) einen großen Lascheneinsetzbereich bilden.

2. Kontakt (2) nach Anspruch 1, dadurch **gekennzeichnet**, daß der Bodenabschnitt (10) ferner untere Kontaktarme (20) aufweist, die aus dem Bodenabschnitt (10) herausgestanzt sind und die den zentralen Abschnitt (22) flankieren.

3. Kontakt (2) nach Anspruch 2, dadurch **gekennzeichnet**, daß jeder der unteren Kontaktarme (20) nach oben abgewinkelt und an einer Stelle benachbart zu dem freien Ende des unteren Kontaktarms (20) gebogen ist, um einen abgerundeten Kontaktabschnitt (38) zu bieten.

4. Kontakt (2) nach Anspruch 3, dadurch **gekennzeichnet**, daß die Unterseite jedes unteren Kontaktarms (20) eine Vertiefung (34) bildet, die sich an der axialen Mittellinie des abgerundeten Kontaktabschnitts (38) befindet und einen Linienkontakt für die Lasche an der oberen Oberfläche des unteren Kontaktarms (20) schafft.

5. Kontakt (2) nach Anspruch 2, 3 oder 4, dadurch **gekennzeichnet**, daß die vorderen Kanten (32) der unteren Kontaktarme (20) sich unter einem Winkel relativ zu der axialen Mittellinie erstrecken und von vorn nach hinten auf den zentralen Abschnitt (22) zu geneigt sind.

6. Kontakt (2) nach Anspruch 5, dadurch **gekennzeichnet**, daß jeder axiale Abstand längs der vorderen Kanten (32) der unteren Kontaktarme (20) niedriger ist als der gleiche repräsentative axiale Abstand längs des geneigten Abschnitts (24) des zentralen Abschnitts (22).

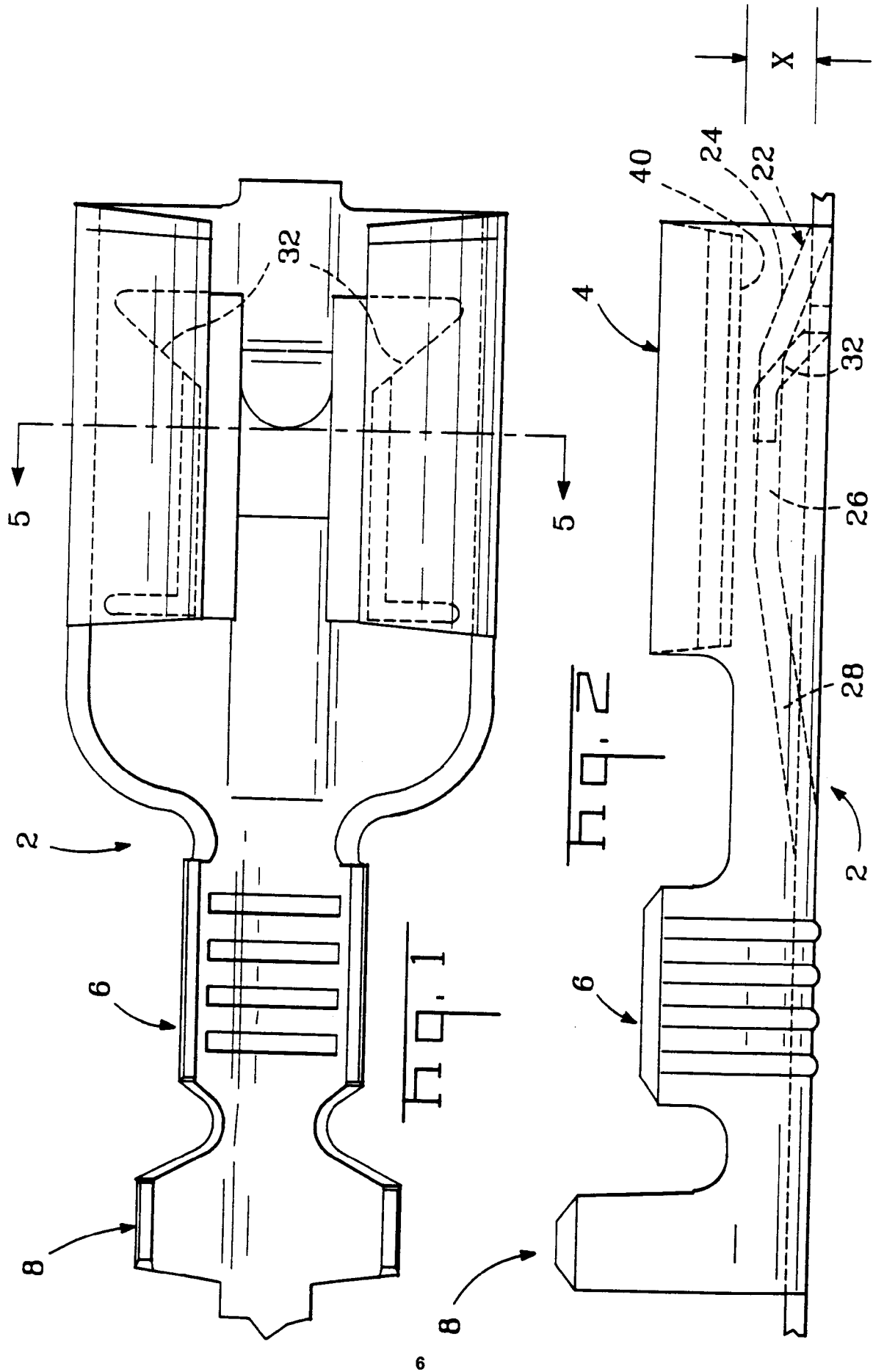
7. Kontakt (2) nach einem der Ansprüche 1 bis 6, dadurch **gekennzeichnet**, daß die freien Enden der oberen Kontaktarme (14) entgegengesetzt nach oben gebogen sind, um nach unten weisende abgerundete Kontaktabschnitte (18) zu bilden.

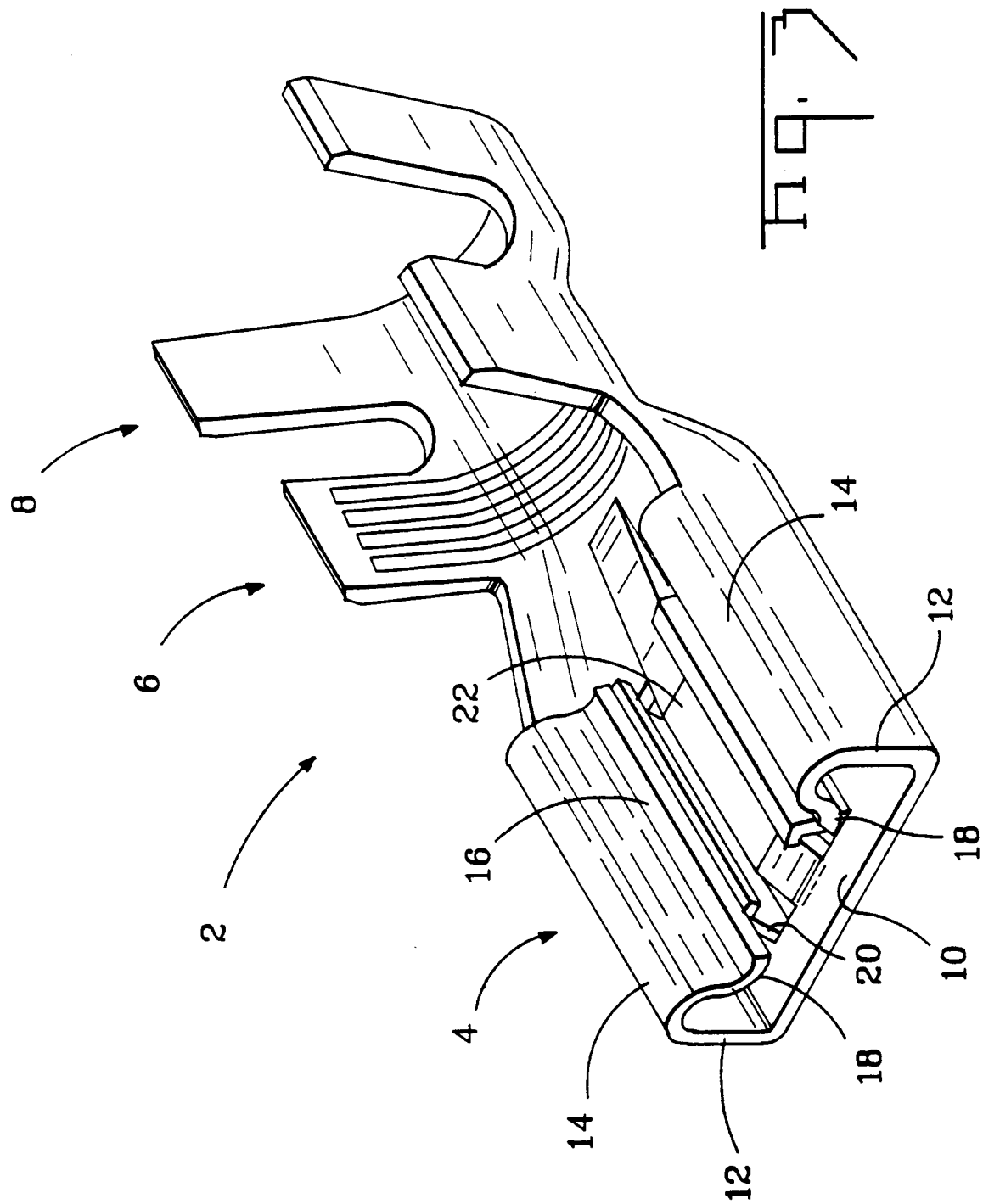
8. Kontakt (2) nach Anspruch 7, dadurch **gekennzeichnet**, daß die äußere Oberfläche jedes oberen Kontaktarms (14) eine Vertiefung (36) an der Tangente des abgerundeten Kontaktabschnitts (18) des Arms (14) bildet, wobei die Vertiefung (36) einen axialen Linienkontakt für die Lasche an der inneren Oberfläche des nach unten weisenden abgerundeten Kontaktabschnitts (18) bildet. 5
9. Kontakt (2) nach einem der Ansprüche 1 bis 8, dadurch **gekennzeichnet**, daß der Anfang des vorderen geneigten Abschnitts (24) axial benachbart zu den vorderen Kanten der oberen Kontaktarme (14) ist. 10
10. Kontakt (2) nach einem der Ansprüche 1 bis 9, dadurch **gekennzeichnet**, daß der zentrale Abschnitt (22) ferner einen flachen Abschnitt (26) aufweist, der axial jenseits des vorderen geneigten Abschnitts (24) angeordnet ist, wobei sich ein nach unten geneigter hinterer Abschnitt (28) von dem flachen Abschnitt (26) zu dem Bodenabschnitt (10) erstreckt. 15 20 25

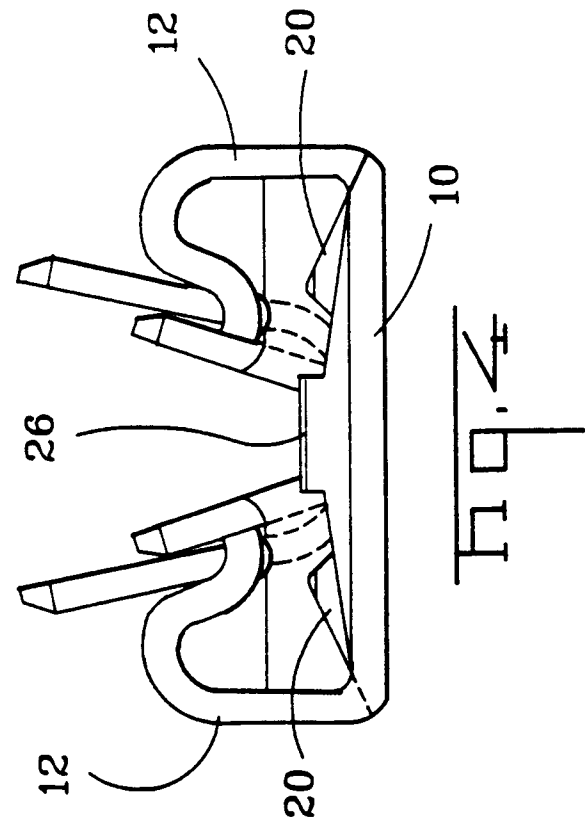
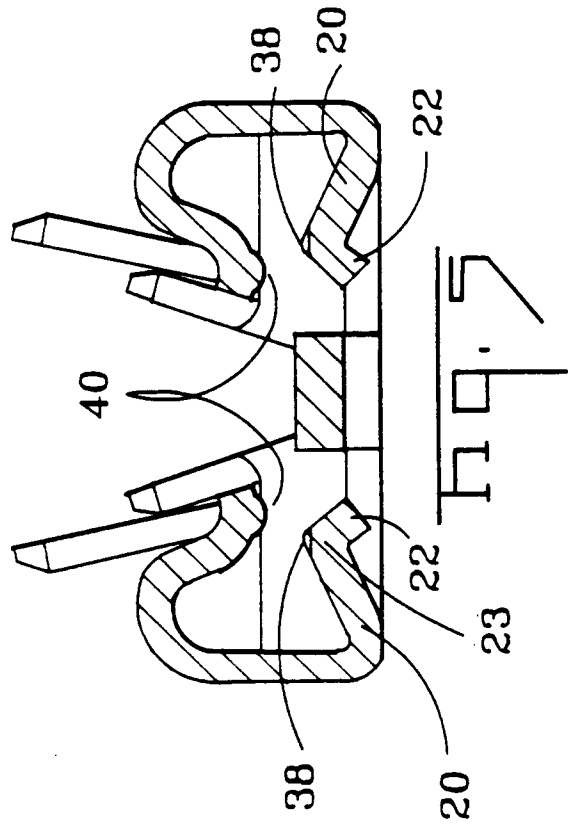
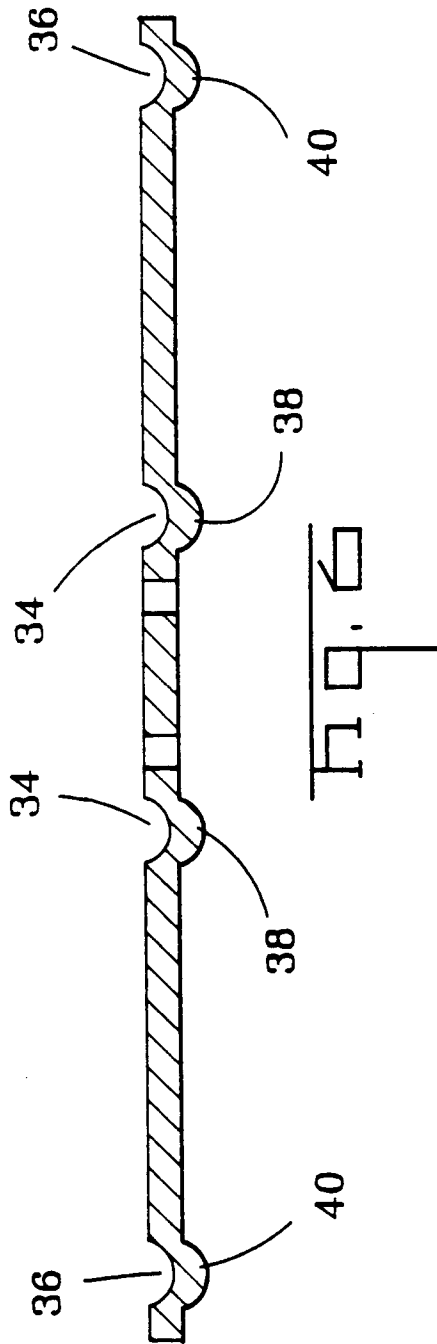
Revendications

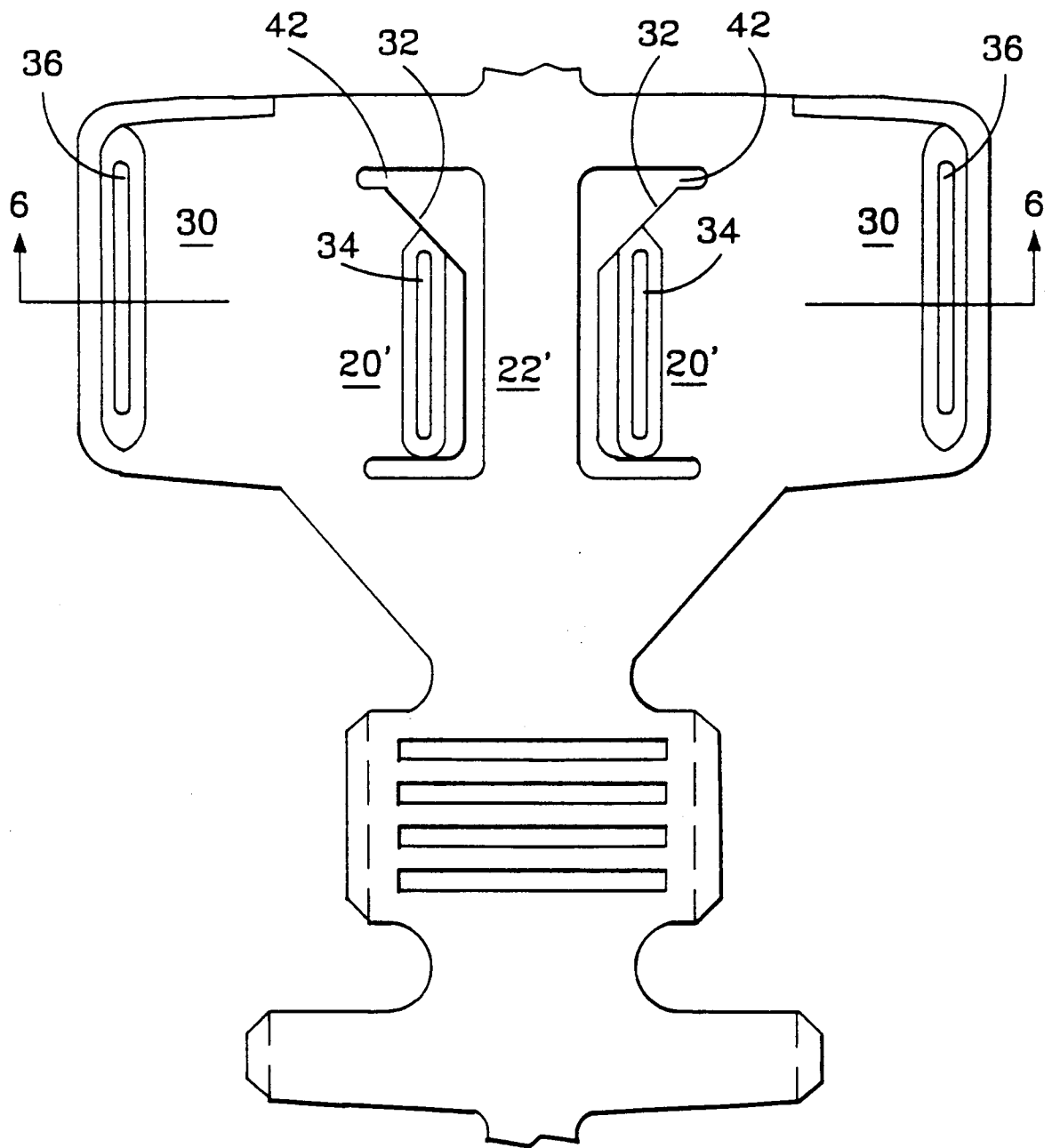
1. Fiche électrique estampée et formée (2) pour recevoir une fiche électrique plate, du type comprenant une section d'embase (10) ayant des bras supérieurs de contact (14) droits depuis la section d'embase et s'incurvant ensuite vers le bas en direction de la section d'embase (10), dans laquelle ; la section d'embase (10) de la borne comprend une section centrale estampée (22) qui s'étend axialement le long de la section d'embase (10), la section centrale (22) étant solidaire de la section d'embase (10) à l'avant, la section centrale (22) comprenant une section avant inclinée vers le haut (24), caractérisée en ce que les bras supérieurs de contact (14) ont des lignes de contact s'étendant axialement (40) pour guider la fiche plate, de telle sorte que la force d'insertion de la fiche plate se fasse généralement le long des lignes de contact s'étendant axialement (40) ; et en ce que la section centrale (22) est solidaire de la section d'embase (10) à l'arrière et comprend une surface plane adaptée pour être fléchie vers le bas par la fiche plate, la section avant s'inclinant vers le haut (24) et les extrémités avant des bras supérieurs de contact (14) réalisant une grande aire d'insertion de fiche plate. 30 35 40 45 50 55
2. Fiche (2) selon la revendication 1, caractérisée en ce que la section d'embase (10) comprend en outre des bras inférieurs de contact (20) estampés depuis la section d'embase (10) et qui flanquent la section centrale (22)

3. Fiche (2) selon la revendication 2, caractérisée en ce que chacun des bras inférieurs de contact (20) est incliné vers le haut et est incurvé en une position à proximité de l'extrémité libre du bras inférieur de contact (20) formant une partie de contact arrondie (38). 5
4. Fiche (2) selon la revendication 3, caractérisée en ce que la surface inférieure de chaque bras inférieur de contact (20) définit une bosse (34) qui se trouve sur la ligne médiane axiale de la partie de contact arrondie (38) et réalise un contact de ligne pour la fiche plate, sur la surface supérieure du bras inférieur de contact (20). 10 15
5. Fiche (2) selon la revendication 2, 3 ou 4, caractérisée en ce que les bords avant (32) des bras inférieurs de contact (20) s'étendent selon un angle par rapport à la ligne médiane axiale, et s'inclinent vers la section centrale (22), d'avant en arrière. 20
6. Fiche (2) selon la revendication 5, caractérisée en ce que chaque distance axiale le long du bord avant (32) des bras inférieurs de contact (20) est inférieure à la même distance axiale représentative le long de la surface inclinée (24) de la section centrale (22). 25
7. Fiche (2) selon l'une quelconque des revendications 1 à 6, caractérisée en ce que les extrémités libres des bras supérieurs de contact (14) sont inversement incurvées vers le haut pour former des parties de contact arrondies tournées vers le bas (18). 30
8. Fiche (2) selon la revendication 7, caractérisée en ce que la surface extérieure de chaque bras supérieur de contact (14) définit une bosse (36) tangentielle à la partie de contact arrondie (18) dudit bras (14), laquelle bosse (36) définit un contact de ligne axiale pour la fiche, sur la surface intérieure de la partie de contact arrondie tournée vers le bas (18). 35 40
9. Fiche (2) selon l'une quelconque des revendications 1 à 8, caractérisée en ce que le commencement de la section avant inclinée (24) se fait axialement et à proximité des bords avant des bras supérieurs de contact (14). 45
10. Fiche (2) selon l'une quelconque des revendications 1 à 9, caractérisée en ce que la section centrale (22) comprend en outre une section plate (26) située axialement au-delà de la section avant inclinée (24), une section arrière inclinée vers le bas (28) s'étendant depuis la section plate (26) à la section d'embase (10). 50 55









Hq. 7