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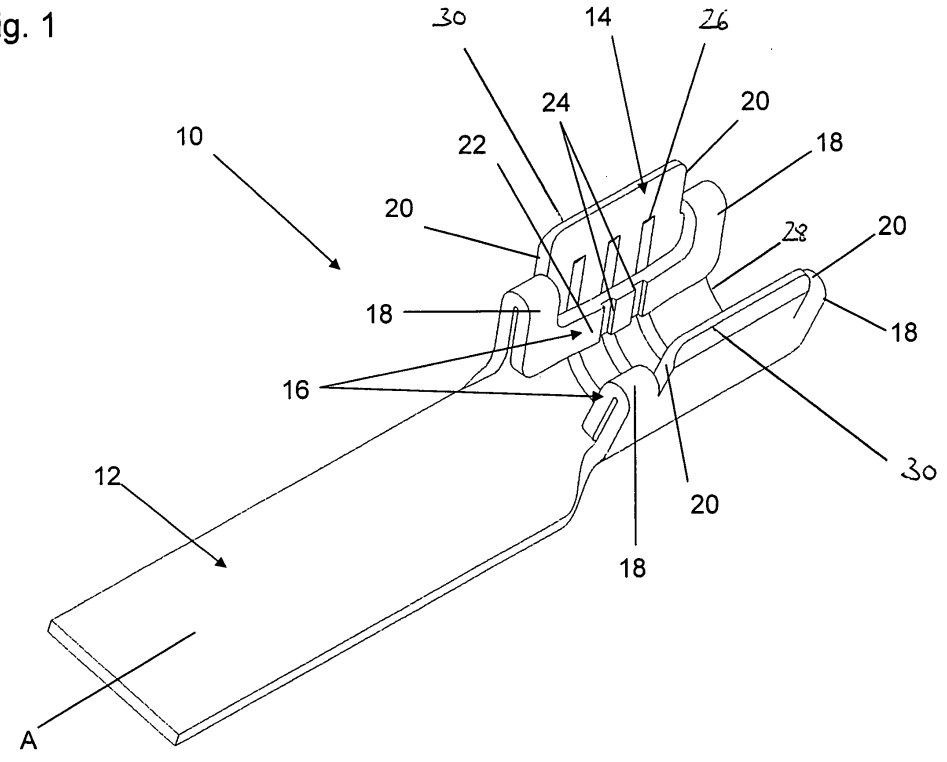
Remarks:
Amended claims in accordance with Rule 137(2) EPC.

## (54) Electrical terminal

(57) The present invention relates to an electrical terminal (10,100), comprising a terminal portion (12,112); a crimp portion (14,114) integral with the terminal portion; and a spring element (16,116) integral with the terminal portion and/or the crimp portion and having a spring arm (22,122) within the crimp portion.

Fig. 1

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## Description

**[0001]** The present invention relates to an electrical terminal having a crimp portion for a crimp connection to an electrical conductor.

**[0002]** It is well known to provide an electrical terminal with a crimp portion. Typically the shape of the crimp portion for connection to an aluminium electrical conductor is the same shape as for connection to a copper wire. In some cases, a two stage crimp process is used, with different compression or force rates, in order to assure base crimp resistance stability. It is also well known that aluminium shows a low tensile strength, and that aluminium is also subject to creepage.

**[0003]** It is an object of the present invention to overcome the above mentioned disadvantages.

**[0004]** An electrical terminal in accordance with the present invention comprises a terminal portion; a crimp portion integral with the terminal portion; and a spring element integral with the terminal portion and/or the crimp portion and having a spring arm within the crimp portion.

**[0005]** The present invention provides an integral spring element in the crimp portion of the terminal to assure a substantially permanent and constant pressure on an electrical conductor when crimped in the crimp portion.

**[0006]** In a preferred arrangement, the terminal portion and the crimp portion have a longitudinal axis and the spring arm extends substantially parallel to the longitudinal axis to increase the effectiveness of the spring arm.

**[0007]** The spring element may take any suitable form. In a preferred arrangement, the spring element is substantially U-shaped, is stamped from the terminal material, and/or is bent such that the central member of the U-shape defines the spring arm. In an alternative arrangement, the spring element is substantially L-shaped, is stamped from the terminal material, and/or is bent such that one of the arms of the L-shape defines the spring arm. In either of these arrangements, the terminal preferably has a pair of spring elements, with the spring arms of each spring element positioned on opposed sides of the crimp portion.

**[0008]** The spring arm of the or each spring element preferably has a curved, convex or sinusoidal shape. Additionally, the spring arm may have a serrated surface. The shape of the spring arm assists in providing a substantially constant force on the crimped conductor irrespective of any spring back proprieties or thermal relaxation of the crimp portion. In the case where the conductor is formed from aluminium, the spring element assists in maintaining a substantially constant crimp force irrespective on any creepage proprieties of the aluminium conductor. Further, a serrated surface on the spring arm assists in cracking any oxide layer on the aluminium conductor for an improved electrical connection between the terminal and the conductor.

**[0009]** Further preferred embodiments of the invention are recited in the dependent claims, in the description and in the drawings.

**[0010]** The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a first embodiment of electrical terminal in accordance with the present invention;

Figure 2 is a top view of the crimp portion and spring element of the terminal of Figure 1;

Figure 3 is a perspective view of a second embodiment of electrical terminal in accordance with the present invention; and

Figure 4 is a top view of the crimp portion and spring element of the terminal of Figure 3.

**[0011]** Referring to Figures 1 and 2, the first embodiment of electrical terminal 10 includes a terminal portion 12, a crimp portion 14, and a pair of spring elements 16. The terminal 10 is stamped and bent from sheet metallic material to integrally form the terminal portion 12, crimp portion 14 and spring elements 16. The terminal portion 12 is shown as a blade terminal, but it will be appreciated that the terminal portion may take any other suitable form. Similarly, the crimp portion 14 may take any suitable form. The terminal portion 12 and the crimp portion 14 have (or define) a longitudinal axis A. The crimp portion 14 preferably is an open crimp barrel, and preferably includes one or more cut-outs 26. The barrel has a body 28 of semicircular cross-section and a pair of crimp wings 30 extending from the body 28.

**[0012]** In this first embodiment, each spring element 16 is substantially U-shaped. The outer arms 18 of each U-shaped spring element 16 lie alongside the longitudinally spaced edges 20 of the crimp portion 14. The central arm 22 of each U-shaped spring element 16 extends between the outer arms 18 and defines the spring arm of each spring element. The spring arm 22 of each spring element 16 extends substantially parallel to the longitudinal axis A and lies within the crimp portion 14. The spring arms 22 lie on opposed sides of the crimp portion 14, and preferably lie adjacent to the crimp wings. The spring arm 22 of each spring element 16 is preferably curved (or convex) in shape, and preferably includes serrations 24 in its surface. Each outer arm 18 is a folded sheet portion which is obtained during manufacture of the electrical terminal 10 when bending the corresponding central arm 22.

**[0013]** Referring to Figures 3 and 4, the second embodiment of electrical terminal 100 includes a terminal portion 112, a crimp portion 114, and a pair of spring elements 116. The terminal 100 is stamped and bent from sheet metallic material to integrally form the terminal portion 112, crimp portion 114 and spring elements 116. The terminal portion 112 is shown as a blade terminal,

but it will be appreciated that the terminal portion may take any other suitable form. Similarly, the crimp portion 114 may take any suitable form. The terminal portion 112 and the crimp portion 114 have (or define) a longitudinal axis A. The crimp portion 114 preferably is an open crimp barrel, and preferably includes one or more cut-outs 126. The barrel has a body 128 of semicircular cross-section and a pair of crimp wings 130 extending from the body 128.

**[0014]** In this second embodiment, each spring element 116 is substantially L-shaped. One arm 118 of each L-shaped spring element 116 lies alongside one of the longitudinally spaced edges 120 of the crimp portion 114. The other arm 122 of each L-shaped spring element 116 extends through the crimp portion 114 and defines the spring arm of each spring element. The spring arm 122 of each spring element 116 extends substantially parallel to the longitudinal axis A and lies within the crimp portion 114. The spring arms 122 lie on opposed sides of the crimp portion 114, and preferably lie adjacent to the crimp wings. The spring arm 122 of each spring element 116 is preferably curved (or convex) in shape, and preferably includes serrations 124 in its surface. In this second embodiment, the one arm 118 of each L-shaped spring element 116 is positioned adjacent the inner longitudinal edges 120 of the crimp portion 114. In an alternative arrangement, the one arm 118 of one or both L-shaped spring element 116 may be positioned alongside the outer longitudinal edge of the crimp portion 114. Each one arm 118 is a folded sheet portion which is obtained during manufacture of the electrical terminal 100 when bending the corresponding other arm 122.

**[0015]** Although each of the described embodiments includes two spring elements 16, 116, one of the spring elements may be omitted in accordance with the present invention.

**[0016]** On crimping the crimp portion 14, 114 to an electrical conductor (not shown) the spring arm 22, 122 of each spring element 16, 116 is pressed against the electrical conductor. This arrangement provides the advantages of assuring a substantially permanent and constant pressure on the electrical conductor when crimped in the crimp portion 16, 116, and compensating for any spring-back of the crimp portion, thermal relaxation, and creepage (if crimped to an aluminium conductor).

Reference numeral list

**[0017]**

| | |
|---|---|
| 10, 100 | electrical terminal |
| 12, 112 | terminal portion |
| 14, 114 | crimp portion |
| 16, 116 | spring element |
| 18, 118 | outer arm |
| 20, 120 | edge |
| 22, 122 | spring arm |
| 24, 124 | serration |
| 26, 126 | cut-out |
| 28, 128 | body |
| 30, 130 | crimp wing |

**Claims**

1. An electrical terminal (10, 100), comprising
a terminal portion (12, 112);
a crimp portion (14, 114) integral with the terminal portion (12, 112); and
a spring element (16, 116) integral with the terminal portion (12, 112) and/or the crimp portion (14, 114) and having a spring arm (22, 122) within the crimp portion (14, 114).

2. An electrical terminal (10, 100) in accordance with claim 1,
**characterized in that**
the terminal portion (12, 112) and the crimp portion (14, 114) have a longitudinal axis (A) and the spring arm (22, 122) extends substantially parallel to the longitudinal axis (A).

3. An electrical terminal (10) in accordance with claim 1 or claim 2,
**characterized in that**
the spring element (16) is substantially U-shaped, is stamped from the terminal material, and/or is bent such that a central member of the U-shape defines the spring arm (22).

4. An electrical terminal (10) in accordance with claim 3,
**characterized in that**
outer arms (18) of the spring element (16) lie alongside the longitudinally spaced edges (20) of the crimp portion (14).

5. An electrical terminal (10) in accordance with claim 4,
**characterized in that**
each outer arm (18) is a folded sheet portion which preferably is obtained during manufacture of the electrical terminal (10) when bending the corresponding central arm (22).

6. An electrical terminal (100) in accordance with claim 1 or claim 2,
**characterized in that**
the spring element (116) is substantially L-shaped, is stamped from the terminal material, and/or is bent such that one of the arms of the L-shape defines the spring arm (122).

7. An electrical terminal (100) in accordance with claim 6,
**characterized in that**
an outer arm (118) of the spring element (116) lies alongside one of the longitudinally spaced edges

(120) of the crimp portion (114).

**8.** An electrical terminal (100) in accordance with claim 7,
**characterized in that**
the outer arm (118) of the spring element (116) is positioned adjacent the inner or outer longitudinal edge (120) of the crimp portion (114).

**9.** An electrical terminal (100) in accordance with claim 7 or claim 8,
**characterized in that**
the outer arm (118) is a folded sheet portion which preferably is obtained during manufacture of the electrical terminal (100) when bending the corresponding central arm (122).

**10.** An electrical terminal (10, 100) in accordance with one of the preceding claims,
**characterized in that**
the terminal (10, 100) has a pair of spring elements (16, 116), with the spring arm (22, 122) of each spring element (16, 116) positioned on opposed sides of the crimp portion (14, 114).

**11.** An electrical terminal (10, 100) in accordance with one of the preceding claims,
**characterized in that**
the spring arm (22, 122) of the or each spring element (16, 116) has a curved, convex or sinusoidal shape.

**12.** An electrical terminal (10, 100) in accordance with one of the preceding claims,
**characterized in that**
the spring arm (22, 122) has a serrated surface (24, 124).

**13.** An electrical terminal (10, 100) in accordance with one of the preceding claims,
**characterized in that**
the terminal portion (12, 112) is a blade terminal and/or the crimp portion (14, 114) is an open crimp barrel.

**14.** An electrical terminal (10, 100) in accordance with one of the preceding claims,
**characterized in that**
the crimp portion (14, 114) includes one or more cut-outs (26, 126).

**Amended claims in accordance with Rule 137(2) EPC.**

**1.** An electrical terminal (10, 100), comprising
a terminal portion (12, 112);
a crimp portion (14, 114) integral with the terminal portion (12, 112), the terminal portion (12, 112) and the crimp portion (14, 114) having a longitudinal axis (A); and
a spring element (16, 116) integral with the terminal portion (12, 112) and / or the crimp portion (14, 114) and having a spring arm (22, 122) extending substantially parallel to the longitudinal axis (A) within the crimp portion (14, 114);
**characterized in that**
an outer arm (18, 118) of the spring element (16, 116) lies alongside one of the longitudinally spaced edges (20, 120) of the crimp portion (14, 114).

**2.** An electrical terminal (10) in accordance with claim 1,
**characterized in that**
the spring element (16) is stamped from the terminal material.

**3.** An electrical terminal (10) in accordance with claim 1 or claim 2,
**characterized in that**
the spring element (16) is substantially U-shaped, preferably is bent such that a central member of the U-shape defines the spring arm (22).

**4.** An electrical terminal (10) in accordance with claim 3,
**characterized in that**
outer arms (18) of the spring element (16) lie alongside the longitudinally spaced edges (20) of the crimp portion (14).

**5.** An electrical terminal (10) in accordance with claim 4,
**characterized in that**
each outer arm (18) is a folded sheet portion which preferably is obtained during manufacture of the electrical terminal (10) when bending the corresponding central arm (22).

**6.** An electrical terminal (100) in accordance with claim 1 or claim 2,
**characterized in that**
the spring element (116) is substantially L-shaped, preferably is bent such that one of the arms of the L-shape defines the spring arm (122).

**7.** An electrical terminal (100) in accordance with claim 6,
**characterized in that**
the outer arm (118) of the spring element (116) is positioned adjacent the inner or outer longitudinal edge (120) of the crimp portion (114).

**8.** An electrical terminal (100) in accordance with claim 7,
**characterized in that**
the outer arm (118) is a folded sheet portion which

preferably is obtained during manufacture of the electrical terminal (100) when bending the corresponding central arm (122).

**9.** An electrical terminal (10, 100) in accordance with one of the preceding claims,
**characterized in that**
the terminal (10, 100) has a pair of spring elements (16, 116), with the spring arm (22, 122) of each spring element (16, 116) positioned on opposed sides of the crimp portion (14, 114).

**10.** An electrical terminal (10, 100) in accordance with one of the preceding claims,
**characterized in that**
the spring arm (22, 122) of the or each spring element (16, 116) has a curved, convex or sinusoidal shape.

**11.** An electrical terminal (10, 100) in accordance with one of the preceding claims,
**characterized in that**
the spring arm (22, 122) has a serrated surface (24, 124).

**12.** An electrical terminal (10, 100) in accordance with one of the preceding claims,
**characterized in that**
the terminal portion (12, 112) is a blade terminal and/or the crimp portion (14, 114) is an open crimp barrel.

**13.** An electrical terminal (10, 100) in accordance with one of the preceding claims,
**characterized in that**
the crimp portion (14, 114) includes one or more cut-outs (26, 126).

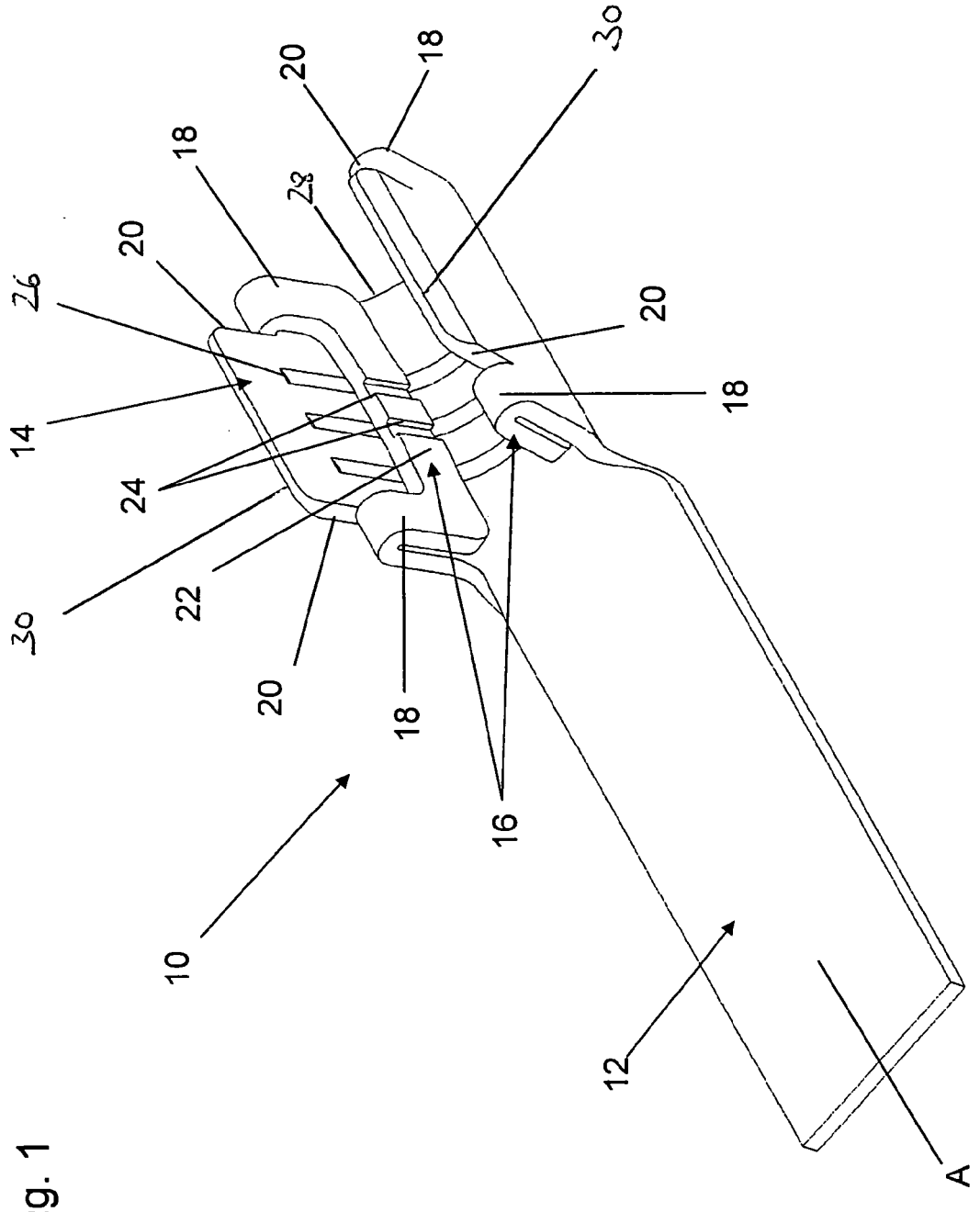


Fig. 1

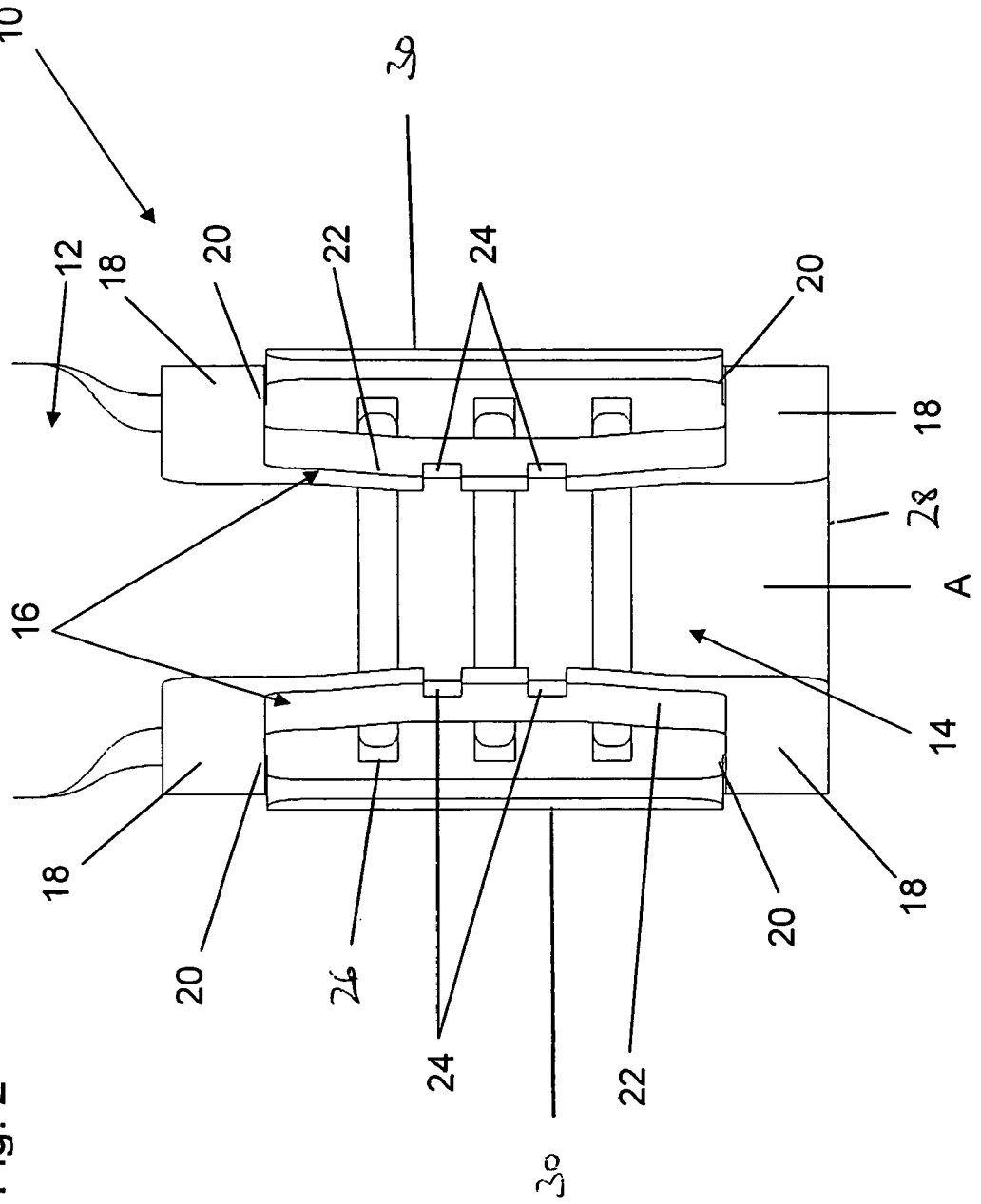


Fig. 2

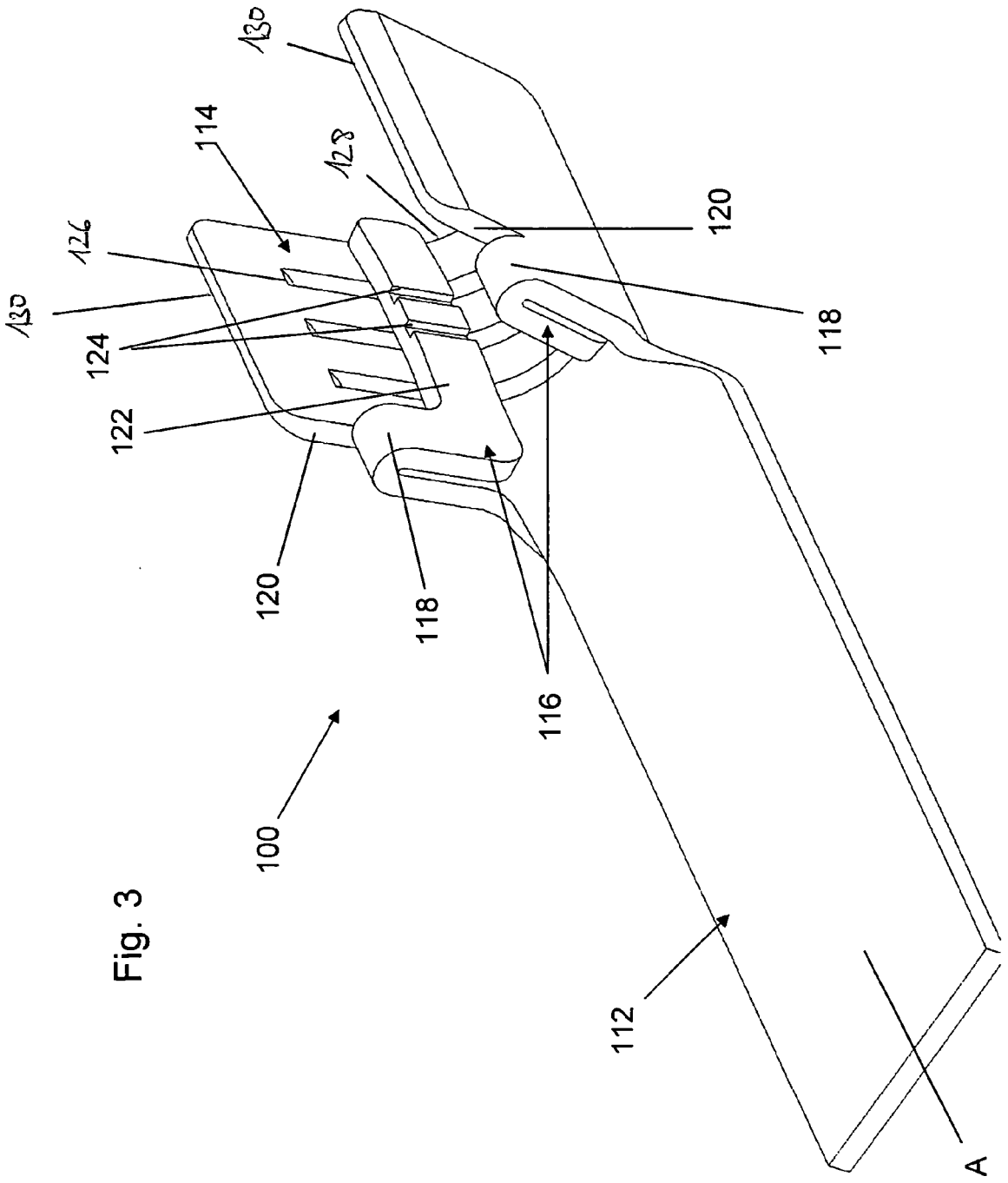


Fig. 3

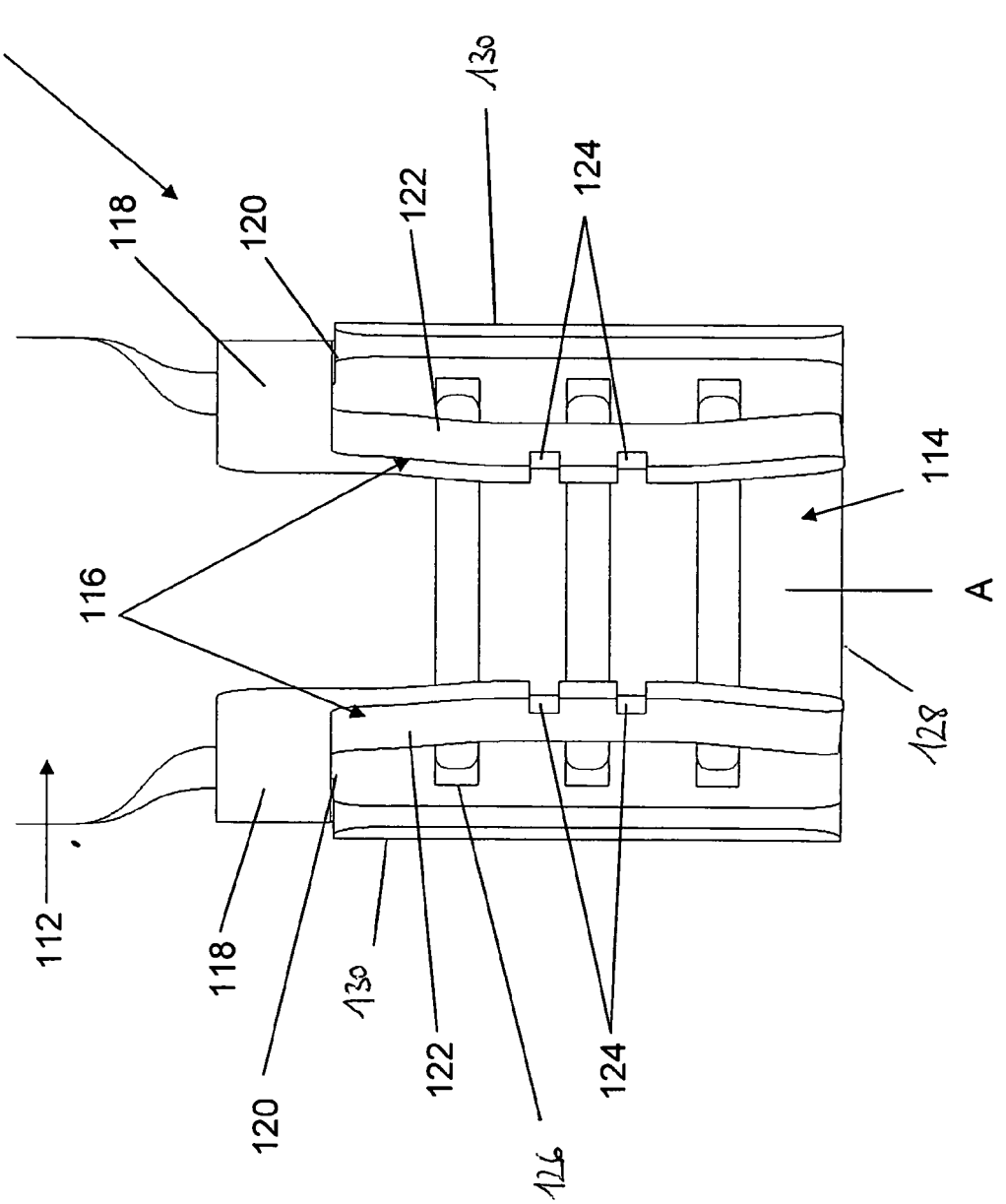


Fig. 4

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# EUROPEAN SEARCH REPORT

Application Number
EP 08 00 1352

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 29 May 2008 | Garcia Congosto, M |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 00 1352

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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