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(54) **Title:** FEMALE ELECTRICAL TERMINAL

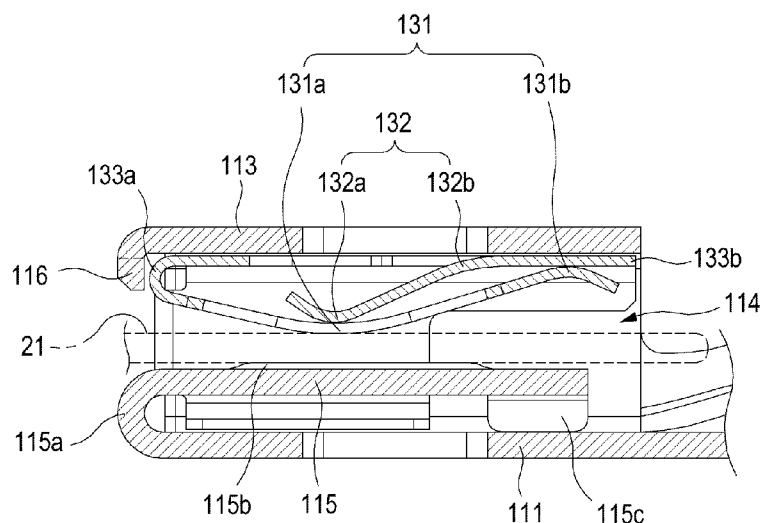


FIG. 7

(57) **Abstract:** The present invention relates to a female electrical terminal having a contact section receiving a contact pin (21) of a male electrical terminal. A spring module of the female electrical terminal is disposed in the contact section and fixes the contact pin (21) to the contact section. The spring module includes a first plate spring (131) pressing the contact pin (21) toward the contact section and a second plate spring (132) pressing the first plate spring (131) toward the contact pin (21). The first plate spring (131) includes a first flexure portion (131a), which comes into contact with the contact pin (21), preferably at its middle. The second plate spring (132) includes a first flexure portion (132a), which comes into contact with the first flexure portion (131a) of the first plate spring (131), preferably at its free end.

Female electrical terminal

The present invention relates to a female electrical terminal for an electrical connector.

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Electrical connectors are used for electrical connection between two electrical devices. The electrical connectors include a male electrical connector and a female electrical connector that can be complementarily mated to each other. Male electrical terminals and female electrical connectors are fixed to their
10 respective electrical connectors.

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Typical electrical terminals are formed by bending a piece of a metal blank into a predetermined shape. A female electrical terminal may include a contact section and a resilient element. The contact section is configured to receive a contact pin of a male electrical terminal. The resilient element fixes the contact pin of the male electrical terminal to the contact section inside the contact section. When
20 such female electrical terminal and such male electrical terminal are mated to each other, the contact pin is brought into close contact with the contact section under a contact force from the resilient element perpendicular to an insertion direction of the contact pin, thus fixing the contact pin to the contact section and making an electrical connection between the contact pin and the contact section.

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A metal blank for forming the female electrical terminal comprises a high conductive metal material, but such a metal material does not have a satisfactory rigidity. Focusing upon conductivity, the contact section and the resilient element may be made from a single piece of a metal blank comprising a high-conductive metal material. However, this may lead to weakness of the contact force provided by the resilient element, thus causing unintended separation between the female electrical terminal and male electrical terminal.

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Further, the contact section and the resilient element may be made from a single piece of a metal blank comprising a high-rigidity metal material. This, in turn, may enhance the contact force of the resilient element, but deteriorates the conductivity of the contact section and the resilient element, thus decreasing

permissible current intensity.

That is, conductivity and rigidity are incompatible with each other since the contact section and the resilient element are made from a single piece of a metal blank.

Further, a prior art female electrical terminal includes the resilient element configured to apply a single contact force to the contact pin of the male electrical terminal. Thus, when the prior art female electrical terminal is used under the vibratory circumstance, its contact structure between the contact pin and the resilient element may weaken.

When an electrical terminal is used in an engine compartment of a motor vehicle, the vibration occurring in the motor vehicle may weaken the contact between the resilient element of the female electrical terminal and the contact pin of the male electrical terminal. This may not make a stable connection between two electronic devices and cause connection failure.

The present invention is directed to solving the aforementioned problems of the prior art. It is an object of the present invention to provide a female electrical terminal, which applies a stronger contact force to a contact pin of a male electrical terminal and achieves more stable connection.

To achieve the above and other objects, in an exemplary embodiment, the present invention provides a female electrical terminal suitable to be connected to a male electrical terminal with a contact pin. The female electrical terminal includes:

- a contact section having an interior cavity suitable to receive the contact pin; and
- a spring module arranged in the interior cavity and fixing the contact pin to the contact section.

The spring module comprises a first plate spring pressing the contact pin toward the contact section and a second plate spring pressing the first plate spring toward the contact pin. The first plate spring includes a first flexure portion,

which comes into contact with the contact pin, preferably at its middle. The second plate spring includes a first flexure portion, which comes into contact with the first flexure portion of the first plate spring, preferably at its free end.

- 5 In an embodiment of the present invention, the spring module further includes a frame configured to be fitted to the interior cavity. The first plate spring extends from one end of the frame, while the second plate spring extends from an opposite end of the frame.
- 10 In an embodiment of the present invention, the first plate spring further includes a second flexure portion, which comes into contact with the opposite end of the frame, at its free end.

- In an embodiment of the present invention, the second plate spring further
15 includes a second flexure portion that is located between the first flexure portion of the second plate spring and the opposite end of the frame.

- In an embodiment of the present invention, the first plate spring has a width
20 wider than that of the second plate spring.

- In an embodiment of the present invention, the contact section has a locking lip
engaging the one end of the frame engages.

- In an embodiment of the present invention, the frame has a stop lug engaging
25 an end of the contact section.

- In an embodiment of the present invention, along a line perpendicular to the
contact pin, the first flexure portion of the first plate spring comes into contact
with the contact pin and the first flexure portion of the second plate spring
30 comes into contact with the first flexure portion of the first plate spring.

In an embodiment of the present invention, the contact section includes a contact strap extending from an end of the contact section opposite to the spring module. The contact pin is intervened between the spring module and the

contact strap.

In an embodiment of the present invention, the contact strap has at least a contact ridge protruding toward the spring module.

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In an embodiment of the present invention, the first plate spring has at least a slit extending in the first flexure portion in a longitudinal direction of the first plate spring.

10 In an embodiment of the present invention, the contact section comprises a copper alloy material, while the spring module comprises a copper alloy material having rigidity higher than the copper alloy material of the contact section or a stainless steel material.

15 According to the female electrical terminal of the present invention, the spring module, which is disposed in the contact section to apply a contact force to the contact pin of the male electrical terminal, is provided individually from the contact section. The contact section is made from a high conductive metal material, while the spring module is made from a high-rigidity metal material.

20 Accordingly, the female electrical terminal can intensify the contact force of the spring module without any decrease in permissible current intensity and thus provide more stable electrical connection.

Further, the spring module includes two plate springs disposed in a double-layered arrangement. Their upper plate spring applies a primary contact force to the contact pin of the male electrical terminal, while their lower plate spring supports the upper plate spring and applies a secondary contact force to the upper plate spring. Thus, the female electrical terminal stably fixes the contact pin of the male electrical terminal to its contact section without connection failure caused by vibration.

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Of course, different features, alternatives and/or embodiments of the present invention can be combined with each other in various arrangement to the extent that they are not incompatible or mutually exclusive of others.

The present invention will be better understood and other features and advantages will become apparent upon reading the following detailed description including embodiments for illustrative purposes with reference to the figures, presented as non-limitative examples, which can be used to complete the understanding of the present invention and the description and, where appropriate, contribute to its definition, in which:

- FIG. 1 is a perspective view showing a female electrical terminal according to an embodiment of the present invention and a complementary male electrical terminal,
- FIG. 2 is a perspective view showing with the female electrical terminal, shown in FIG. 1, turned upside down and a spring module separated from a contact section,
- FIG. 3 is a perspective transversally-sectional view showing a contact section of the female electrical terminal with a contact strap appearing,
- FIG. 4 is an enlarged perspective view of a spring module shown in FIG. 2,
- FIG. 5 is a view similar to FIG. 4 with a first plate spring shown in dashed lines,
- FIG. 6 is a perspective longitudinally-sectional view showing a front portion of the female electrical terminal,
- FIG. 7 is a side longitudinally-sectional view corresponding to FIG. 6, with a contact pin inserted to a contact section,
- FIG. 8 is a plan view of a piece of a metal blank forming a contact section and a wire connection section of the female electrical terminal, and
- FIG. 9 is a plan view of a piece of another metal blank forming a spring module of the female electrical terminal.

It should be noted that, on figures, structural and/or functional elements which are common to different embodiments may have the same reference sign. Thus, unless otherwise stated, these elements have structural, dimensional and material properties which are identical.

Moreover, descriptions are made as to embodiments of a female electrical terminal according to the present invention with reference to the accompanying

drawings. As used herein, the directional term “front” or “forward” refers to a direction in which a female electrical terminal faces to a complementary male electrical terminal and the directional term “rear” or “rearward” refers to a direction opposite to a front or forward direction.

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Referring to FIG. 1, a female electrical terminal 100 according to an embodiment of present invention is mated to a complementary male electrical terminal 20, thereby making an electrical connection between an electrical wire joined to the female electrical terminal 100 and another electrical wire joined to the male electrical terminal 20.

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The male electrical terminal 20 includes an elongated thin contact pin 21 and a wire connection section 22 extending opposite to the contact pin 21. The contact pin 21 is inserted to the female electrical terminal 100. An electrical wire is joined to the wire connection section 22.

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Referring to FIGS. 1 and 2, the female electrical terminal 100 includes the following:

- a contact section 110 configured to receive the contact pin 21 of the male electrical terminal 20,
- a wire connection section 120 rearward extending from the contact section 110, and
- a spring module 130 disposed in the contact section 110 to resiliently fix the contact pin 21 of the male electrical terminal 20 to the contact section 110.

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The contact section 110 and the wire connection section 120 are formed by bending a piece of a metal blank 100a, shown on FIG. 8, while the spring module 130 is formed by a piece of another metal blank 100b, shown on FIG. 9.

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The contact section 110 has a generally box shape or a tubular shape with a rectangular cross-section. The contact section 110 has a bottom portion 111, a pair of lateral portions 112 perpendicularly extending from the bottom portion 111 and a pair of top portions 113 extending from the lateral portions 112

respectively opposite to the bottom portion 111, thus defining therein an interior cavity 114 that receives the contact pin 21 of the male electrical terminal 20 and has a rectangular cross-section. Preferably, each top portion 113 has a size of a half of the bottom portion 111.

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The top portions 113 are opposed to each other to form a top of the contact section 110. A front end of the contact section 110 is open for entry of the contact pin 21 of the male electrical terminal 20.

- 10 As shown in FIGS. 3, 6 and 7, the contact section 110 includes a contact strap 115 rearward extending from a front end of the bottom portion 111. The contact strap 115 extends parallel to the bottom portion 111 and is opposed to the spring module 130. The contact strap 115 is connected to the bottom portion 111 with a joint 115a. The joint 115a comprises a forwardly convex curved surface.
- 15 The joint 115a of the contact strap 115 guides the insertion of the contact pin 21 of the male electrical terminal 20.

The contact strap 115 has a pair of support legs 115c that extend from its free end toward the bottom portion 111, as shown on FIGS. 3 and 7. The support

20 legs 115c abut an inner surface of the bottom portion 111. The contact strap 115 contacts the contact pin 21 of the male electrical terminal 20 and thus permits flow of electric current.

As shown in FIG. 3, the contact strap 115 has four contact ridges 115b

25 protruding inward of the interior cavity 114, toward the spring module 130. The contact ridge 115b extends forward and backward on a surface of the contact strap 115, which contacts the contact pin 21 of the male electrical terminal 20.

When the female electrical terminal 100 and the male electrical terminal 20 are

30 mated to each other and the contact pin 21 contacts the contact strap 115, foreign substances stuck to the surface of the contact strap 115 or to the surface of the contact pin 21 may cause unstable contact. However, the contact strap 115 and the contact pin 21 contact each other through the contact ridges 115b, thus providing stable electrical connection without the influence of the surface

condition of the contact strap 115 or the contact pin 21.

The contact section 110 has a pair of locking lips 116 extending downward from the respective top portions 113. The locking lips 116 block a portion of the front
5 end of the contact section 110 and prevent the spring module 130 inserted to the contact section 110 from being separated from the contact section 110. The locking lips 116 may be inwardly bent after the spring module 130 is inserted to the interior cavity 114 of the contact section 110.

10 The wire connection section 120 rearward extends from the contact section 110. The wire connection section 120 has a wire crimp barrel 121, an insulation crimp barrel 122 and a transition portion 123.

The wire crimp barrel 121 is connected to a conducting wire core of an electrical
15 wire. The insulation crimp barrel 122 extends from the wire crimp barrel 121 and is connected to an insulation covering of the electrical wire. The wire crimp barrel 121 and the insulation crimp barrel 122 have two laterally-protruding wing tabs. These wing tabs may be folded or crimped to join the conducting wire core and the insulation covering of the electrical wire to the respective barrels.

20 The transition portion 123 interconnects the contact section 110 and the wire crimp barrel 121. Preferably, the transition portion 123 gradually narrows toward rear, thus preventing the spring module 130 in the contact section 110 from moving rearward.

25 The spring module 130 is fitted to the interior cavity 114 of the contact section 110 and is positioned opposite to the contact strap 115. The spring module 130 is inserted from the front end of the contact section 110 into the interior cavity 114.

30 When the contact pin 21 of the male electrical terminal 20 is inserted to the contact section 110, the contact pin 21 is intervened between the contact strap 115 and the spring module 130.

The spring module 130 presses or biases the contact pin 21 toward the inner surface of the contact section 110, i.e., toward the contact strap 115. Advantageously, the spring module 130 applies a normal contact force perpendicular to the contact strap 115 or the contact pin 21 to the contact pin 21, thereby fixing the contact pin 21 in between itself and the contact strap 115.

Referring to FIGS. 4 to 7, the spring module 130 includes a first plate spring 131 and a second plate spring 132 that are juxtaposed one above the other or disposed in a double-layered arrangement.

The first plate spring 131 faces toward the interior cavity 114. The first plate spring 131 comes into surface contact with the contact pin 21 and presses the contact pin 21 toward the contact section 110 (toward the contact strap 115). The first plate spring 131 applies a primary normal contact force to the contact pin 21.

The second plate spring 132, which is located outward of the first plate spring 131, supports the first plate spring 131 and presses the first plate spring 131 toward the contact pin 21. The second plate spring 132 applies an additional or secondary normal contact force to the contact pin 21 via the first plate spring 131.

The spring module 130 includes:

- a frame 133, preferably a rectangular frame 33, fitted to the interior cavity 114 of the contact section 110,
- the first plate spring 131 extending from a front end (one end) 133a of the frame 133, and
- the second plate spring 132 extending from a rear end (the opposite end) 133b of the frame 133.

The first plate spring 131 and the second plate spring 132 extend from the longitudinal ends of the frame 133 in opposite directions. The first plate spring 131 and the second plate spring 132 take the form of a cantilever.

The frame 133 has a pair of lateral walls 133c that are upstanding from the front end 133a and the rear end 133b. Preferably, opposing leading ends of the lateral walls 133c are bent inwardly of the spring module 130. The lateral wall 133c has a height corresponding to a perpendicular height of the cavity 114 of the contact section 110.

The frame 133 may contact the inner surface of the contact section 110 at an outer surface of the lateral walls 133c. Lateral walls 133c of the frame 133 are upstanding from its bottom and thus permits fitting between the spring module 130 and inner surfaces of the contact section 110.

Particularly, a pair of stop lugs 133d, which protrude laterally, are formed at front ends of the lateral walls 133c. When the spring module 130 is fitted to the interior cavity 114 of the contact section 110, the stop lugs 133d engages front ends of the lateral portions 112 of the contact section 110, restricting the insertion of the spring module 130.

Preferably, the first plate spring 131 has a width wider than that of the second plate spring 132 and is configured to cover the second plate spring 132.

The first plate spring 131 has a first flexure portion 131a and a second flexure portion 131b. The first flexure portion 131a rearward extends from the front end 133a of the frame 133. Particularly, the first flexure portion 131a is located in the middle of the first plate spring 131, i.e., between the front end 133a of the frame 133 and a free end of the first plate spring 131. Advantageously, the first flexure portion 131a is convex toward the contact strap 115 and comes into contact with the contact pin 21 at its approximate halfway point.

The second flexure portion 131b extends from the first flexure portion 131a and is convex relative to the contact strap 115, i.e., opposite to the curvature of the first flexure portion 131a. An end of the second flexure portion 131b becomes the free end of the first plate spring 131.

In particular, the first flexure portion 131a is formed with a plurality of slits 131c

extending forward and rearward, i.e. in a longitudinal direction of the first plate spring 131.

5 The first plate spring 131 comes into contact with a base end of the second plate spring 132 or the rear end 133b of the frame 133, particularly at an approximate halfway portion of the second flexure portion 131b.

10 The second plate spring 132 is located outward of the first plate spring 131. The second plate spring 132 forward extends from the rear end 133b of the frame 133. The second plate spring 132 has a first flexure portion 132a and a second flexure portion 132b.

15 The first flexure portion 132a of the second plate spring 132 is configured to come into contact with the first flexure portion 131a of the first plate spring 131 and forms a free end of the second plate spring 132.

The second flexure portion 132b of the second plate spring 132 is located between the first flexure portion 132a and the rear end 133b of the frame 133.

20 Preferably, the first flexure portion 132a is convex toward the contact strap 115. Similarly, the second flexure portion 132b is preferably convex relative to the contact strap 115, i.e., opposite to the curvature of the first flexure portion 132a of the second plate spring 132.

25 When no load acts on the first plate spring 131 of the spring module 130, the second plate spring 132 does not come into contact with the first flexure portion 131a of the first plate spring 131. If a load acts on the first plate spring 131, then the second plate spring 132 can come into contact with a surface of the first flexure portion 131a of the first plate spring 131 at an approximate halfway
30 portion of the first flexure portion 132a.

If the contact pin 21 of the male electrical terminal 20 is inserted between the spring module 130 and the contact strap 114 with the spring module 130 fitted to the interior cavity 114 of the contact section 110, then the first plate spring 131

and the second plate spring 132 resiliently flex or are resiliently pressed away from the contact strap 115.

Further, along a line substantially perpendicular to the contact pin 21, the first flexure portion 131a of the first plate spring 131 may come into contact with the contact pin 21. Similarly, the first flexure portion 132a of the second plate spring 132 may come into contact with the first flexure portion 131a of the first plate spring 131.

That is, in a perpendicular contact position of the contact pin 21 and the first plate spring 131 and the second plate spring 132, a contact point between the contact pin 21 and the first plate spring 131 as well as another contact point between the first plate spring 131 and the second plate spring 132 may lie on a line substantially perpendicular to the contact pin 21 or be located in close proximity with the line.

With the above-described pressure or flex, the first plate spring 131 applies the normal contact force, preferably from the halfway portion of the first flexure portion 131a, toward the contact pin 21. Further, the second plate spring 132 applies the additional normal contact force, preferably from the halfway portion of the first flexure portion 132a, toward the first flexure portion 131a of the first plate spring 131 as well as the contact pin 21.

Furthermore, since the contact points between the contact point 21 and the first plate spring 131 and the second plate spring 132 lie on a line as described above, the normal contact force and the additional normal contact force are integrated on the line, thus applying a strong contact force to the contact pin 21.

Thus, the normal contact forces from the respective first plate spring 131 and second plate spring 132 are applied to the contact pin 21, thereby firmly retaining the contact pin 21 in between the contact strap 115 and the first plate spring 131 and bringing the contact pin 21 into stable contact with the contact strap 115 and the spring module 130.

FIG. 8 shows a single piece of a metal blank that is formed into the contact section 110 and the wire connection section 120 of the female electrical terminal 100. FIG. 9 shows a single piece of another metal blank that is formed into the spring module 130.

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Referring to FIGS. 8 and 9, the contact section 110 and the wire connection section 120 are formed by bending a first metal blank 100a and the spring module 130 is formed by bending a second metal blank 100b.

- 10 The first metal blank 100a and the second metal blank 100b may be formed by blanking. Further, preferably, the first metal blank 100a is made from a high-conductive copper alloy material, while the second metal blank 100b is, preferably, made from a high-rigidity stainless steel material or a copper alloy material having rigidity higher than that of the first metal blank 100a. Accordingly,
- 15 the contact section 110 is made from a high-conductive metal material, while the spring module 130 is made from a high-rigidity metal material.

Thus, the female electrical terminal 100 can enhance the resiliency of the spring module 130 while preventing the decrease in permissible current intensity.

- 20 Further, the female electrical terminal 100 and the male electrical terminal 20 can be firmly connected to each other.

- Obviously, the present invention is not limited to embodiments which are here above described and provided only as examples. It also includes different
- 25 modifications, and alternatives that may be considered by the person skill in the art as part of the present invention, including all combinations of different embodiments here above described, taken alone or in combination.

Claims

1. A female electrical terminal (100), suitable to be connected to a male electrical terminal (20) with a contact pin (21), comprising:

- 5 – a contact section (110) having an interior cavity (114), suitable to receive the contact pin (21), and
- a spring module (130) arranged in the interior cavity (114) and fixing the contact pin (21) to the contact section (110),

10 **wherein** the spring module (130) comprises a first plate spring (131) pressing the contact pin (21) toward the contact section (110) and a second plate spring (132) pressing the first plate spring (131) toward the contact pin (21),

wherein the first plate spring (131) includes a first flexure portion (131a) that comes into contact with the contact pin (21), preferably at a middle thereof, and

15 **wherein** the second plate spring (132) includes a first flexure portion (132a) that comes into contact with the first flexure portion (131a) of the first plate spring (131), preferably at a free end thereof.

2. The female electrical terminal (100) according to Claim 1, **wherein** the spring module (130) further includes a frame (133) configured to be fitted to the

20 interior cavity (114).

3. The female electrical terminal (100) according to Claim 2, **wherein** the first plate spring (131) extends from one end (133a) of the frame (133) and/or the second plate spring (132) extends from an opposite end (133b) of the frame

25 (133).

4. The female electrical terminal (100) according to Claim 3, **wherein** the first plate spring (131) further includes a second flexure portion (131b) at a free end thereof, coming into contact with the opposite end (133b) of the frame (133).

30 5. The female electrical terminal (100) according to Claim 3 or 4, **wherein** the second plate spring (132) further includes a second flexure portion (132b) located between the first flexure portion (132a) of the second plate spring (132) and the opposite end (133a) of the frame (133).

6. The female electrical terminal (100) according to any Claims 3 to 5, **wherein** the contact section (110) has a locking lip (116) engaging the one end (133a) of the frame (133).

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7. The female electrical terminal (100) according to any of the preceding Claims, **wherein** the frame (133) has a stop lug (133d) engaging an end of the contact section (110).

10 8. The female electrical terminal (100) of according to any of the preceding Claims, **wherein**, along a line perpendicular to the contact pin (21), the first flexure portion (131a) of the first plate spring (131) comes into contact with the contact pin (21) and the first flexure portion (132a) of the second plate spring (132) comes into contact with the first flexure portion (131a) of the first plate
15 spring (131).

9. The female electrical terminal (100) according to any of the preceding Claims, **wherein** the contact section (110) includes a contact strap (115) extending from an end of the contact section (110) opposite to the spring module
20 (130).

10. The female electrical terminal (100) according to Claim 9, **wherein** the contact pin (21) is intervened between the spring module (130) and the contact strap (115).

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11. The female electrical terminal (100) of Claim 9 or 10, **wherein** the contact strap (115) has at least a contact ridge (115b) protruding toward the spring module (130).

30 12. The female electrical terminal (100) according to any of the preceding Claims, **wherein** the first plate spring (131) has at least a slit (131c) extending in the first flexure portion (131a) in a longitudinal direction of the first plate spring (131).

13. The female electrical terminal (100) of any of the preceding Claims, **wherein** the first plate spring (131) has a width wider than that of the second plate spring (132).

- 5 14. The female electrical terminal (100) according to any of the preceding Claims, **wherein** the contact section (110) comprises a copper alloy material and the spring module (130) comprises a copper alloy material having rigidity higher than the copper alloy material of the contact section (110) or a stainless steel material.

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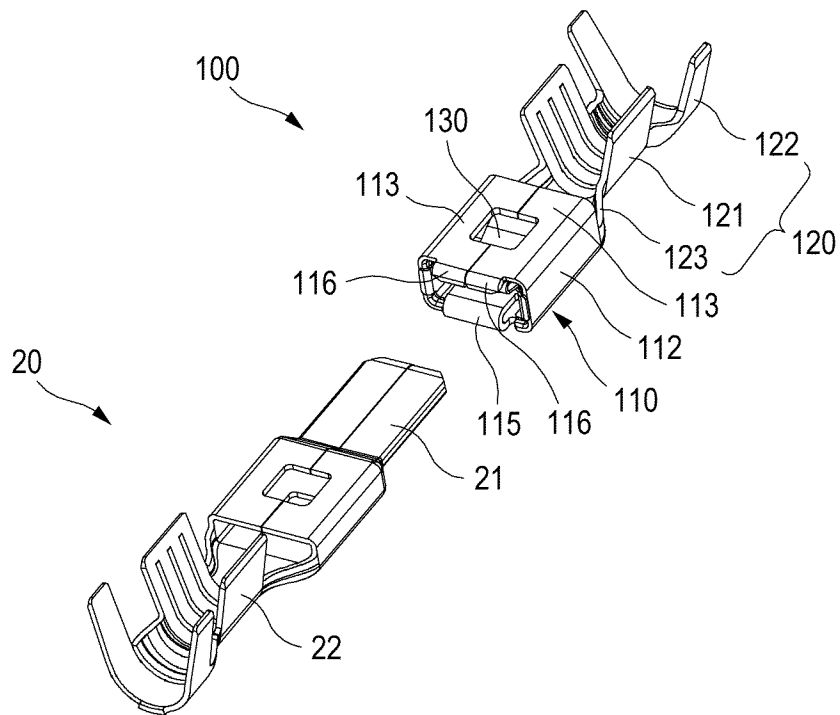


FIG. 1

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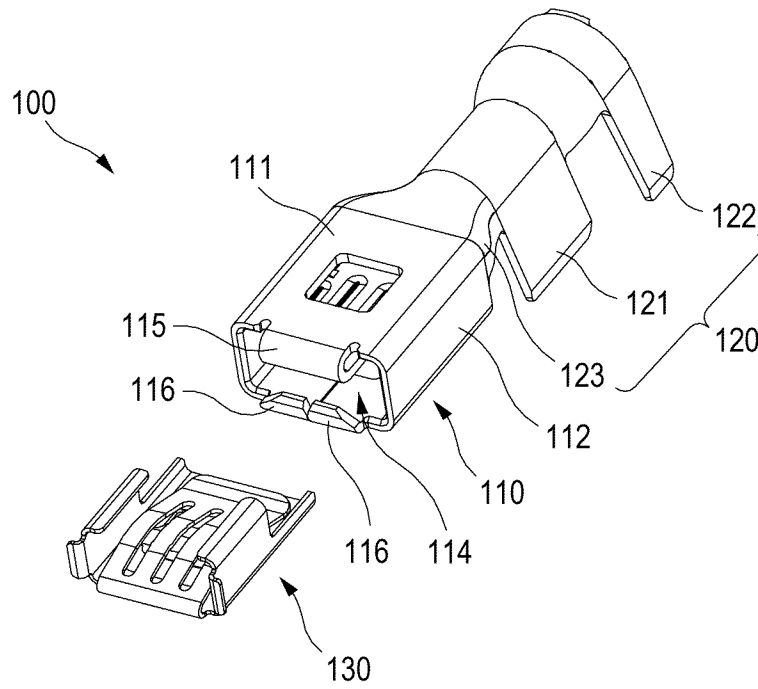


FIG. 2

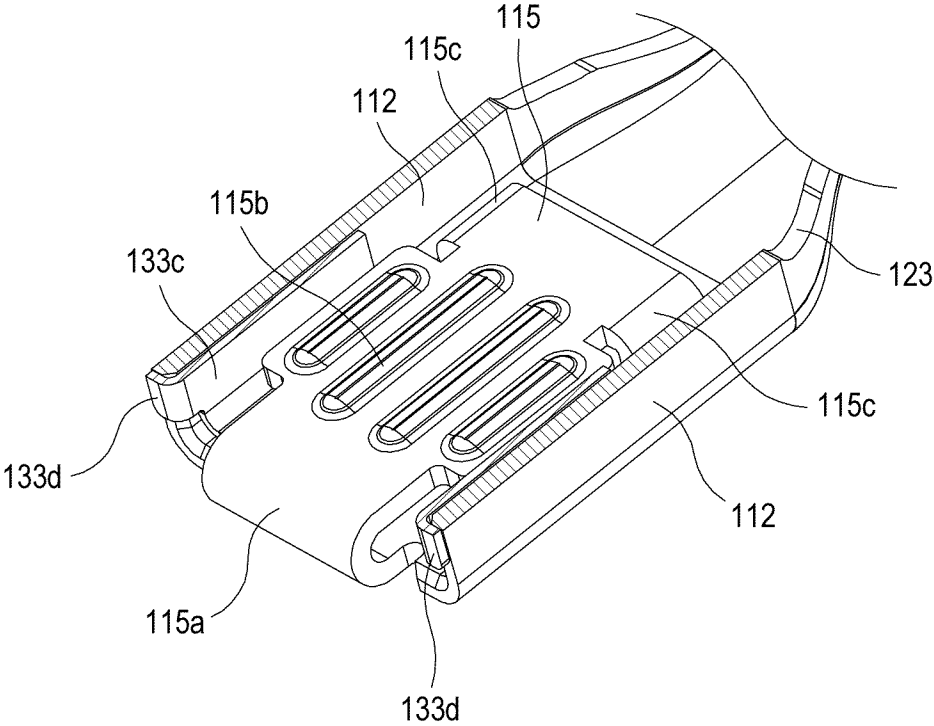


FIG. 3

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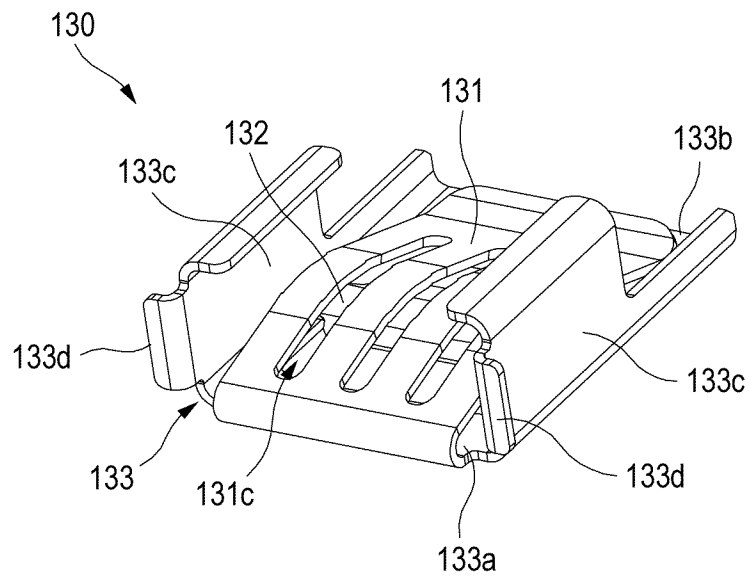


FIG. 4

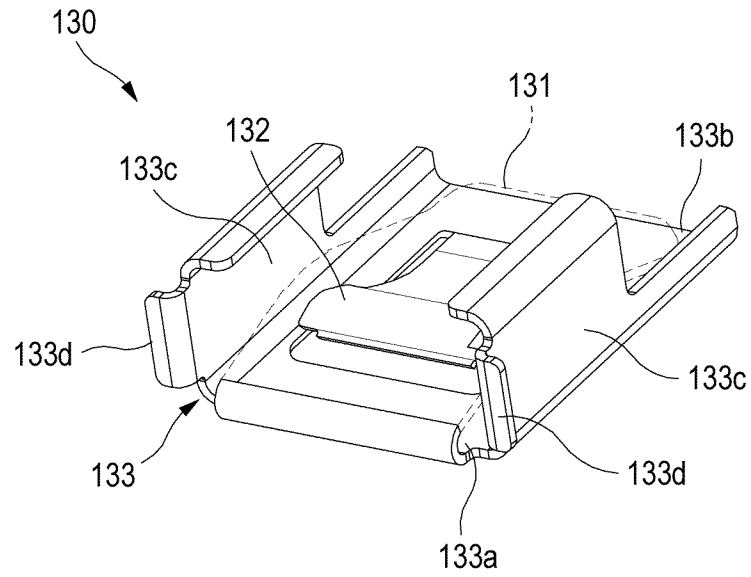


FIG. 5

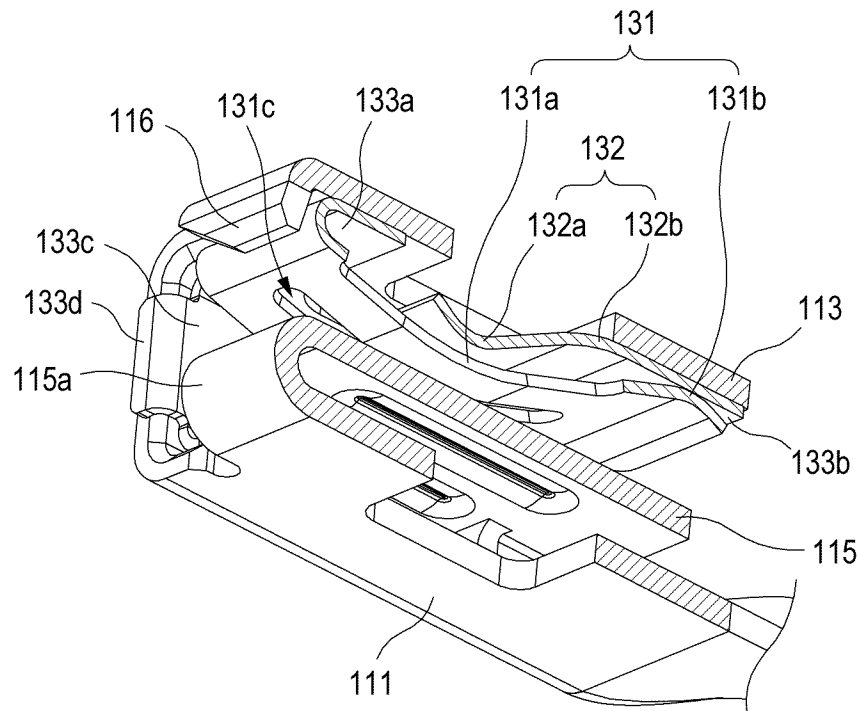


FIG. 6

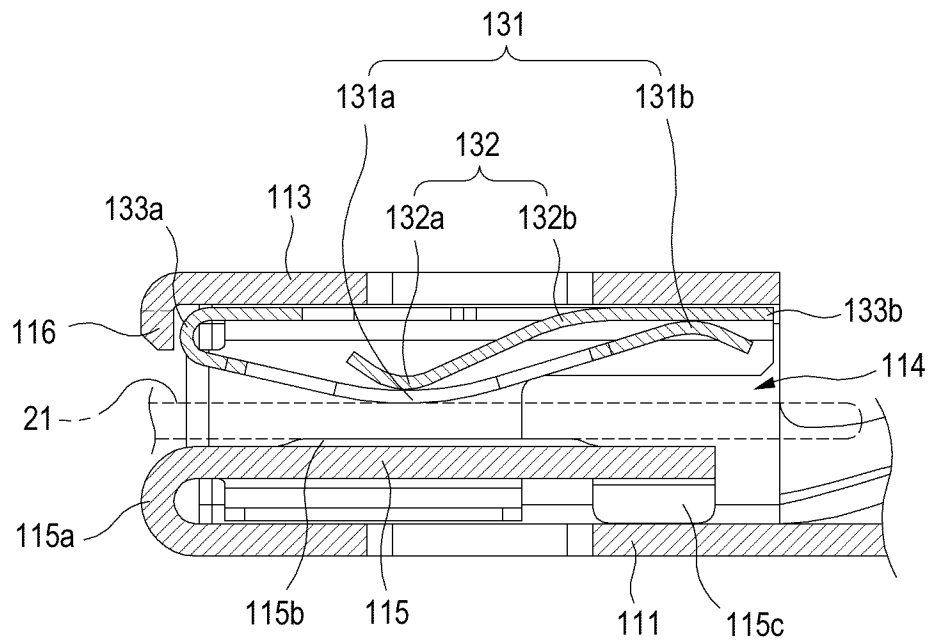


FIG. 7

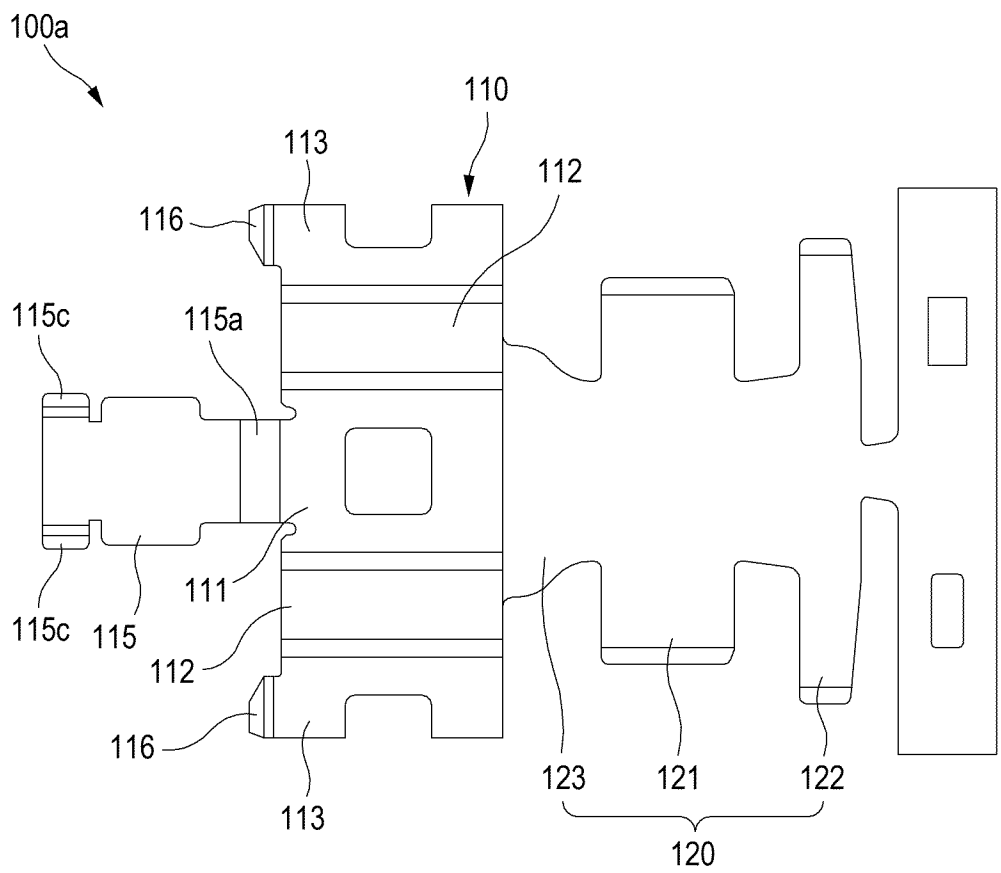


FIG. 8

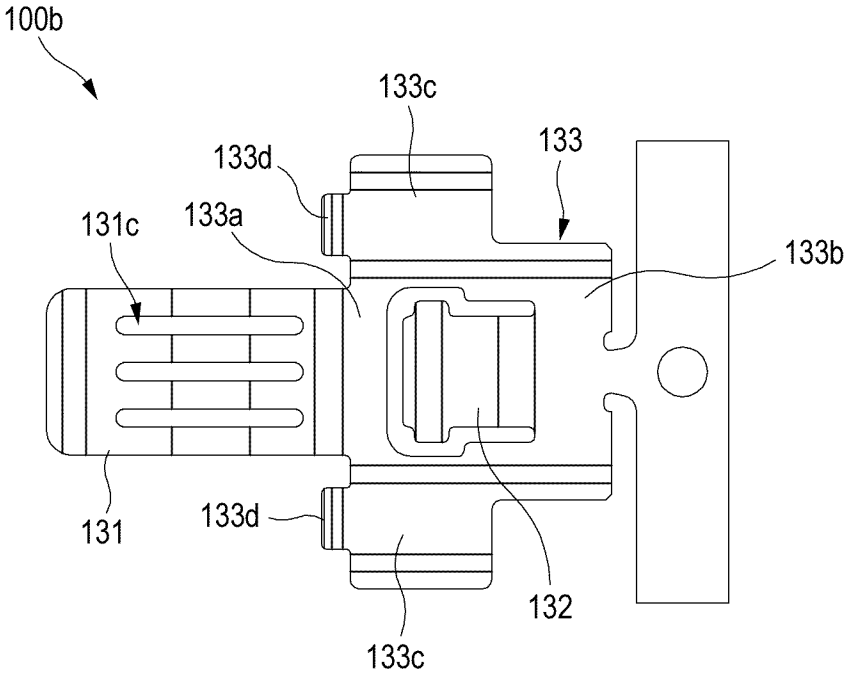


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2013/050670

A. CLASSIFICATION OF SUBJECT MATTER

INV. H01R13/187

ADD. H01R13/11

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	US 7 294 027 B1 (TYLER ADAM P [US]) 13 November 2007 (2007-11-13)	1,8-11
Y	the whole document	2-7,12
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X	the whole document	1
X	WO 2010/098157 A1 (SUMITOMO WIRING SYSTEMS [JP]; NHK SPRING CO LTD [JP]; MUKUNO JUNICHI []) 2 September 2010 (2010-09-02) figure 10	1
X	WO 2012/176395 A1 (YAZAKI CORP [JP]; ANDO SHUHEI [JP]; MATSUMOTO TERUMICHI [JP]; KATO HAJ) 27 December 2012 (2012-12-27)	1
Y	the whole document	2-7,12
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Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2013/050670

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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