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(54) **ELECTRICALLY CONDUCTIVE TERMINAL**

(57) The present invention relates to an electrically conductive terminal (10), which is adapted to receive a counter-terminal, in particular a blade or plate terminal of an automotive fuse. The electrically conductive terminal comprises a spring contact (20) having two opposed spring legs (21,22). The electrically conductive terminal (10) further comprises a fork-shaped contact (30) having two opposed arms (31,32). The spring contact (20) and the fork-shaped contact (30) are provided to each receive the counter-terminal, when the counter-terminal is mated with the electrically conductive terminal (10).

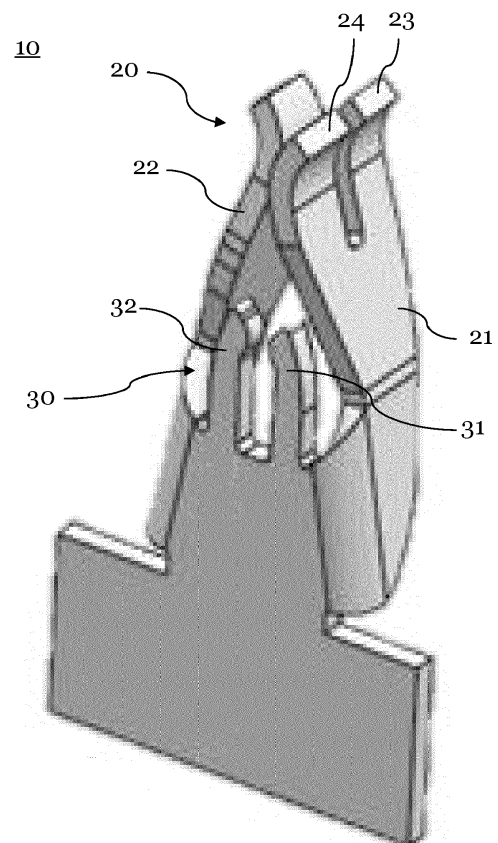


Fig. 1

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Description**1. Field of the invention**

[0001] The present invention relates to an electrically conductive terminal, which is adapted to receive a respective counter-terminal, for example of an automotive fuse.

2. Technical background

[0002] A proper electrical connection between two different components is important for many applications. For example, in an automotive vehicle, fuses are typically inserted into a fuse socket, such that the terminals of the fuses are mated with respective terminals of the fuse socket. The resulting connection between the fuse terminals of the fuses and the fuse socket should thereby be such that the corresponding electrical connection is maintained securely. For example, the electrical connection should withstand all ranges of temperatures, vibration and shock, which the connection is typically subjected to.

[0003] Electrical centers typically comprise busbars with tuning forks to conduct electricity. Typical busbars can thereby withstand currents of up to 18 A. Due to a low temperature dissipation of the busbars, higher currents are typically not applicable, as the resulting high temperatures may damage the busbars.

[0004] The German patent DE 10 2008 005 078 B3 describes a current bridge with a first and second plurality of contacts, which lie on different planes. This allows for spatially grouping different types of fuses, such as for example F-and C-fuses, at the same or even increased packing density. However, the design cannot withstand high currents of, for example, 32 A. Also, a tight connection between the fuse and the contacts is not provided, and the instable fuse positioning may lead to voltage jumps and overheating.

[0005] US patent 5,049,095 is directed to an automotive fuse socket and to electrically conductive terminals that may be mounted in the socket. However, also the terminals disclosed therein are not suited for big-sized terminals or contacts, which may withstand high currents.

[0006] It is further known to use special adapters, e.g. F/F terminals, and to use those to connect e.g. a maxi fuse and a busbar. However, these special adapters are typically provided as separate parts, and thus increase the number of electrical interconnections.

[0007] Thus, it is an object of the present invention to provide a terminal design which can withstand high currents. Furthermore, it is an object of the present invention to provide a terminal which allows for a secure and resistant electrical connection of the terminal to a respective counter-terminal.

[0008] These and other objects, which are apparent from the following description to the person skilled in the art, are solved by the subject matters of the independent

claims.

3. Summary of the invention

[0009] The present invention relates to an electrically conductive terminal, which is adapted to receive a counter-terminal. The counter-terminal may be any terminal suited for being mated with the electrically conductive terminal of the present invention. For example, but not limited thereto, the counter-terminal may be a blade or plate terminal, having a blade- or plate-like structure. Thus, the counter-terminal may have a planar portion adapted to be mated with the electrically conductive terminal of the present invention. The counter-terminal may be of an automotive fuse in a particularly preferred embodiment of the present invention. The electrically conductive terminal may be provided in form of a female terminal.

[0010] The electrically conductive terminal comprises a spring contact having two opposed spring legs, and a fork-shaped contact having two opposed arms. The spring contact and the fork-shaped contact are provided to each receive the counter-terminal, when the counter-terminal is mated with the electrically conductive terminal. The skilled person understands that the mating may be achieved by inserting the counter-terminal into the electrically conductive terminal of the present invention. The legs of the spring contact and the arms of the fork-shaped contact may be oriented into the same direction for receiving the counter-terminal during the mating process. The main orientation of the legs and of the arms may be essentially parallel to a mating or insertion direction of the counter-terminal.

[0011] Thus, according to the present invention, two contact pairs are used to improve thermal and electrical conductance, so the terminal does not overheat during high current usage. The spring contact may thereby provide a relatively high contact area and relatively small normal forces, compared to the fork-shaped contact. The fork-shaped contact may provide a relatively small contact area and relatively large normal forces, compared to the spring contact. Thereby, a high quality electrical connection may be achieved. The high normal contact forces of the fork-shaped contact provide a secure connection even during vibration and shock. The large contact area of the spring contact allows for an electrical connection of high quality.

[0012] The fork-shaped contact may have a tuning-fork structure. Thus, the two opposed arms of the fork-shaped contact may extend into the same direction and may define contact surfaces at a minimum-dimensioned gap there between. The fork-shaped contact may have a generally U-shaped structure. In the mated state, the counter-terminal may be at least partially in direct contact with the inner sides of the opposed arms. Upon insertion of the counter-terminal into the fork-shaped contact, the counter-terminal may come into contact with the arms of the fork-shaped contact and may thereby cause the two

opposed arms to deflect, such that the counter-terminal can be inserted into the gap defined between the arms of the fork-shaped contact. It will be appreciated that the arms of the fork-shaped contact are formed and positioned such, that the counter-terminal having a predefined strength can be received by the fork-shaped contact without or only marginally deflecting the arms of the fork-shaped contact.

[0013] The spring contact may be configured such that the two opposed spring legs can be deflected symmetrically upon insertion of the counter-terminal into the spring contact. Upon insertion of the counter-terminal into the spring contact, the counter-terminal may come into contact with the spring legs of the spring contact and may thereby cause the two opposed spring legs to deflect, such that the counter-terminal can be inserted in between the legs of the spring contact.

[0014] Preferably, when the counter-terminal is mated with the electrically conductive terminal, a retention force of the fork-shaped contact is greater than a retention force of the spring contact. Preferably, the retention force of the fork-shaped contact is at least 10% greater, more preferably at least 20% greater, more preferably at least 50% greater, more preferably at least 100% greater, and most preferred at least 200% greater than the retention force of the spring contact. Thus, the person skilled in the art understands that the terminal is configured such that the counter-terminal is securely held in place when mated with the electrically conductive terminal, due to the high retention force of the fork-shaped contact. For this purpose, a bending-apart or spreading stiffness of the two opposed arms of the fork-shaped contact is preferably higher than a bending-apart or spreading stiffness of the two opposed spring legs of the spring contact. Thus, the person skilled in the art understand that when inserting the counter-terminal into the electrically conductive terminal or removing the counter-terminal therefrom, higher forces may be required for mating or unmating the counter-terminal with the fork-shaped contact compared to the forces required for mating or unmating the counter-terminal with the spring contact. Thereby, a rather stiff contact or connection between the fork-shaped and the counter-terminal is provided, preventing slippage of the counter-terminal from the electrically conductive terminal. Generally, the bending-apart or spreading stiffness may refer to the resistance of the legs or arms when applying a force to increase a gap defined between the legs or arms, when no counter-terminal is mated with the electrically conductive terminal.

[0015] Preferably, when the counter-terminal is not mated with the electrically conductive terminal, a gap defined between contact areas of the spring contact is less than a gap defined between contact areas of the fork-shaped contact. The terms contact areas of the spring contact and of the fork-shaped contact used herein may be those parts of the legs or arms of the respective contacts, which are in contact with the counter-terminal, when the counter-terminal is mated with the electrically

conductive terminal. By providing the spring contact with a relatively narrow gap when the counter-terminal is not mated with the electrically conductive terminal, a proper electrical connection upon mating is ensured.

[0016] Preferably, the spring contact defines a first contact plane. Thus, the contact areas of the spring contact may be provided such that the counter-terminal is in a predefined orientation relative to the electrically conductive terminal, when being mated. Further particularly, the two arms of the fork-shaped contact are provided on opposing sides of the first contact plane defined by the spring contact. Thus, the person skilled in the art understands that the spring contact and the fork-shaped contact are designed to both connect to the same counter-terminal mated with the electrically conductive terminal. A solid grip of the counter-terminal is provided due to the fork-shaped contact, while an electrical connection of high quality is provided due to the spring contact.

[0017] Preferably, the spring contact and the fork-shaped contact are integrally formed. This allows for an easy manufacturing of the electrically conductive terminal, as both contacts may be formed of a common base material. For example, a single metal plate may be used for forming the electrically conductive terminal comprising both the spring contact and fork-shaped contact. Thus, the spring contact and fork-shaped contact may be provided as a single member. The electrically conductive terminal is less prone to deterioration, as the electrically conductive terminal does not feature vulnerable connections between the spring contact and the fork-shaped contact.

[0018] In a preferred embodiment, the contact area of the spring contact is offset to the contact area of the fork-shaped contact. Thus, when viewed in mating or insertion direction of the counter-terminal into the electrically conductive terminal, the contact area of the fork-shaped contact is located behind the contact area of the spring contact. Accordingly, when inserting the counter-terminal into the electrically conductive terminal, the counter-terminal may first be electrically connected to the spring contact before it is connected to the fork-shaped contact. Preferably, the offset between the contact areas is in the range of 1-25mm, more preferably in the range of 3-15mm, more preferably in the range of 5-12mm, more preferably in the range of 7-10mm, and most preferred in the range of 8-9mm. The skilled person understands to choose a suitable offset with regard to the application and the size of the respective counter-terminal. Thus, the spring legs of the spring contact may be longer in length than the arms of the fork-shaped contact. Thereby, a better flexing of the spring contact and therefore a better electrical connection of the spring contact may be achieved, while maintaining a proper positioning of the counter-terminal within the electrically conductive terminal due to the stiff fork-shaped contact.

[0019] Preferably, a width of each of the two opposed arms at the contact area of the fork-shaped contact is less than a width of each of the two spring legs at the

contact area of the spring contact. The term "width" used herein denotes to a dimension which is measured in a direction perpendicular to a mating direction of the counter-terminal into the electrically conductive terminal and parallel to a contact plane of the electrically conductive terminal defined by the spring contact and/or fork-shaped contact. Accordingly, a high quality electrical connection is provided, as in particular the spring contact provides improved thermal performance, such that the electrically conductive terminal is suited for high currents.

[0020] In another preferred embodiment, a thickness of the spring legs at a contact area of the spring contact is essentially the same as a width of the arms of the fork-shaped contact. The term "thickness" used herein denotes to a dimension which is measured in a direction perpendicular to a mating direction of the counter-terminal into the electrically conductive terminal and perpendicular to a contact plane of the electrically conductive terminal defined by the spring contact and/or fork-shaped contact. Thus, the spring legs and the arms may be formed of the same base material, wherein the spring legs are bended and twisted with respect to the arms such that the width of the arms matches the thickness of the spring legs.

[0021] In another preferred embodiment, a thickness of the spring legs at the contact area of the spring legs and/or a width of the arms at a contact area of the fork-shaped contact is at least 0.6 mm, preferably at least 0.8 mm, more preferably at least 1.0 mm and most preferably at least 1.2 mm. Thus, a sheet metal with a respective strength of, for example, 1.0 mm may be used for manufacturing the electrically conductive terminal of the present invention. Thereby, the electrically conductive terminal can withstand high currents and provide a stable positioning of the counter-terminal.

[0022] In another preferred embodiment, a width of the first one of the opposed spring legs at a contact area of the spring contact is greater than a width of the second one of the opposed spring legs at the contact area of the spring contact. Thereby, a stable positioning of the counter-terminal to the electrically conductive terminal is also enabled by the spring contact.

[0023] In a particularly preferred embodiment, the first one of the two opposed spring legs comprises two parallel beams. Thus, the person skilled in the art understands that at least one of the two opposed spring legs of the spring contact may be divided or split such as to form two parallel beams. The two parallel beams thereby may extend into the same direction as the other one of the two opposed spring legs. When the counter-terminal is mated with the electrically conductive terminal, the two parallel beams of the first one of the two opposed spring legs may be provided on one side of the counter-terminal, while the other one of the two opposed spring legs may be provided on the opposed side.

[0024] Further preferred, the width of one of the two parallel beams at a contact area of the spring contact is essentially the same as the width of the second spring

leg at the contact area of the spring contact. Thus, a proper electrical connection upon mating is achieved.

[0025] Particularly preferred, the width of each of the two parallel beams at the contact area of the spring legs is essentially the same as the width of the second spring leg at the contact area of the spring contact. Accordingly, the beams may have similar dimensions and provide a proper electrical connection and enhance the stable positioning of the counter-terminal. By separating one of the spring contacts into two separate beams, the stable positioning of the counter-terminal is advantageously enhanced.

[0026] In another preferred embodiment, when the counter-terminal is mated with the electrically conductive terminal, the electrically conductive terminal withstands a current of at least 18 A, preferably at least 20 A, more preferably at least 24 A, more preferably at least 32 A, more preferably at least 40 A, and most preferably at least 60 A applied across the electrically conductive terminal and the counter-terminal. In particular the large contact area of the spring contact may thereby allow for the good thermal performance of the electrically conductive terminal, thereby allowing the application of such currents.

[0027] The present invention further relates to a metallic busbar comprising an elongated base plate and a plurality of electrically conductive terminals as described above. Each of the plurality of electrically conductive terminals may be provided in a row along the elongated base plate. Preferably, the base plate and the plurality of electrically conductive terminals are integrally formed. Preferably, the spring contacts of the plurality of electrically conductive terminals are provided in a first row and the fork-shaped contacts of the plurality of the electrically conductive terminals are provided in a second row, which is parallel to the first row. Accordingly, when inserting a respective counter-terminal into any one of the electrically conductive terminal of the busbar, an electrical connection may first be established with the spring contacts.

[0028] The present invention further relates to a fuse socket, comprising a first and a second metallic busbar as described above. The first and second metallic busbar may be aligned parallel to each other, such that, for example, an automotive fuse may be used to interconnect the electrically conductive terminals of the first and second metallic busbar.

[0029] Furthermore, the present invention relates to an electrical assembly comprising an electrically conductive terminal as described above and a respective counter-terminal, which is preferably provided in form of a blade or plate terminal. The electrical assembly may be part of an electrical center of an automotive vehicle, for example.

[0030] The present invention also relates to a method for manufacturing a terminal, and preferably for manufacturing an electrically conductive terminal as described above. The method comprises the step of providing a sheet metal plate. The sheet metal plate may be an essentially two-dimensional plate, with a defined strength.

Preferably, this strength is at least 0.6 mm, more preferably at least 0.8 mm, more preferably at least 1.0 mm and most preferably at least 1.2 mm. Preferably, the strength is at most 10 mm, more preferably at most 5 mm, and most preferably at most 2 mm. Thus, the resulting terminal can withstand high currents due to the strength of the sheet metal plate.

[0031] The method further comprises the step of cutting the sheet metal plate for forming two legs and for forming a fork-shaped contact having two opposed arms between the two legs. The skilled person understands that a spring contact will be formed of the two legs.

[0032] Furthermore, the method comprises the step of bending the two legs so as to form the spring contact, wherein bend lines of the legs are angled with respect to each other. This particularly allows for better manufacturability. Thus, by performing the bending, the two legs are reconfigured to form the spring legs of the spring contact. The person skilled in the art understands that a plurality of spring contacts and fork-shaped contacts may be manufactured in this manner. Due to the angling of the bend lines, the contacts can be cut and bent such that the resulting plurality of terminals may be positioned close to each other (if required).

[0033] The present invention further relates to the use of the electrically conductive terminal described above for securing a counter-terminal of a fuse, particularly an automotive fuse, to an automotive electrical center.

4. Description of preferred embodiments

[0034] In the following, the present invention is described in more detail with reference to the figures. In the figures, equal features are provided with the same reference signs.

Fig. 1 presents an electrically conductive terminal according to an embodiment of the present invention;

Fig. 2 presents an electrically conductive terminal according to another embodiment;

Figs 3a and 3b present electrically conductive terminals according to further embodiments;

Fig. 4 presents a busbar during a manufacturing process according to an embodiment;

Fig. 5 presents an electrical assembly according to an embodiment of the invention;

[0035] Fig. 1 illustrates the schematic structure of an electrically conductive terminal 10 according to an embodiment of the invention. The terminal 10 generally comprises two contact pairs. The top contact, i.e. spring contact 20, comprises two spring arms 21, 22. The first spring arm 21 is split to form two beams 23, 24. When a respec-

tive counter-terminal is inserted into the electrically conductive terminal 10, the first spring arm 21, i.e. the two beams 23, 24 of the first spring arm 21, and the second spring arm 22 are in electrical contact with the counter-terminal.

[0036] Further, the electrically conductive terminal 10 of fig. 1 comprises a bottom contact, i.e. a fork-shaped contact 30. The fork-shaped contact 30 may be a typical tuning fork contact with small contact area and big normal forces. The fork-shaped contact 30 comprises two opposed arms 31, 32. When the counter-terminal is inserted into the electrically conductive terminal 10, both arms 31, 32 are in electrical contact with the counter-terminal.

[0037] Fig. 2 shows a top view of the electrically conductive terminal 10 of fig. 1 mated with a respective counter-terminal 40 or blade terminal 40. The counter-terminal 40 is inserted between the two spring legs 21, 22 of spring contact 20 and between the two opposed arms 31, 32 of the fork-shaped contact 30. As can be seen, at least the two beams 23, 24 of the first spring leg 21, and the second spring leg 22 are in electrical contact with the counter-terminal 40.

[0038] Figs. 3a and 3b show two different embodiments of an electrically conductive terminal 10 according to the present invention. The terminal 10 is mated with a respective counter-terminal 40, which is part of an automotive fuse 2. In fig. 3A, the electrically conductive terminal 10 is adapted to be mounted to a PCB. In fig. 3B, the electrically conductive terminal 10 is adapted to be part of a busbar.

[0039] Fig. 4 shows schematically a bending process which takes place during manufacturing of the electrically conductive terminal 10 according to the present invention, e.g. for manufacturing the electrically conductive terminals 10 of figs. 1-3. At step (A) of fig. 4, a sheet metal plate is cut to form a plurality of legs 21', 22', and for forming a fork-shaped contact 30 having two opposed arms, whereby each fork-shaped contact 30 is provided between two legs 21', 22'. Bending lines 51, 52 of the legs 21', 22' are angled with respect to each other. After bending the legs 21', 22', spring legs of a spring contact are formed as illustrated in step (B) of fig. 4. As the bend lines 51, 52 are angled, it is possible to cut and bend the sheet metal such that the plurality of electrically conductive terminals 10 are positioned close to each other.

[0040] Fig. 5 shows the analysis of an electrical assembly according to the present invention. The electrical assembly comprises a busbar 1 with a plurality of electrically conductive terminals 10 according to the present invention. A second busbar 1' comprises a plurality of terminals 10' of the prior art. An automotive fuse 2 is mated to the busbars 1, 1', i.e. one blade terminal 40 of the fuse 2 is mated with an electrically conductive terminal 10 of busbar 1, while another blade terminal 40 is connected with a terminal 10' of the prior art busbar 1'. Fig. 5 further shows the results of an FEA simulation, with which the temperature of the electrical assembly was analyzed. As can be seen from the resulting temperature

gradient, the busbar temperature of the prior art busbar 1' is higher compared to the busbar temperature of the busbar 1 of the present invention comprising the inventive electrically conductive terminals 10. Thus, compared to the prior art, the inventive electrically conductive terminals 10 result in improved thermal performance, and thus allow for the application of higher currents.

[0041] With the present invention, an improved electrically conductive terminal is provided, which is easy to manufacture and low in cost. Now special adapters are needed for providing a solid positioning of a respective counter-terminal, and for allowing the terminal to withstand high currents. Thermal and electrical conductance is improved.

Reference chart:

[0042]

1	busbar
1'	busbar (prior art)
2	automotive fuse
10	electrically conductive terminal
10'	electrically conductive terminal (prior art)
20	spring contact
21, 22	spring legs
21', 22'	legs
23, 24	beams
30	fork-shaped contact
31, 32	arms
40	counter-terminal
51, 52	bent lines

Claims

1. An electrically conductive terminal (10) adapted to receive a counter-terminal (40), in particular a blade terminal of an automotive fuse (2), comprising:

a spring contact (20) having two opposed spring legs (21, 22),
a fork-shaped contact (30) having two opposed arms (31, 32),
wherein the spring contact (20) and the fork-shaped contact (30) are provided to each receive the counter-terminal (40) when the counter-terminal (40) is mated with the electrically conductive terminal (10).

2. The electrically conductive terminal (10) according to claim 1, wherein, when the counter-terminal (40) is mated with the electrically conductive terminal (10), a retention force of the fork-shaped contact (30) is greater than a retention force of the spring contact (20), preferably at least 10% greater, more preferably at least 20% greater, more preferably at least 50% greater, more preferably at least 100% greater,

and most preferred at least 200% greater.

3. The electrically conductive terminal (10) according to claim 1 or 2, wherein, when the counter-terminal (40) is not mated with the electrically conductive terminal (10), a gap between contact areas of the spring contact (20) is less than a gap between contact areas of the fork-shaped contact (30).
4. The electrically conductive terminal (10) according to any one of claims 1-3, wherein a bending-apart or spreading stiffness of the two opposed arms (31, 32) is higher than a bending-apart or spreading stiffness of the two opposed spring legs (21, 22).
5. The electrically conductive terminal (10) according to any one of claims 1-4, wherein the spring contact (20) and fork-shaped contact (30) are integrally formed.
6. The electrically conductive terminal (10) according to any one of claims 1-5, wherein the spring contact (20) defines a first contact plane, and wherein the two arms (31, 32) of the fork-shaped contact (30) are provided on opposing sides of the first contact plane.
7. The electrically conductive terminal (10) according to any one of claims 1-6, wherein a contact area of the spring contact (20) is offset to a contact area of the fork-shaped contact (30), so that, when viewed in mating direction of the counter-terminal (40) into the electrically conductive terminal (10), the contact area of the fork-shaped contact (30) is located behind the contact area of the spring contact (20), wherein the offset is preferably in the range of 1-25 mm, more preferred in the range of 3-15 mm, more preferred in the range of 5-12 mm, more preferred in the range of 7-10 mm, and most preferred in the range of 8-9 mm.
8. The electrically conductive terminal (10) according to any one of claims 1-7, wherein a width of each of the two opposed arms (31, 32) at a contact area of the fork-shaped contact (30) is less than a width of each of the two spring legs (21, 22) at a contact area of the spring contact (20), wherein the width is measured in a direction perpendicular to a mating direction of the counter-terminal (40) into the electrically conductive terminal (10) and parallel to a contact plane of the electrically conductive terminal (10) defined by the spring contact (20) and fork-shaped contact (30).
9. The electrically conductive terminal (10) according to any one of claims 1-8, wherein a thickness of the spring legs (21, 22) at a contact area of the spring contact (20) is essentially the same as a width of the arms (31, 32) of the fork-shaped contact (30),

wherein the thickness is measured in a direction perpendicular to a mating direction of the counter-terminal (40) into the electrically conductive terminal (10) and perpendicular to a contact plane of the electrically conductive terminal (10) defined by the spring contact (20) and fork-shaped contact (30), and wherein the width is measured in a direction perpendicular to the mating direction of the counter-terminal (40) into the electrically conductive terminal (10) and parallel to the contact plane of the electrically conductive terminal (10) defined by the spring contact (20) and fork-shaped contact (30).

10. The electrically conductive terminal (10) according to any one of claims 1-9, wherein a thickness of the spring legs (21, 22) at a contact area of the spring contact (20) and/or a width of the arms (31, 32) at a contact area of the fork-shaped contact (30) is at least 0.6 mm, preferably at least 0.8 mm, more preferred at least 1.0 mm and most preferred at least 1.2 mm,

wherein the thickness is measured in a direction perpendicular to a mating direction of the counter-terminal (40) into the electrically conductive terminal (10) and perpendicular to a contact plane of the electrically conductive terminal (10) defined by the spring contact (20) and fork-shaped contact (30), and wherein the width is measured in a direction perpendicular to the mating direction of the counter-terminal (40) into the electrically conductive terminal (10) and parallel to the contact plane of the electrically conductive terminal (10) defined by the spring contact (20) and fork-shaped contact (30).

11. The electrically conductive terminal (10) according to any one of claims 1-10, wherein a width of the first one (21) of the opposed spring legs (21, 22) at a contact area of the spring contact (20) is greater than a width of the second one (22) of the opposed spring legs (21, 22) at the contact area of the spring contact (20), wherein the width is measured in a direction perpendicular to a mating direction of the counter-terminal (40) into the electrically conductive terminal (10) and parallel to the contact plane of the electrically conductive terminal (10) defined by the spring contact (20) and fork-shaped contact (30).

12. The electrically conductive terminal (10) according to claim 11, wherein the first one (21) of the two opposed spring legs (21, 22) comprises two parallel beams (23, 24).

13. The electrically conductive terminal (10) according to claim 12, wherein the width of one of the two parallel beams (23, 24) at a contact area of the spring contact (20) is essentially the same as the width of the second spring leg (22) at the contact area of the

spring contact (20).

14. The electrically conductive terminal (10) according to claim 12, wherein the width of each of the two parallel beams (23, 24) at the contact area of the spring contact (20) is essentially the same as the width of the second spring leg (22) at the contact area of the spring contact (20).

15. The electrically conductive terminal (10) according to any one of claims 1-14, wherein, when the counter-terminal (40) is mated with the electrically conductive terminal (10), the electrically conductive terminal (10) withstands a current of at least 18 Ampere, preferably at least 20 Ampere, more preferably at least 24 Ampere, more preferably at least 32 Ampere, more preferably at least 40 Ampere, most preferably at least 60 Ampere applied across the electrically conductive terminal (10) and the counter-terminal (40).

16. A metallic busbar (1) comprising an elongated base plate and a plurality of electrically conductive terminals (10) according to any one of claims 1-15, wherein preferably the base plate and the plurality of electrically conductive terminals (10) are integrally formed, more preferably wherein the spring contacts (20) of the plurality of electrically conductive terminal (10) are provided in a first row and the fork-shaped contacts (30) of the plurality of electrically conductive terminals (10) are provided in a second row parallel to the first row.

17. A method of manufacturing a terminal (10), preferably an electrically conductive terminal (10) according to any one of claims 1-15, comprising the steps of:

Providing a sheet metal plate with a strength of preferably at least 0.6 mm, more preferred at least 0.8 mm, further preferred at least 1.0 mm and most preferred at least 1.2 mm;
cutting the sheet metal plate for forming two legs (21', 22') and for forming a fork-shaped contact (30) having two opposed arms (31, 32) between the two legs (21', 22'); and
bending the legs (21', 22') so as to form a spring contact (20) having two spring legs (21, 22), wherein bend lines of the spring legs (21, 22) are angled with respect to each other.

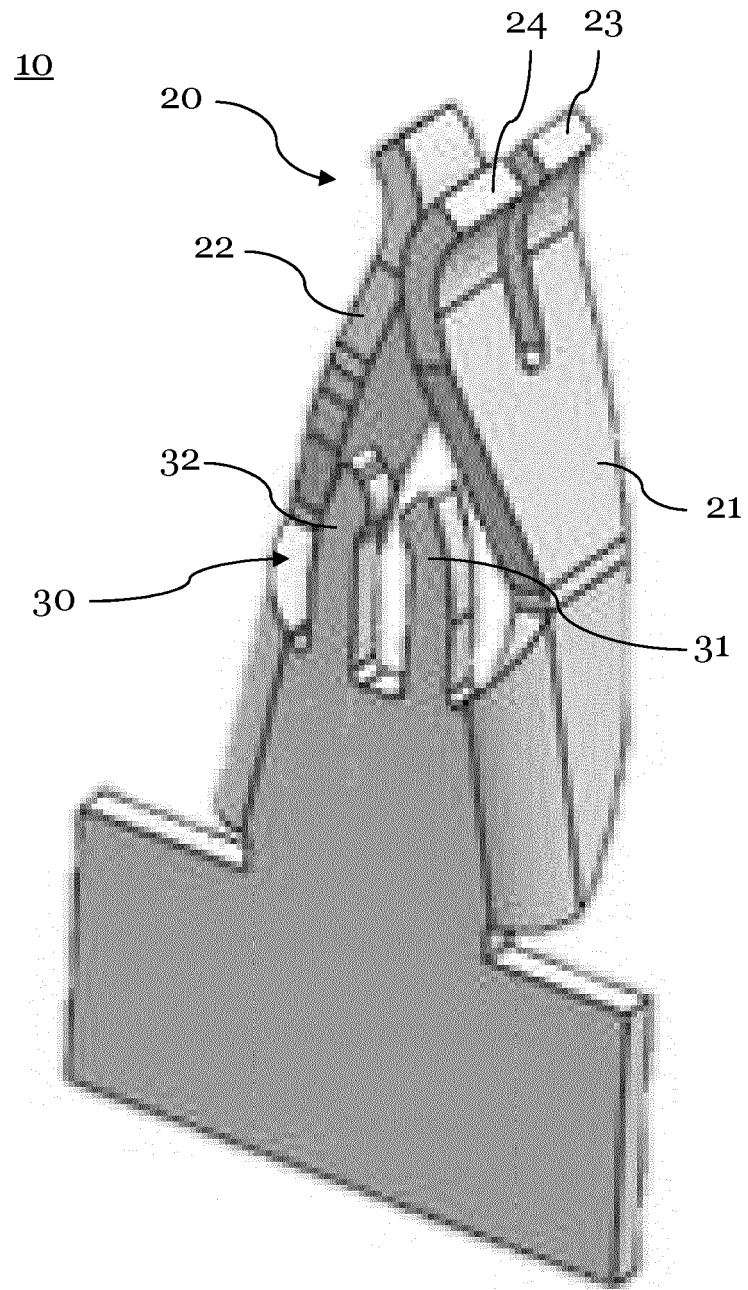


Fig. 1

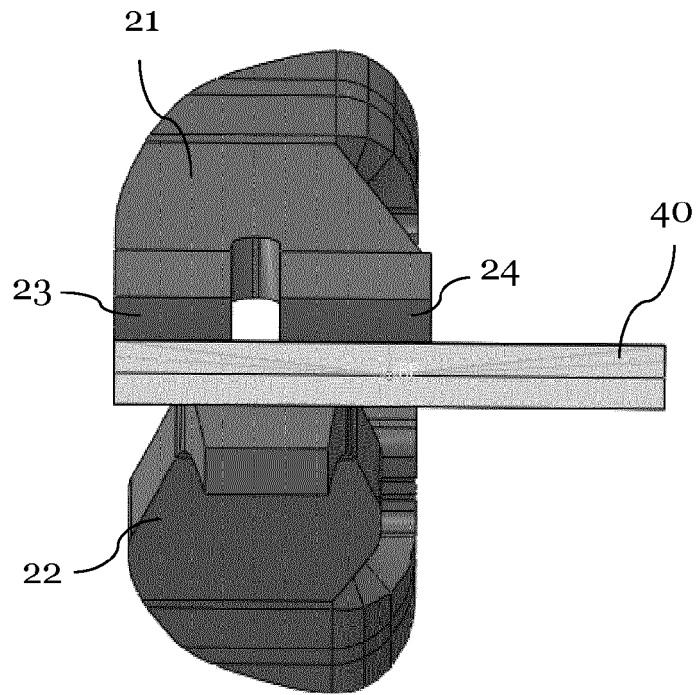


Fig. 2

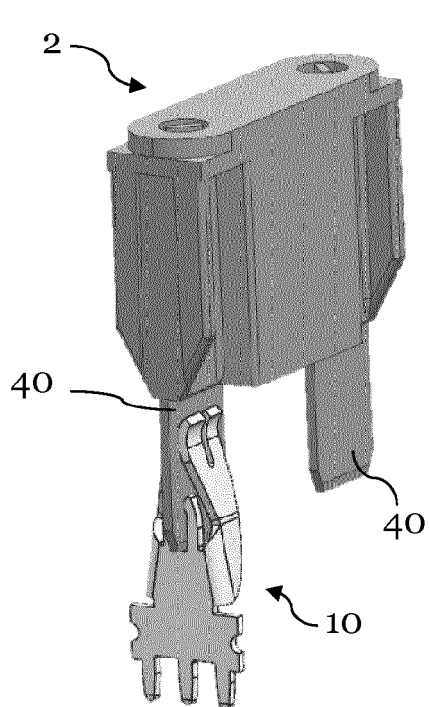


Fig. 3A

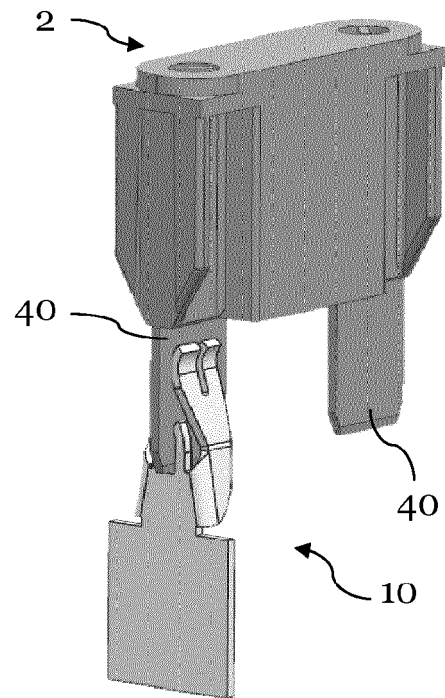


Fig. 3B

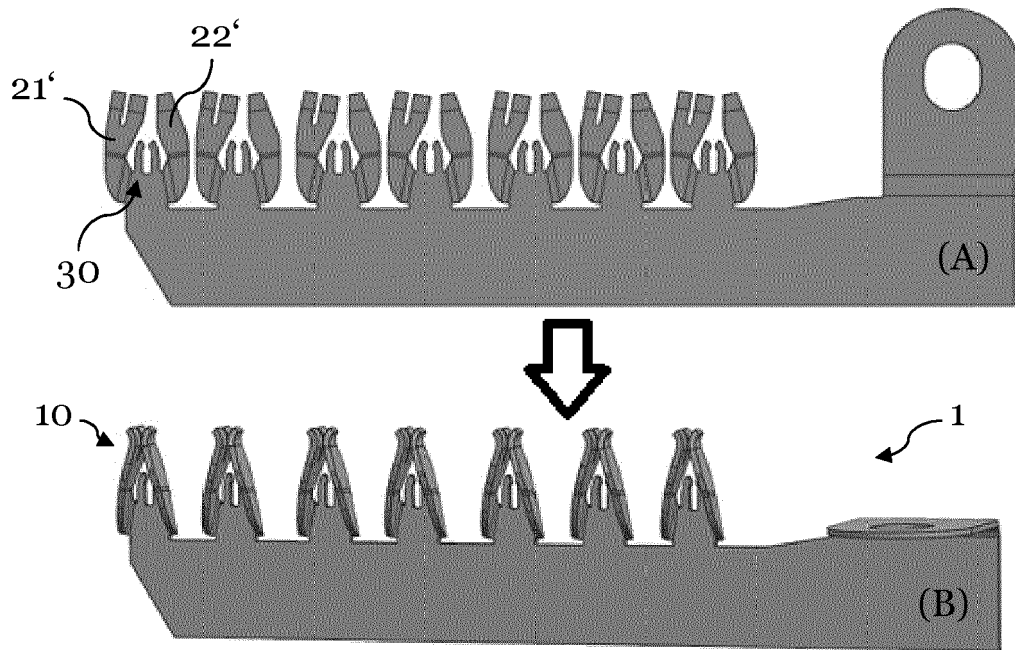


Fig. 4

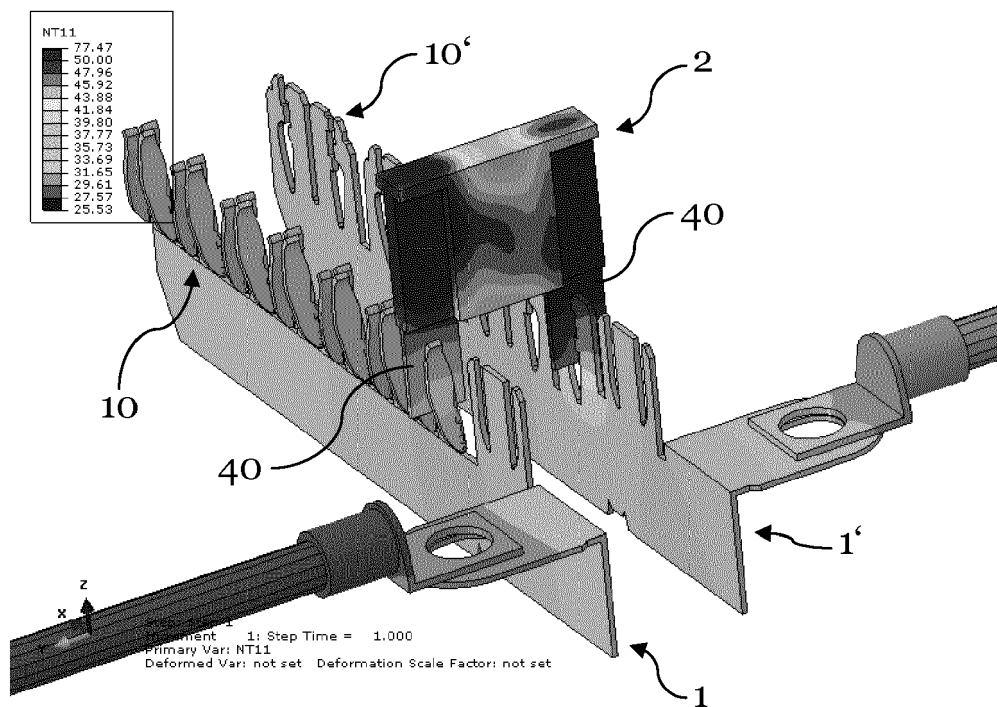


Fig. 5



EUROPEAN SEARCH REPORT

 Application Number
 EP 15 20 1307

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP H10 241769 A (YAZAKI CORP) 11 September 1998 (1998-09-11) * abstract * * paragraph [0011] - paragraph [0011] * * figures 1-3 *	1-17	INV. H01R13/11 H01R43/16
A	US 5 416 972 A (SUGIURA TOMOHIRO [JP] ET AL) 23 May 1995 (1995-05-23) * abstract * * figures 1(A)-5 *	1-17	
A	JP H07 230865 A (KANSEI KK) 29 August 1995 (1995-08-29) * abstract * * figures 1(a)-6 *	1-17	
A	JP H04 109579 A (YAZAKI CORP) 10 April 1992 (1992-04-10) * abstract * * figures 1-5 *	1-17	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01H H01R
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 May 2016	Examiner Pugliese, Sandro
CATEGORY OF CITED DOCUMENTS 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 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 & : member of the same patent family, corresponding document			

 1
 EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 20 1307

5

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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23-05-2016

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP H10241769 A	11-09-1998	JP 3412797 B2	03-06-2003
		JP H10241769 A	11-09-1998
US 5416972 A	23-05-1995	DE 4342269 A1	16-06-1994
		JP 2830887 B2	02-12-1998
		JP H06176847 A	24-06-1994
		US 5416972 A	23-05-1995
		US 5554040 A	10-09-1996
JP H07230865 A	29-08-1995	NONE	
JP H04109579 A	10-04-1992	NONE	

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 102008005078 B3 [0004]
- US 5049095 A [0005]