



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.06.2014 Bulletin 2014/23

(51) Int Cl.:
H01R 4/48 (2006.01)

(21) Application number: **13003735.1**

(22) Date of filing: **26.07.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **ABB AG**
68309 Mannheim (DE)

(72) Inventors:
• **Van-Den-Bosch, Jules**
5216GX s'Hertogenbosch (NL)
• **Witte, Adriaan Marinus**
3436 HT Nieuwegein (NL)

(30) Priority: **30.11.2012 EP 12008057**

(54) **Connecting terminal**

(57) The invention is about a connecting terminal (3) for electrical conductors, having a contact element (40) substantially in the form of a U-profile, provided for the purpose of electrically contacting the conductor, having a substantially U-shaped clamping spring (41), in the form of a leaf spring, which keeps the conductor in electrical and mechanical connection with the contact element (40), and having an insulating housing (4) which accommodates the contact element (40) and the clamping spring (41), said housing (4) having an insertion side (60), a mounting side (61), a top side (62), a bottom side (63), and at the insertion side (60) at least one insertion opening (42) for the conductor, said contact element (40) having a first profile section (43) possessing substantially a L-shape with a first and a second limb (46, 47) and with a plug-in opening (44) which is aligned with respect to the insertion opening (42), and with a second, substantially flat profile section (45), whereby the clamping spring (41) has a support limb (48) abutting on the second profile section (45) of the contact element (40), and a clamping limb (49) which is configured to be positioned with its free end against a conductor inserted into the plug-in opening (44) to press it against the first limb (46) of the contact element (40) and to be pushed towards the support limb (48) for releasing the conductor from the first limb (46), whereby the clamping spring (41) is accommodated within the U-profile of the contact element (40), whereby the U-shapes of both the clamping spring (41) and the contact element (40) open towards the mounting side of the housing (4), that an arrester bar with a substantially U-profiled cross-section is accommodated within the U-profile of the clamping spring, whereby the U-shape of the arrester bar opens towards the mounting side (61) of the housing (4), and whereby a first limb of the arrester bar abuts on the support limb (48) of the contact spring (49), and whereby a second limb of the arrester bar extends

in the open space between the support limb (48) and the clamping limb (49) of the clamping spring (41) to serve as a dead stop for the bending movement of the clamping limb (49) when releasing the conductor from the first limb (46) of the contact element (40).

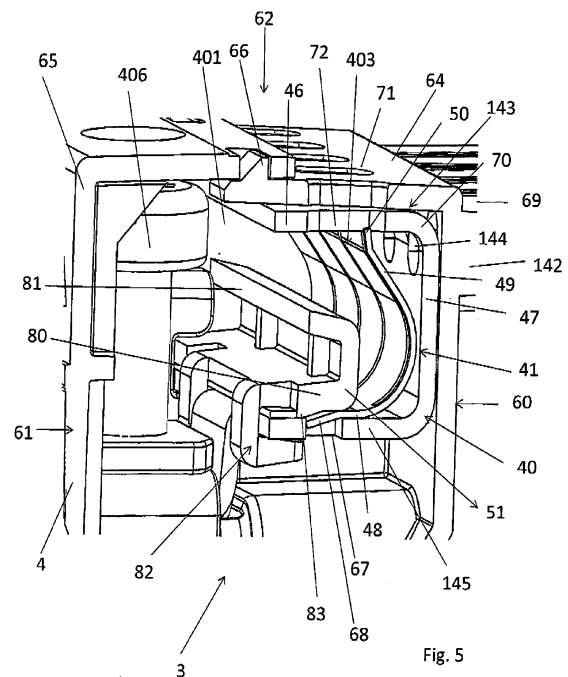


Fig. 5

Description

[0001] The invention relates to a connecting terminal for electrical conductors, having a contact element substantially in the form of a U-profile, provided for the purpose of electrically contacting the conductor, having a substantially U-shaped clamping spring, in the form of a leaf spring, which keeps the conductor in electrical and mechanical connection with the contact element, and having an insulating housing which accommodates the contact element and the clamping spring, said housing having an insertion side, a mounting side, a top side, a bottom side, and at the insertion side at least one insertion opening for the conductor, said contact element having a first profile section possessing substantially an L-shape with a first and a second limb and with a plug-in opening which is aligned with respect to the insertion opening, and with a second, substantially flat profile section, whereby the clamping spring has a support limb being connected to the second profile section of the contact element, and a clamping limb which is configured to be positioned with its free end against a conductor inserted into the plug-in opening to press it against the first limb of the contact element and to be pushed towards the support limb for releasing the conductor from the first limb, according to the preamble of claim 1.

[0002] EP 1 217 692 B1 shows a connecting terminal for electrical conductors, having a contact element provided for the purpose of carrying electrical power, a clamping spring, which keeps the conductor in electrical and mechanical connection with the contact element, whose material is different from the material of the contact element and which is in the form of a leaf spring, and an insulating housing, which accommodates the contact element and the clamping spring, having an insertion opening for the conductor, the contact element having a first profile section having a plug-in opening which is aligned with respect to the insertion opening and a second profile section which is bent back at an angle from the first profile section in the plug-in direction of the conductor, and the clamping spring being connected at one end to the first profile section of the contact element, and it being possible for the clamping spring to be positioned with the other end against the conductor to be connected to the terminal in order to press it against the second profile section, whereby the clamping spring extends, next to one end which is connected to the contact element on the front side (in the plug-in direction of the conductor) of the first section, in an arc over the first section and is passed with the other end, which can be positioned against the conductor, through the plug-in opening. Such an arrangement of contact springs and contact element requires quite some space

[0003] The object of the present invention is to provide an improved connecting terminal, which can be made very compact and where the clamping spring is protected against over-stretching when releasing the conductor.

[0004] According to the invention, the above object is achieved by a connecting terminal with the features as pointed out in claim 1.

[0005] Advantageous embodiments are described in the characteristic features of the dependent claims.

[0006] According to the invention the clamping spring is accommodated within the U-profile of the contact element, whereby the U-shapes of both the clamping spring and the contact element open towards the mounting side of the housing, whereby an arrester bar with a substantially U-profiled cross-section is accommodated within the U-profile of the clamping spring, whereby the U-shape of the arrester bar opens towards the mounting side of the housing, and whereby a first limb of the arrester bar abuts on the support limb of the contact spring, and whereby a second limb of the arrester bar extends in the open space between the support limb and the clamping limb of the clamping spring to serve as a dead stop for the bending movement of the clamping limb when releasing the conductor from the first limb.

[0007] According to an advantageous aspect of the invention a hook is formed to the free edge of the first limb of the arrester bar for clamping the arrester bar to the stack of the second profile section of the contact element and the support limb of the contact spring, whereby the hook is opening towards the insertion side of the housing, so that the arrester bar can be slid with its first limb onto the stack of the second profile section of the contact element and the support limb of the contact spring.

[0008] According to an advantageous aspect of the invention the support limb of the clamping spring is fixed to the second profile section by a latching mechanism comprising a latching recess in the second profile section and a latching tongue formed in the support limb of the clamping spring by slot-like recesses and resiliently projecting out of the plane of the support limb.

[0009] According to an advantageous aspect of the invention a latching nose is formed at the first limb of the arrester bar, facing towards the support limb of the clamping spring, for latching engagement with the slot-like recess in the support limb of the clamping spring that forms the latching tongue.

[0010] According to an advantageous aspect of the invention, the housing is composed of a base part and a cover part, which are held together by a snap action mechanism, whereby the cover part is forming the mounting side, and the base part is forming the insertion side.

[0011] According to an advantageous aspect of the invention, in the first limb of the first profile section there is a contact recess providing access for a tool to the clamping limb of the clamping spring for the purpose of pressing the clamping limb towards the support limb for releasing the conductor, whereby after removing the tool, the clamping spring will resiliently go back to its retaining position pressing the free end of the clamping limb to the first limb of the first profile

section.

[0012] According to an advantageous aspect of the invention, in the top side of the housing there is a housing recess aligned with the contact recess providing access for a tool to the clamping limb of the clamping spring.

[0013] According to an advantageous aspect of the invention, the interior of the connection terminal module housing has an upper connection compartment and a lower connection compartment, whereby there are screwless spring-type connection means arranged in the upper connection compartment, and there are screw-type connection means arranged in the lower connection compartment.

[0014] According to an advantageous aspect of the invention, both the screwless and the screw-type connection means can contact and mechanically and electrically connect an inserted conductor to the U-profiled contact element.

[0015] According to an advantageous aspect of the invention, on the insertion side of the module housing there is a slot-like recess foreseen for receiving a coupler element which has two U-limbs and can be inserted with its U-limbs into insertion openings of the screw-type connection means of two adjacently mounted connecting terminals for electrically connecting the contact elements in the two adjacently mounted connecting terminals.

[0016] According to an advantageous aspect of the invention, either of the internal walls of the slot-like recess or the coupler element is equipped with clamping means for mechanically securing the coupler element in the slot-like recess upon insertion and before the U-limbs are fastened by the screw-type connection means.

[0017] The invention will be described in greater detail by description of an embodiment with reference to the accompanying drawings, wherein

Fig. 1 shows an embodiment of a distribution unit with a connection terminal arrangement according to the invention,

Fig. 2 shows a connection terminal module oriented towards a mounting strip in a connection terminal block arrangement according to the invention,

Fig. 3a shows a module oriented towards a mounting strip in a connection terminal block arrangement according to a second embodiment of the invention,

Fig. 3b shows a schematic drawing of a side view and a view perpendicular to the mounting wall of a connection terminal module according to the embodiment shown in figure 3a,

Fig. 4 shows a sectional view of the connection terminal block arrangement according to the embodiment of figure 3a, the module being fixed to the mounting strip,

Fig. 5 shows a detailed sectional view of the upper part of the connection terminal block arrangement according to fig. 4,

Fig. 6 shows an enlarged detail view of the mounting interface between a connection terminal module fixed to a mounting strip according to the embodiment shown in figure 3a,

Fig. 7 shows a connection terminal module housing with a coupler inserted.

[0018] Referring to figures 1 to 7, there is shown a distribution unit 1 for an electrical installation. The distribution unit 1 has a substructure 7 in form of a mounting plate. There are two locations with means for installing a top hat rail 32, also called a DIN hat rail, to the substructure 7. Instead of the top hat rail 32 shown any other kind of profiled rails allowed in the various technical standards that are applied in different countries throughout the world for electrical distribution boards may be applied. The top hat rail serves for mounting electrical installation devices, such as miniature circuit breakers (MCM), residual current circuit breakers (RCCB), contactor devices, overvoltage protection devices or the like. In fig. 1 as an example an MCB device 33 is mounted to the top hat rail 32. In the distribution board 1 shown in figure 1 two such top hat rails can be installed in parallel and at a distance apart from each other, although only one of them, the one close to the topside edge 34 of the mounting plate 7 of the distribution unit 1 is shown.

[0019] The distribution unit 1 is further comprising a connection terminal block arrangement, in particular for connecting protective earth conductors and neutral conductors (PE/N terminal). The connection terminal block arrangement is located at the topside edge of the mounting plate 7. It could, however, also be located at the bottom side, opposite of the topside edge 34, or there could be connection terminal block arrangements located both at the topside 34 and the bottom side. The terminal block arrangement has a mounting strip 2 and modules 3, only one module 3 shown in exemplary mode in figure 1, that can be fitted to the mounting strip 2 next to one another in a row.

[0020] The connection terminal block arrangement usually has a conductor rail and a number of connection elements for the purpose of connecting conductors to the conductor rail. Each of the modules 3 has at least one of the connection

elements. The modules 3 have an insulating housing 4 and a conductor rail section (not shown here in figure 1) which is arranged within the housing 4. The conductor rail sections are forming the conductor rail, and the connection terminal block arrangement may have links for the purpose of electrically connecting the conductor rail sections of modules which are fitted next to one another on the mounting strip.

[0021] The conductor rail section is for example shown in figure 4. In figure 4 one sees that the interior of the connection terminal module housing 4 has an upper connection compartment 401 and a lower connection compartment 402. There are screwless spring-type connection means 403 arranged in the upper connection compartment 401, and there are screw-type connection means 404 arranged in the lower connection compartment 402. Both the screwless and the screw-type connection means are contacting and mechanically and electrically connecting inserted conductors to a U-profiled contact element 40.

[0022] A U-shaped link element 500, also called a coupler 500, can be inserted with one of its U-limbs into the insertion opening 405 of the screw-type connection means 404 in the lower connection compartment 402 located at the side of a first module housing, as is shown in figure 7. With its other U-limb 501 it may be inserted into the insertion opening of the screw-type connection means in the lower connection compartment located at the side of a second module housing, located adjacent to the first module housing, both U-limbs being fixed by the respective clamping screws 406. By that an electrical connection can be established between the two U-profiled contact elements 40 of the two neighbored connection terminal housings. So electrically, the two U-profiled contact elements 40 perform as one single long conductor rail across both connection terminal housings. This can be repeated with any number of adjacently arranged connection terminal housings in a row.

[0023] The connection part between the two U-limbs, the central bar of the link element, is protected by an insulating cover 502. In order to save space, there is a recess 503 foreseen in the housing on the insertion side 60 for receiving the major part of the insulating cover 502, so that the insulating cover 502 of the coupler 500 will not protrude out of the insertion side 60 too much.

[0024] The inward looking sides of this recess 503 and / or the outward looking surface of the insulating cover 502 of the coupler 500 may be equipped with clamping means, such as for example bumps protruding out from the surfaces (not shown in the figure). Such clamping means have the following advantage. When preparing a connection terminal arrangement for installation, the operator may wish to insert the couplers 500 already prior to inserting the other conductors and prior to fixing the whole installation by fixing the clamping screws 406. The clamping means described will avoid that a loosely inserted coupler 500 can easily fall out prior to fixing the clamping screw 406, as it will firmly fix the coupler in the recess, by clamping force between the insulating cover 502 and the recess walls, even without the clamping screw 406 being fixed.

[0025] The distribution unit 1 has a first and a second support 5, 6 for the mounting strip 2 being disposed at a spacing from one another on the substructure 7. Located next to the first and second supports 5, 6, there are additional first and a second supports 5', 6', situated a small distance below the first and second supports 5, 6. The height above the mounting plate 7 of the first and second supports 5, 6 is larger than the height above the mounting plate 7 of the additional first and second supports 5', 6'. So the additional first and second supports 5', 6' allow for fixing the mounting strip 2 close to the mounting plate 7, and the first and second supports 5, 6 allow for mounting the mounting strip 2 at a certain distance above the mounting plate 7. It may even be the case that two mounting strips, each equipped with terminal blocks, are installed, one on the first or on the second supports 5, 6 and the other on the additional first and second supports 5', 6'. Figure 1 shows the situation where a first mounting strip 2' is fixed to the additional first and second supports 5', 6', a second mounting strip 2 is shown in a position before fixing to the supports, the arrows indicating the direction of insertion to the supports 5, 6.

[0026] The mounting strip 2 is being secured to the supports 5, 6, whereby for this purpose the mounting strip 2 has coupling parts 8, 9 being formed at its opposing narrow ends. Each of the coupling parts 8, 9 have a latch that can be released by pressing it in direction towards the free end of the mounting strip 2 by a tool or by a finger. The latch biases into a retaining position.

[0027] The mounting strip 2 is formed as an elongated cube-shaped rod. The rod has two rectangular broad long-edged plates 11, 12 which are connected by two rectangular narrow short-edged plates 13, 14. The long edges of the broad long-edged plates 11, 12 and the narrow edges of the narrow short-edged plates 13, 14 define two narrow long-edged side sections 17, 18.

[0028] Each of the housings 4 and the mounting strip 2 have devices for the purpose of plugging the modules 3 to the mounting strip 2, transversely with respect to the longitudinal direction of the mounting strip 2. Said devices on the side of the mounting strip 2 are formed as projecting connection bars 20, oriented transversely with respect to the longitudinal direction of the mounting strip 2, arranged in parallel to each other, formed to the outside of one of its rectangular broad long-edged plates 11, 12. Said devices on the side of the insulating housing are formed as at least one slot 21 (see fig. 2) oriented transversely with respect to the longitudinal direction of the mounting strip 2 and adapted for positive locking of the bar 2 into the slot 21 when plugging the module housing 4 to the mounting strip 2.

[0029] Each housing 4 has a mounting wall 45 and at least one receiving slot 21 in the mounting side 45. The mounting

wall 45 has an insertion edge 42 and the receiving slot 21 has an insertion opening 43 at the insertion edge 42, extending from the insertion edge 42 upwards towards a second edge 44 of the housing 4 located opposite the insertion edge 42. The receiving slot 21 extends about half the way up from the insertion edge 42 to the second edge. The insertion opening 43 is a little wider than the receiving slot 21, facilitating the pushing of the module housing 4 to the connection bars.

[0030] The mounting strip 2 has a number of connection bars 20 projecting from one of its two rectangular broad long-edged front plates 11 and oriented transversely with respect to the longitudinal direction of the mounting strip 2. So the receiving slot 21 and the connection bars 20 are forming the mutual connection devices. The connection bar 20 has a T-shaped cross-section, with a first plate-like limb arising from the broad long-edged front plate 11, and with a second plate-like limb formed at the free end of and perpendicular to the first limb.

[0031] The connection bars 20 are all oriented in parallel and transversely with respect to the longitudinal direction of the mounting strip 2. They are arranged by being spaced apart in equal distances, forming a kind of raster. In figure 1 one sees a raster of sixteen connection bars 20, in figure 2 and 3a one sees a detail with six resp. seven of these connection bars 20. The housing 4 of the module 3 in figures 2 and 3a has four receiving slots 21, all of said receiving slots 21 being arranged in a mutually spaced manner, spaced apart in the same equal distances as the connection bars 20. So the raster of the receiving slots 21 in the module housing 4 fits to the raster of the connection bars 20 at the mounting strip 2. This design allows for an exact positioning of the module housings 4, in a rastered, grid-like spacing along the longitudinal extension of the mounting strip 2.

[0032] The connection bar 20 and the receiving slot 21 are adapted for a gliding cooperation when the connection bar 20 is inserted into the receiving slot 21 at the insertion opening 43.

[0033] The connection bar 20 has an insertion end 480 and a distal end opposite the insertion end 480, see figures 2 and 3a. The reference sign 480 is shown only once in the figures, but it is understood that the other connection bars can easily be identified in the figures, as their structure is the same as that marked with a reference sign, and for purposes of clarity of drawing only one out of a number of identical multiple structures was marked with a reference number.

[0034] The width of the cross-sectional contour of the connection bar 20 at the insertion end 480 is matched with cross-sectional contour of the receiving slot 21 for easy insertion, but the cross-sectional contour of the connection bar 20 at the distal end is larger than the width of the cross-sectional contour of the receiving slot 21 at the insertion opening 43, so that an insertion of the module 3 at the distal end of the connection bar 20 is prohibited and thus a false insertion of the module 3 is impeded. The described widening of the contour is not shown in the figures, but it can easily be understood.

[0035] For increasing the width of the cross-sectional contour of the connection bar 20 at the distal end there are numerous ways. One can increase the dimension of the cross-section of the first plate-like limb, or of the second plate-like limb, or of both. The increase of the width of the cross-sectional contour needs not to be large. In essence, it would be sufficient to increase to a small extent, only to such an extent that the distal end of the connection bar 20 still can be inserted into the insertion opening 43 mentioned above, but does not easily fit into the remaining portion of the receiving slot 21, or can only be pressed into it by applying a substantial force. So the operator would easily recognize the difference between insertion on the correct side of the connection bar, where insertion is smooth and an easy gliding of the receiving slot on the connection bar is felt, and insertion on the wrong side, where insertion is not smoothly possible.

[0036] Figures 3a and 3b show an embodiment where there is an alternative or additional means for fixing the module housing 4 to the mounting strip 2. There is a resilient fixation arm 52, which biases into a retaining position. The resilient fixation arm 52 is formed in the mounting wall 45 of the module housing 4 by slot-like recesses 53, 54, 55. The fixation arm has a latching or locking member 56, here in the form of a latching nose, protruding out of the mounting wall 45. In the broad long-edged front plate 11 of the mounting strip 2 there are recesses 57 formed, see figure 1 and figure 4. The recesses 57 are rastered with the same raster as the connection bars 20 and the receiving slots 21, whereby each of the recesses 57 is located between two neighbouring connection bars 21, as also each resilient fixation arm 52 is located between two neighbouring insertion slots 21. It is not required to have as many resilient fixation arms 52 as recesses 57. It may be sufficient for small housings to have as little as one resilient fixation arm. In the embodiment of figure 3a there are only two resilient fixation arms 52, one to the left, one to the right, none in the centre. Each resilient fixation arm 52 is adapted for a resiliently latching engagement with a corresponding recess 57.

[0037] The free end of the resilient fixation arm 52 has a pushing member 58 at its end for pushing the end portion of the resilient fixation arm 52 towards the inside of the housing 4. The latching member 56 can be released by pushing on the pushing member 58 and so pressing the fixation arm 52 towards the inside of the housing 4 for releasing the latching engagement. Positioned near the latching member 56, there is at least one spacer 59 formed at the mounting wall 45 of the housing 4. The effect of the spacer 59 is to limit the displacement of the resilient arm 52 when pressing the mounting wall 45 of the housing 4 against a flat surface.

[0038] As can be seen in figure 6, the pushing member 58 exceeds the upper surface of the mounting strip 2 when the module is fixed to the mounting strip 2. So the pushing member 58 is accessible for a manual pushing operation, by finger or by a tool, even when the housing 4 is fixed to the mounting strip 2. So it is possible to release an individual housing out of a combination of housings arranged in a row and fixed to a mounting strip, even from within the combination.

[0039] Referring now to figure 5, there is shown a sectional view of the upper compartment 401 of the connection terminal module housing 4, with the screwless connection means 403.

[0040] The connecting terminal 3 for electrical conductors has a contact element 40 substantially in the form of a U-profile. The contact element 40 is provided for the purpose of electrically contacting a conductor which is inserted into an insertion opening 142 (the conductor is not shown in the figure). The connecting terminal 3 further has a substantially U-shaped clamping spring 41, in the form of a leaf spring. The clamping spring 41 is configured to keep the inserted conductor in electrical and mechanical connection with the contact element 40 by pressing the inserted conductor with the free end 50 of the clamping limb 49 to the first limb 46 of the first profile section 143. The connecting terminal 3 further has an insulating housing 4 which accommodates the contact element 40 and the clamping spring 41.

[0041] The housing 4, as can be seen in fig. 4, has an insertion side 60, a mounting side 61, a top side 62, a bottom side 63, and at the insertion side 60 at least one insertion opening 142 for inserting a conductor to the screwless connection means 403, and at least one insertion opening 405 for inserting another conductor or a bus bar to the screw-type connection means 404. The mounting side 61 equals the mounting wall 45 mentioned in describing the figures 2 and 3a above.

[0042] The contact element 40 has a first profile section 143 possessing substantially an L-shape with a first and a second limb 46, 47 and with a plug-in opening 144, which is aligned with respect to the insertion opening 142. The plug-in opening 144 is formed in the transition edge 70 between the first and second limb 46, 47 of the first profile section 143.

[0043] The contact element 40 has a second, substantially flat profile section 145. The clamping spring 41 has a support limb 48 being abut and connected to the second profile section 145 of the contact element 40. The clamping spring 41 further has a clamping limb 49 which is configured to be positioned with its free end against a conductor inserted into the plug-in opening 144 to press it against the first limb 46 of the contact element 40 and to be pushed towards the support limb 48 for releasing the conductor from the first limb 46.

[0044] The clamping spring 41 is accommodated within the U-profile of the contact element 40. The U-shape of the clamping spring 41 opens towards the mounting side 61 of the housing 4.

[0045] A conductor guiding tube 69 is formed to the insertion side 60 of the housing 4, the inner side of the conductor guiding tube 69 establishing a guiding channel for the conductor, the channel being aligned with the insertion opening 142 and the plug-in opening 144.

[0046] The housing 4 is composed of a base part 64 and a cover part 65, which are held together by a snap action mechanism 66, whereby the cover part 65 is forming the mounting side 61, and the base part 64 is forming the insertion side 60.

[0047] In the first limb 46 of the first profile section 143 there is a contact recess 72 providing access for a tool to the clamping limb 49 of the clamping spring 41 for the purpose of pressing the clamping limb 49 towards the support limb 48 for releasing the conductor.

[0048] After removing the tool, the clamping spring 41 will resiliently go back to its retaining position pressing the free end 50 of the clamping limb 49 to the first limb 46 of the first profile section 143.

[0049] In the top side 62 of the housing 4 there is a housing recess 71 aligned with the contact recess 72 providing access for a tool to the clamping limb 49 of the clamping spring 41.

[0050] The clamping spring 41 is accommodated within the U-profile of the contact element 40, whereby the U-shapes of both the clamping spring 41 and the contact element 40 open towards the mounting side of the housing 4. An arrester bar 51 with a substantially U-profiled cross-section is accommodated within the U-profile of the clamping spring 41, whereby the U-shape of the arrester bar 51 opens towards the mounting side 61 of the housing 4, as does the U-shape of the contact element 40. A first limb 80 of the arrester bar 51 abuts on the support limb 48 of the contact spring 49. A second limb 81 of the arrester bar 51 extends in the open space between the support limb 48 and the clamping limb 49 of the clamping spring 41 to serve as a dead stop for the bending movement of the clamping limb 49 when releasing the conductor from the first limb 46 of the contact element 40.

[0051] A hook 83 is formed to the free edge of the first limb 80 of the arrester bar 51 for clamping the arrester bar 51 to the stack comprising the second profile section 145 of the contact element 40 and the support limb 48 of the contact spring 49. The hook 82 is opening towards the insertion side 60 of the housing 4, so that the arrester bar 51 can be slid with its first limb 80 onto the stack comprising the second profile section (145 of the contact element 40 and the support limb 48 of the contact spring 49).

[0052] The support limb 48 of the clamping spring 41 is furthermore fixed to the second profile section 145 by a latching mechanism comprising a latching recess 67 in the second profile section 145 and a latching tongue 68. The latching tongue 68 is formed in the support limb 48 of the clamping spring 41 by slot-like recesses and resiliently projecting out of the plane of the support limb 48.

[0053] A latching nose 83 is formed at the first limb 80 of the arrester bar 51, facing towards the support limb 48 of the clamping spring 41, for latching engagement with the slot-like recess in the support limb 48 of the clamping spring 41 that forms the latching tongue 68.

[0054] An advantage of the design of the screwless clamping arrangement according to the invention is that the arrester

bar 51 which serves as an overload protection for the clamping spring 41, can be inserted and clipped into the U-profiled contact element 40.

[0055] The latching tongue 68, as described in the context of figure 5 above, has a twofold function. It firstly fixes the clamping spring 41 to the second profile section 145 of the contact element 40, by latching into the latching recess 67.

[0056] Secondly, with its resilient force, it presses back upwards onto the first limb 80 of the arrester bar 51. On the opposite side, the arrester bar 51 is fixed to the second profile section 145 through the hook 82. So the resilient force of the latching tongue 68 affects a clamping force onto the first limb 80 of the arrester bar 51. This force presses the hook 82 of the arrester bar 51 more firmly against the support limb 48, increasing friction between the support limb 48 and the arrester bar 51. This increases the fixation power for fixing the arrester bar 51 to the support limb 48.

[0057] The design concept of the connecting terminal according to the invention thus comprises the arrangement of three substantially U-shaped parts, namely the contact element 40, the clamping spring 41, the arrester bar 51, all three elements being nested into one another, and all three elements having the open side of the U-profile heading in the same direction, away from the insertion side 60, facing the mounting side 61.

List of reference signs

1	distribution unit	56	locking member
2, 2'	elongated mounting strip	57	recess
3	connecting terminal module	58	pushing member
4	housing	59	spacer
5, 5'	support part	60	insertion side
6, 6'	support part	61	mounting side
7	substructure	62	top side
8	coupling part	63	bottom side
9	coupling part	64	base part
11	broad long-edged front plate	65	cover part
12	broad long-edged front plate	66	snap action mechanism
13	narrow short-edged plate	67	recess
14	narrow short-edged plate	68	latching tongue
17	narrow long-edged side section	69	conductor guiding tube
18	narrow long-edged side section	70	transition edge
20	connection bar	71	housing recess
21	receiving slot	72	contact recess
32	hat rail top	80	first limb of arrester bar
33	MCB device	81	second limb of arrester bar
34	edge of mounting plate	82	hook
40	contact element	83	latching nose
41	clamping spring	142	insertion opening
42	insertion edge	143	first profile section
43	insertion opening	144	plug-in opening
44	second edge	145	second profile section
45	mounting wall	401	upper compartment
46	first limb of contact element	402	lower compartment
47	second limb of contact element	403	screwless connection means
48	support limb	404	screw-type connection means
49	clamping limb	405	insertion opening
50	free end of clamping limb	406	clamping screw
51	arrester bar	480	insertion end
52	resilient fixation arm	500	coupler
53	slot-like recess	501	other U-limb of coupler
54	slot-like recess	502	insulating cover
55	slot like recess	503	recess for coupler

Claims

1. Connecting terminal (3) for electrical conductors, having a contact element (40) substantially in the form of a U-profile, provided for the purpose of electrically contacting the conductor, having a substantially U-shaped clamping spring (41), in the form of a leaf spring, which keeps the conductor in electrical and mechanical connection with the contact element (40), and having an insulating housing (4) which accommodates the contact element (40) and the clamping spring (41), said housing (4) having an insertion side (60), a mounting side (61), a top side (62), a bottom side (63), and at the insertion side (60) at least one insertion opening (142) for the conductor, said contact element (40) having a first profile section (143) possessing substantially a L-shape with a first and a second limb (46, 47) and with a plug-in opening (144) which is aligned with respect to the insertion opening (142), and with a second, substantially flat profile section (145), whereby the clamping spring (41) has a support limb (48) abutting on the second profile section (145) of the contact element (40), and a clamping limb (49) which is configured to be positioned with its free end against a conductor inserted into the plug-in opening (144) to press it against the first limb (46) of the contact element (40) and to be pushed towards the support limb (48) for releasing the conductor from the first limb (46),
characterised in that the clamping spring (41) is accommodated within the U-profile of the contact element (40), whereby the U-shapes of both the clamping spring (41) and the contact element (40) open towards the mounting side (161) of the housing (4), that an arrester bar (51) with a substantially U-profiled cross-section is accommodated within the U-profile of the clamping spring (41), whereby the U-shape of the arrester bar (51) opens towards the mounting side (61) of the housing (4), and whereby a first limb (80) of the arrester bar (51) abuts on the support limb (48) of the contact spring (49), and whereby a second limb (81) of the arrester bar (51) extends in the open space between the support limb (48) and the clamping limb (49) of the clamping spring (41) to serve as a dead stop for the bending movement of the clamping limb (49) when releasing the conductor from the first limb (46) of the contact element (40).
2. Connecting terminal according to claim 1, **characterised in that** a hook (82) is formed to the free edge of the first limb (80) of the arrester bar (51) for clamping the arrester bar (51) to the stack comprising the second profile section (145) of the contact element (40) and the support limb (48) of the contact spring (49), whereby the hook (82) is opening towards the insertion side (60) of the housing (4), so that the arrester bar (51) can be slid with its first limb (80) onto the stack comprising the second profile section (145) of the contact element (40) and the support limb (48) of the contact spring (49).
3. Connecting terminal (3) according to claim 2, **characterised in that** the support limb (48) of the clamping spring (41) is fixed to the second profile section (145) by a latching mechanism comprising a latching recess (67) in the second profile section (45) and a latching tongue (68) formed in the support limb (48) of the clamping spring (41) by slot-like recesses and resiliently projecting out of the plane of the support limb (48).
4. Connecting terminal (3) according to claim 3, **characterised in that** a latching nose (83) is formed at the first limb (80) of the arrester bar (51), facing towards the support limb (48) of the clamping spring (41), for latching engagement with the slot-like recess in the support limb (48) of the clamping spring (41) that forms the latching tongue (68).
5. Connecting terminal (3) according to claim 1, **characterised in that** the housing (4) is composed of a base part (64) and a cover part (65), which are held together by a snap action mechanism (66), whereby the cover part (65) is forming the mounting side (61), and the base part (64) is forming the insertion side (60).
6. Connecting terminal (3) according to claim 1, **characterised in that** in the first limb (46) of the first profile section (143) there is a contact recess (72) providing access for a tool to the clamping limb (49) of the clamping spring (41) for the purpose of pressing the clamping limb (49) towards the support limb (48) for releasing the conductor., whereby after removing the tool, the clamping spring (41) will resiliently go back to its retaining position pressing the free end (50) of the clamping limb (49) to the first limb (46) of the first profile section (143).
7. Connecting terminal (3) according to claim 6, **characterised in that** in the top side (62) of the housing (4) there is a housing recess (71) aligned with the contact recess (72) providing access for a tool to the clamping limb (49) of the clamping spring (41).
8. Connecting terminal (3) according to claim 1, **characterised in that** the interior of the connection terminal module housing (4) has an upper connection compartment (401) and a lower connection compartment (402), whereby there are screwless spring-type connection means (403) arranged in the upper connection compartment (401), and there

are screw-type connection means (404) arranged in the lower connection compartment (402).

- 5
9. Connecting terminal (3) according to claim 1, **characterised in that** both the screwless and the screw-type connection means can contact and mechanically and electrically connect an inserted conductor to the U-profiled contact element (40).
- 10
10. Connecting terminal (3) according to claim 8, **characterised in that** on the insertion side (60) of the module housing (4) there is a slot-like recess (503) forseen for receiving a coupler element (500) which has two U-limbs (501) and can be inserted with its U-limbs into insertion openings of the screw-type connection means (404) of two adjacently mounted connecting terminals (3) for electrically connecting the contact elements (40) in the two adjacently mounted connecting terminals (3).
- 15
11. Connecting terminal (3) according to claim 8, **characterised in that** either of the internal walls of the slot-like recess (503) or the coupler element (500) is equipped with clamping means for mechanically securing the coupler element (500) in the slot-like recess (503) upon insertion and before the U-limbs (501) are fastened by the screw-type connection means (404).

20

25

30

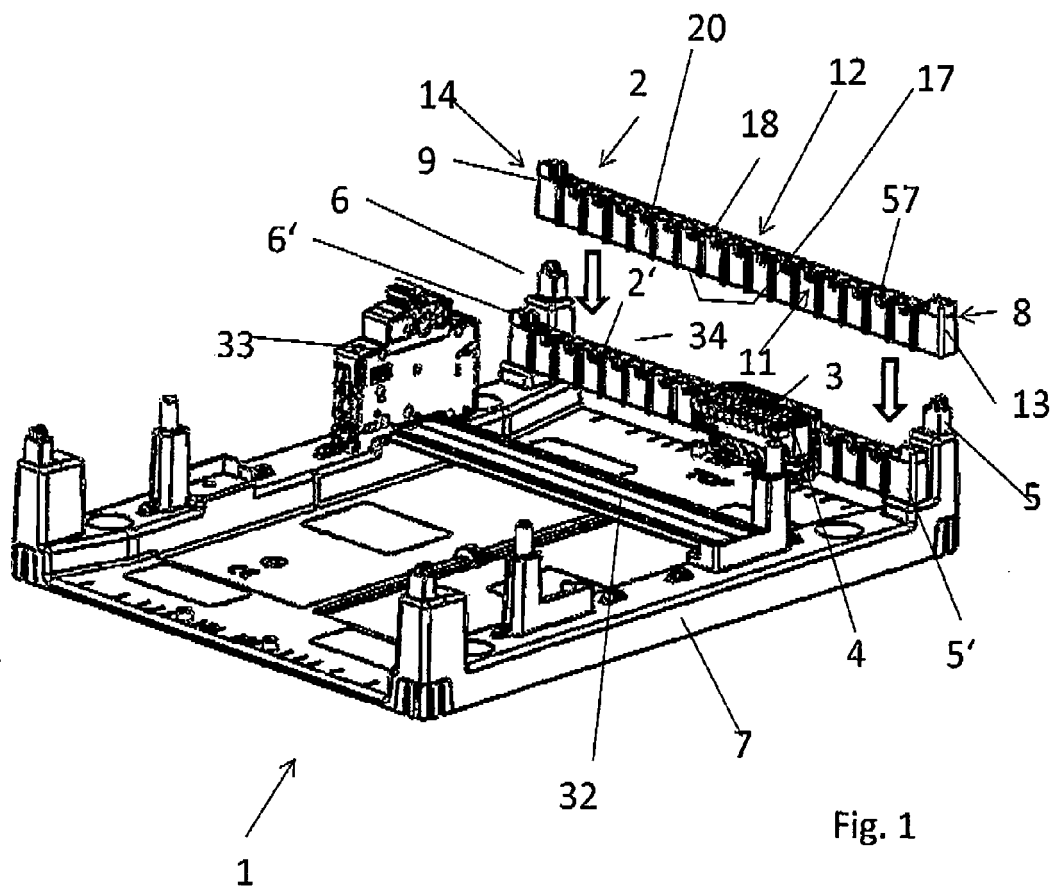
35

40

45

50

55



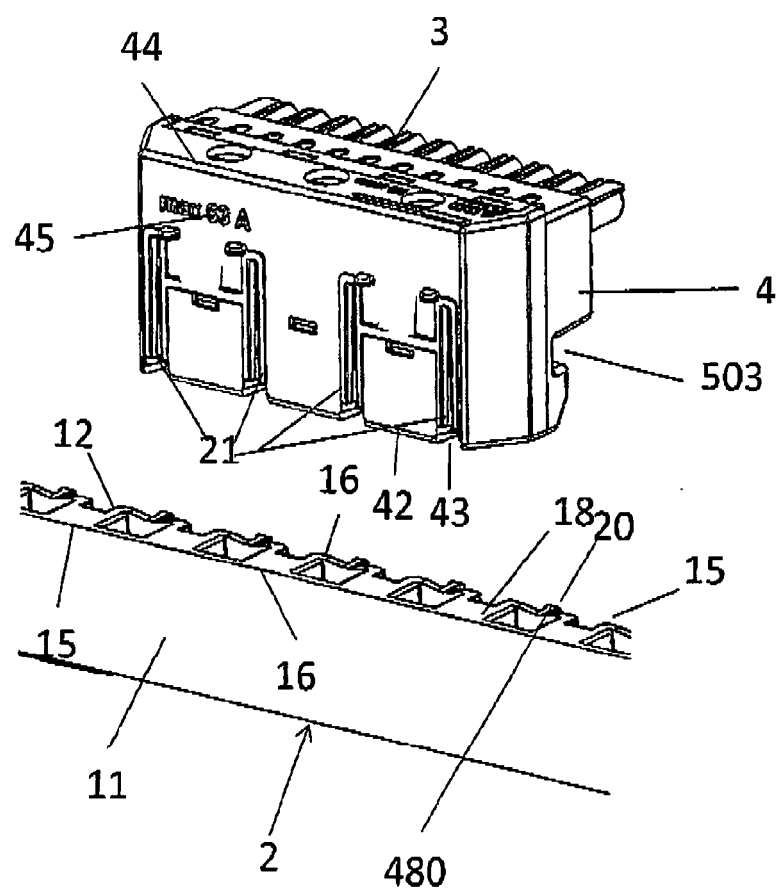
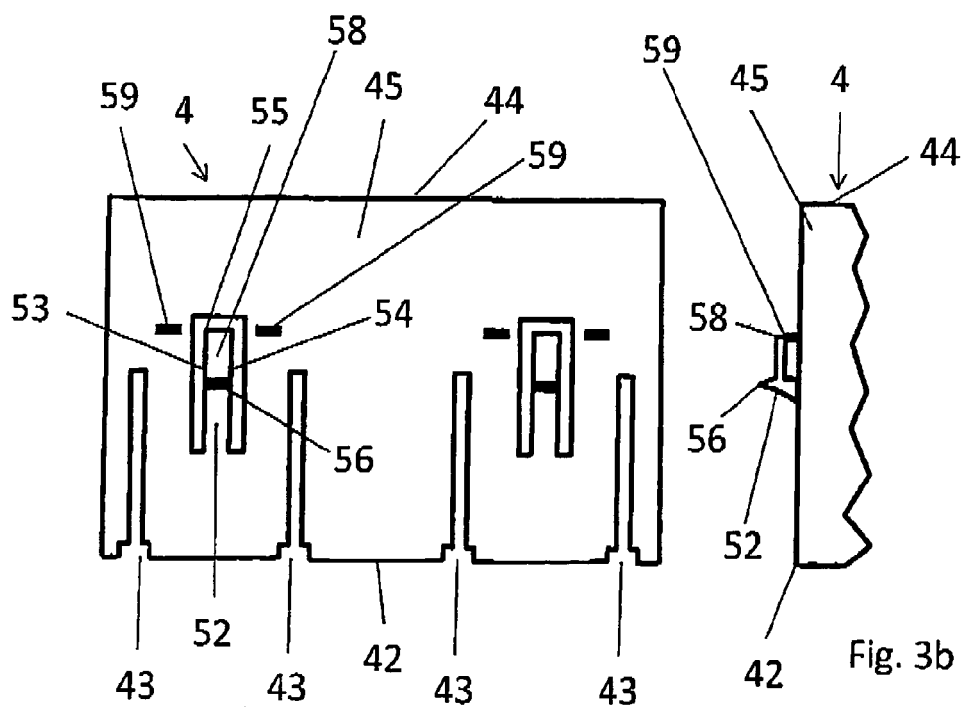
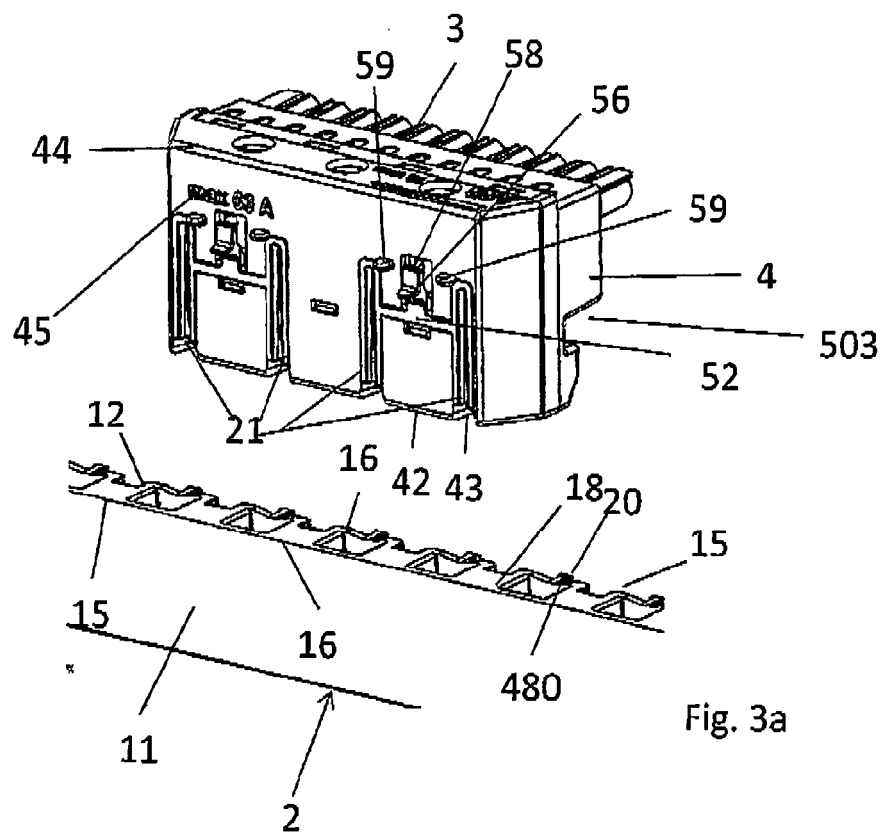


Fig. 2



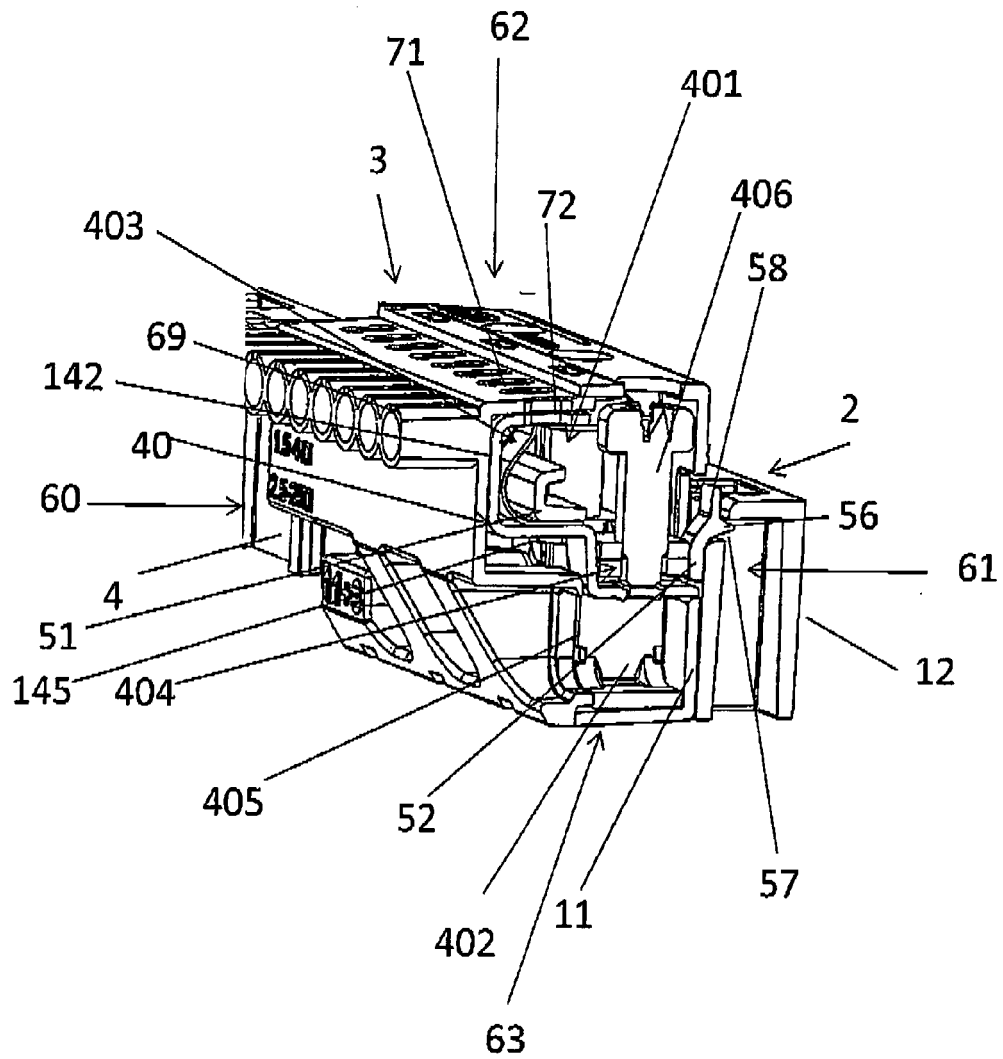
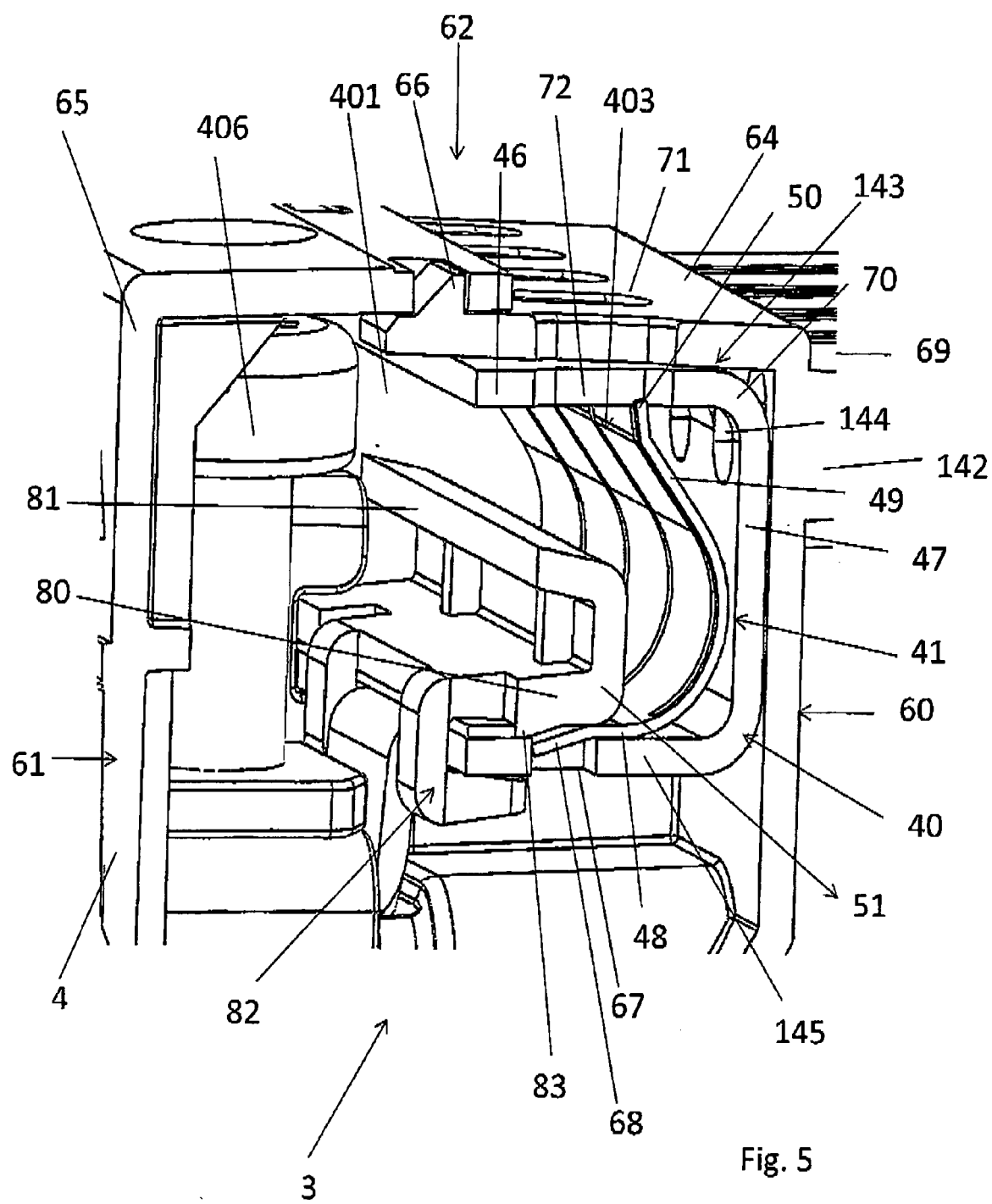


Fig. 4



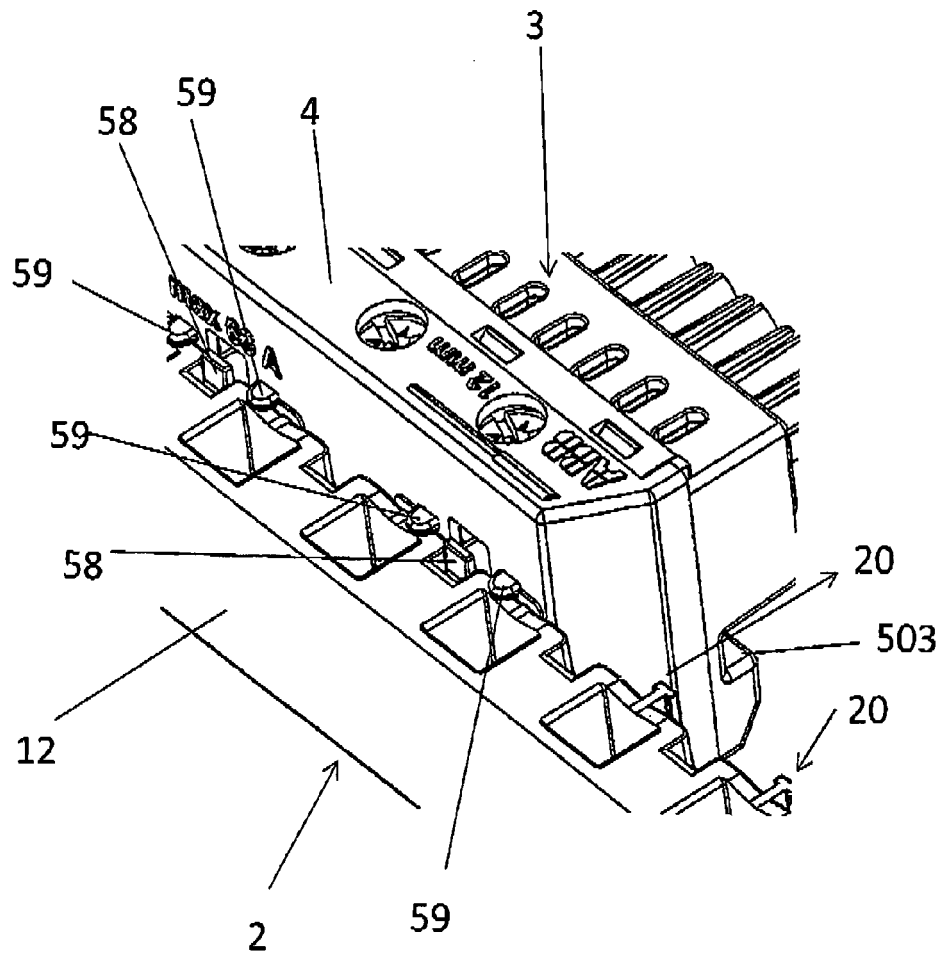
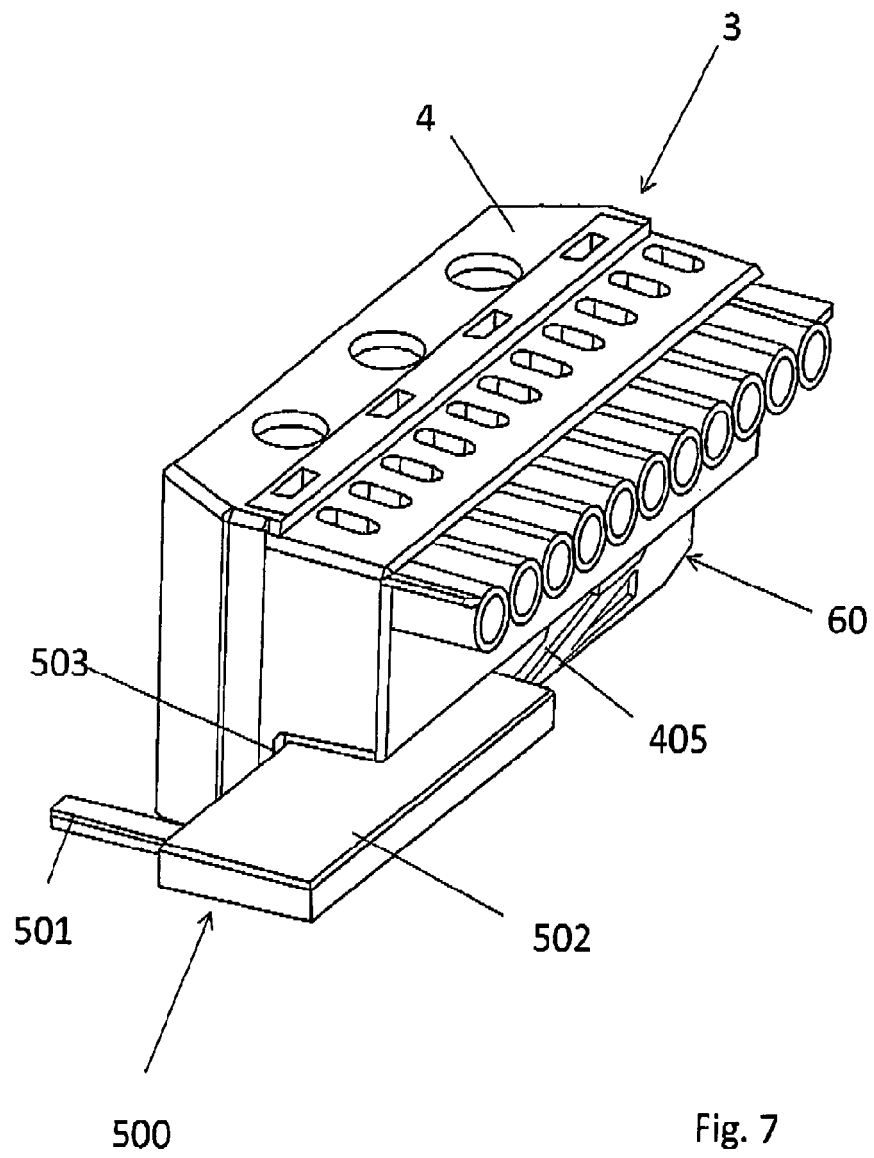


Fig. 6





EUROPEAN SEARCH REPORT

Application Number
EP 13 00 3735

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	DE 66 13 119 U1 (BETTERMANN ELEKTRO OHG) 26 August 1976 (1976-08-26) * page 1, paragraph 1 - page 2, paragraph 1 * * page 4, paragraph 1 - paragraph 4; figures 1,2 *	1-11	INV. H01R4/48
Y	DE 298 18 669 U1 (WAGO VERWALTUNGS GMBH [DE]) 4 February 1999 (1999-02-04) * page 3, paragraph 2 * * page 5, last paragraph - page 6, paragraph 1; figure 1 *	1-11	
A	US 6 315 597 B1 (COYNE JAMES CHRISTOPHER [US] ET AL) 13 November 2001 (2001-11-13) * column 2, line 13 - line 38; figure 1 *	1	
A	DE 10 2005 048972 A1 (PHOENIX CONTACT GMBH & CO [DE]) 19 April 2007 (2007-04-19) * paragraph [0016] - paragraph [0017]; figure 1 *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			H01R
Place of search		Date of completion of the search	Examiner
The Hague		10 January 2014	Knack, Steffen
CATEGORY OF CITED DOCUMENTS		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	
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			

1
EPO FORM 1503 03/82 (P04C01)

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

EP 13 00 3735

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-01-2014

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 7613119	U1	26-08-1976	NONE	
DE 29818669	U1	04-02-1999	NONE	
US 6315597	B1	13-11-2001	NONE	
DE 102005048972 A1		19-04-2007	NONE	

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

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 1217692 B1 [0002]