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(71) Applicant: **Necto Group S.r.l.**
36077 Altavilla (VI) (IT)

(72) Inventor: **Pizzi, Giordano**
20144 Milano (IT)

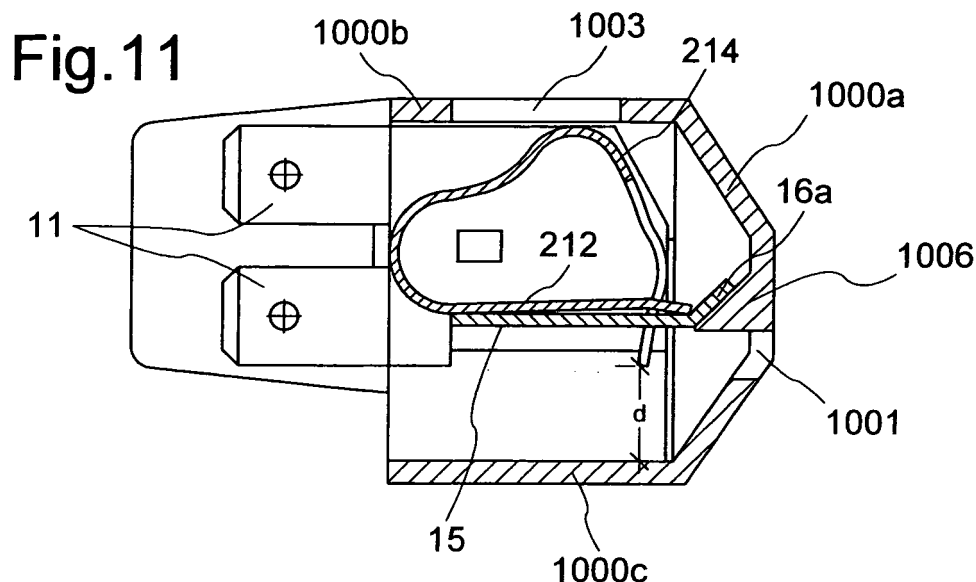
(74) Representative: **Raimondi, Margherita**
Dott. Ing. Prof. Alfredo Raimondi S.r.l.,
Piazzale Cadorna, 15
20123 Milano (IT)

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(54) **Electric connector of the fast-on type and terminal block comprising such a connector**

(57) Electrical connection component of the fast-on type (10;110), comprising at least a set of three electrical contact pins (11), in which at least two pins (11) of the set of three pins lie arranged above one another in a first

common vertical plane (Z-Z) and the third pin (11) of the set of three pins lies in a second vertical plane (Z-Z) parallel to the first plane at a suitable distance in the transverse direction (Y-Y).



Description

[0001] The present invention relates to an electric connector of the fast-on type and to a terminal block for connecting electric cables, incorporating said fast-on connector.

[0002] It is known, in the technical sector relating to the assembly of electric cables, that there exist difficulties as regards the need to keep said cables firmly fixed once they are connected to the connection/branch-off terminal blocks mounted on the various electrical apparatus, electric household appliances and the like.

[0003] These difficulties arise mainly owing to the presence of screws for gripping the ends of the electric wires which, apart from forming an additional component in the whole assembly, with their own cost, must be mounted during a subsequent stage of production, with an obvious increase in the labour costs, determining also the minimum centre-to-centre distance between the contact pins of the fast-on connector, this distance necessarily increasing with the increase in the load in relation to which the dimensions of the screw must be determined.

[0004] In addition to this, the screws also require that the wire be inserted in a predefined direction which is compatible with the direction of screwing and are subject to vibrations of the electric household appliance with the consequent tendency to come loose, resulting in a poor wire contact over time.

[0005] The terminal blocks of the known type, in particular if small in size, also have the drawback that they do not allow the installation of a large number of electrical connection pins since the outputs for electrical connection to the apparatus are arranged in different planes, this preventing an increase in the number of contacts available for fast-on contacts, thus also requiring the production of connectors which cannot be standardised with an obvious limitation in availability and increase in warehouse space and management costs.

[0006] The technical problem which is posed, therefore, is to provide an electric connector of the fast-on type and a terminal block for connecting electric cables, which allow faster and more cost-effective production thereof and ensure stable fixing of the wires without the use of screws, being able to be applied in an easy and repeatable manner.

[0007] In connection with this problem a further requirement is that the terminal block should have electric outputs which can be connected to standard connectors, ensuring small centre-to-centre distances between the pins of the fast-on connector, and that it should have means for gripping the cable, able to allow easy and rapid positioning/removal thereof.

[0008] These results are achieved according to the present invention by a fast-on connector according to Claim 1 and by a terminal block for electrical connections according to the characteristic features of Claim 16.

[0009] Further details may be obtained from the following description of a non-limiting example of embodiment

of the object of the present invention provided with reference to the accompanying figures, in which:

- Figure 1 shows a perspective front view of the fast-on connector according to the present invention;
- Figure 2 shows a side view of the fast-on connector according to Fig. 1;
- Figure 3 shows a view, from above, of the fast-on connector according to Fig. 1;
- Figure 4 shows a view, from above of a fast-on connector according to the present invention with an earth contact;
- Figure 5 shows a rear view of the fast-on connector according to Figure 4;
- Figure 6 shows a perspective rear view of a fast-on connector with means for gripping the electric wire according to the present invention;
- Figure 7 shows a cross-section along a longitudinal vertical plane of the fast-on connector according to Fig. 6;
- Figure 8 shows a perspective rear view of a fast-on connector with an earth contact and wire gripping means;
- Figure 9 shows a perspective rear view of a terminal block according to the present invention;
- Figure 10 shows a schematic cross-section, along a horizontal plane, of the terminal block according to Fig. 9;
- Figure 11 shows a cross-section along the plane indicated by line XI-XI in Fig. 10;
- Figure 12 shows a cross-section similar to that of Fig. 11 with the electric wire inserted.

[0010] Assuming solely for the sake of convenience of description and without a restrictive meaning a set of three reference axes in the longitudinal direction X-X, transverse direction Y-Y and vertical direction Z-Z, respectively, as well as a front part corresponding to the pins of the fast-on connector and a rear part corresponding to the means for gripping the wire thereon, the fast-on connector 10 according to the present invention comprises essentially at least three pins 11 which are arranged with at least two pins of the set of three pins lying in a first vertical plane Z-Z, arranged above each other, and extending parallel to the longitudinal direction X-X; the third pin 11 of the set of three pins lies in a second vertical plane Z-Z parallel to the previous one and at a suitable distance from the first plane in the transverse direction Y-Y; as shown in the example, the third pin is in turn arranged above a fourth pin 11 lying in the same plane so as to form a corresponding number of electrical output connections.

[0011] Each pin 11 of the pair lying in the same vertical plane is integral with a body 12 in turn parallel with the vertical plane and provided with a lug 13 for engagement with the corresponding insulating support 1000, as will become clear below with reference to Fig. 10.

[0012] The two lugs 13 are staggered with respect to

each other in the longitudinal direction X-X so as not to increase the dimensions in the transverse direction Y-Y.

[0013] The two bodies 12 are connected together in the transverse direction Y-Y by a bridge-piece 15 lying in a horizontal plane and obtained by folding the two bodies 12 so as to ensure continuity and a large conductive cross-section, improving the thermal properties of the said connection; the bridge-piece 15 has extending from it, outwards and towards the rear, a tongue 16, the free end 16a of which is folded upwards so as to form the contact surface for resting on a corresponding surface 1006 of the insulating body of the terminal block, as described in detail below.

[0014] Figures 4 and 5 show a further embodiment of the fast-on connector 110 according to the present invention suitable for fixing to the body of the electrical apparatus as an earth connection; in this embodiment, the fast-on connector 110 has a tongue 115a extending from one of the pins 11 parallel to the vertical direction Z-Z and folded in an L shape along a section 115b connected to a flange 116 with holes 116a for receiving fixing screws (not shown).

[0015] The bridge-piece 15 and the tongue 16 also act as a support for the means 200 for gripping the end 1b of the wires 1a of the electric cable 1; said gripping means 200 consist of a resilient lamina 210 folded to form a closed ring comprising a substantially flat side 212 for resting on the bridge-piece 15 and a curved part 213, with a resilient reaction, having a rear side 214 which is inclined and provided with an eyelet 214a inside which the tongue 16 engages, said tongue, in the rest condition, pressing against the end of the eyelet 214a so as to prevent opening (Fig. 7) of the lamina owing to its elasticity.

[0016] The dimensions of the gripping means 200 are such as to allow them to be contained inside the structure of the fast-on connector.

[0017] As shown in Fig. 12, the compression of the resilient lamina in the vertical direction Z-Z positions the eyelet 214a underneath the tongue 16, allowing insertion of the end 1b of the wire 1a inside it; when the lamina 210 is released, it tends to return elastically into the rest position, exerting a compressive force on the end 1b of the wire which is thus retained against the tongue 16 so as to prevent it being pulled out in the longitudinal direction.

[0018] As shown in Fig. 9 and with the same directional arrangement as in the preceding figures, the terminal block according to the present invention comprises essentially a box 1000 with, formed inside it, at least two seats 1001 (three in the example since the connection to the earth wire 1 is provided), said seats having a suitable depth in the vertical direction Z-Z and extending parallel to the longitudinal direction X-X.

[0019] Said seats 1001 are arranged at constant relative distances in the transverse direction Y-Y.

[0020] Each seat has, moreover, a respective opening 1002 in the rear side 1000a of the box, for insertion of the end of the respective electric wires 1b and at least

one opening 1003 formed on the upper side 1000b of the box 1000 and suitable for insertion of a tool for compressive operation of the lamina 213.

[0021] Each seat has moreover a vertical wall provided with respective undercuts 1004 extending outwards in the transverse direction Y-Y and staggered with respect to each other in the longitudinal direction X-X; said undercuts are able to receive the lugs 13 of the fast-on connector 10 so as to cause the stable locking thereof in the longitudinal direction X-X and therefore prevent it from coming out, once inserted inside the respective seat.

[0022] It can be seen, moreover, how the staggered alignment of the undercuts and the lugs 13 of the fast-on connector are able to avoid an increase in the corresponding dimensions in the direction Y-Y and consequently ensure a constant pitch "p" between the pins 11 also of different fast-on connectors arranged inside adjacent seats 1001.

[0023] Each seat is separated from the other seats by means of parallel partitions 1005 extending outwards in the longitudinal direction X-X in order to keep the pins 11 of the fast-on connectors 10 electrically insulated from each other.

[0024] As shown in Fig. 11, the insulating box 1000 has a tooth 1006 projecting in the longitudinal direction towards the inside of the said container and able to form a stop surface for the tongue 16 of the fast-on connector so as to fix it in the vertical direction X-X and allow the compressed actuation of the resilient lamina 213.

[0025] As shown in Figure 12 the tooth 1006 also helps ensure electrical insulation of the wire 1b.

[0026] The same Fig. 11 shows the distance "d" of the free end of the inclined side 214 of the said lamina from the bottom side 1000c of the box; this distance "d" may be suitably determined in relation to the dimensions of the lamina 213 so as to allow controlled compression thereof able to prevent stress-relieving over time.

[0027] In addition to this it is pointed out that the standard pitch "p" of the pins may be contained within minimum values, for example 5 mm also in the case of high electric loads (63A).

[0028] Although not illustrated, it is envisaged, moreover, that one of the fast-on connectors of the terminal blocks is of the type with an earth pin 116 projecting towards the outside of the box from one of the sides of the box.

[0029] It is therefore clear how, with the terminal blocks according to the invention, it is possible to solve the drawbacks of the known art by means of elimination of the screw-type fixing parts, which means introduction of the wire in the gripping part independently of the size and direction of rotation of the screw, more stable and longer gripping since it is not influenced by vibrations, possibility of limiting the dimensions of the terminal block, and increase in the electric outputs for the same dimensions of conventional terminal blocks.

[0030] In addition to this, the constant-pitch modular

structure and the limited dimensions allow connection by means of connectors of the standardised conventional type, while allowing the powering of high loads owing to the large conductive surface area and the large number of outputs of the fast-on connector.

[0031] The terminal block moreover has pins which are electrically insulated and protected on three sides.

Claims

1. Electrical connection component of the fast-on type (10;110), comprising at least a set of three electrical contact pins (11), **characterized in that** at least two pins (11) of the set of three pins lie arranged above one another in a first common vertical plane (Z-Z) and the third pin (11) of the set of three pins lies in a second vertical plane (Z-Z) parallel to the first plane at a suitable distance in the transverse direction (Y-Y).
2. Component according to Claim 1, **characterized in that** it comprises two pair of pins (11), each of which lies in a respective vertical plane (Z-Z).
3. Component according to Claim 1, **characterized in that** said fourth pin is an earth pin (111).
4. Component according to Claim 3, **characterized in that** said earth pin (111) has a tongue (115a) extending from one of the pins parallel to the vertical direction (Z-Z) and folded in an L shape along a section (115b) connected to a flange (116) with holes (116a) for receiving fixing screws.
5. Component according to Claim 1, **characterized in that** each pin (11) of the pair lying in the same vertical plane (Z-Z) is integral with a body (12) which is in turn parallel to the vertical plane.
6. Component according to Claim 5, **characterized in that** each body (12) has a lug (13) projecting transversely outwards for fixing the fast-on connector in position.
7. Component according to Claim 6, **characterized in that** said lugs (13) are staggered with respect to each other in the longitudinal direction (X-X).
8. Component according to Claim 1, **characterized in that in that** the two bodies (12) are connected together in the transverse direction (Y-Y) by a bridge-piece (15) lying in a horizontal plane (X-X).
9. Component according to Claim 8, **characterized in that** said bridge-piece (15) is connected to the bodies (12) along a folding line (15a).
10. Component according to Claim 8, **characterized in that** a tongue (16), the free end (16a) of which is folded upwards, extends from the bridge-piece (15) outwards and towards the rear part of the fast-on connector.
11. Component according to Claim 1, **characterized in that** it comprises means (200) of the resilient type for gripping the end (1a) of the electric wire (1b).
12. Component according to Claim 1, **characterized in that** the dimensions of the gripping means (200) are such as to remain within the dimensions of the fast-on connector.
13. Component according to Claim 11, **characterized in that** said means (200) for gripping the end (1b) of the wires (1a) of the electric cable (1) comprise a resilient lamina (210) which is folded so as to form a closed ring.
14. Component according to Claim 13, **characterized in that** said closed ring comprises a substantially flat side (212) for resting on the bridge-piece (15) of the fast-on connector (10;110) and a curved resilient reaction part (213) with a rear side (214) inclined towards the outside.
15. Component according to Claim 14, **characterized in that** said inclined rear side (214) has an eyelet (214a) suitable for insertion of the tongue (16).
16. Electrical terminal block, comprising a box (1000) which has, arranged inside it, electrical connection components (10;110) comprising at least one part (200) for gripping the end of the wires (1a,1b) of a cable (1) and at least one set of three pins (11) of the fast-on type, **characterized in that:**
 - at least two pins (11) of the set of three pins lie arranged above one another in a first common vertical plane (Z-Z) and the third pin (11) of the set of three pins lies in a second vertical plane (Z-Z) parallel to the first plane at a suitable distance in the transverse direction (Y-Y) and **in that**
 - said gripping parts (200) are of the resilient type.
17. Terminal block according to Claim 16, **characterized in that** it comprises a box (1000) which has, formed inside it, at least two seats (1001) with a suitable depth in the vertical direction (Z-Z) and extending parallel to the longitudinal direction (X-X).
18. Terminal block according to Claim 17, **characterized in that** said seats (1001) are arranged at constant relative distances in the transverse direction

(Y-Y).

19. Terminal block according to Claim 17, **characterized in that** each seat has a respective opening (1002) in the rear side (1000a) of the box, for insertion of the end of the respective electric wires (1b).
20. Terminal block according to Claim 17, **characterized in that** each seat has at least one opening (1003) which is formed in the upper side (1000b) of the box (1000) and suitable for insertion of a tool for operating the means (200) for gripping the wire (1a).
21. Terminal block according to Claim 16, **characterized in that** each seat also has respective undercuts (1004) extending outwards in the transverse direction (Y-Y) and able to receive the lugs (13) of the fast-on connector (10) for ensuring stable fixing thereof in the longitudinal direction (X-X).
22. Terminal block according to Claim 21, **characterized in that** said undercuts (1004) are staggered relative to each other in the longitudinal direction (X-X).
23. Terminal block according to Claim 16, **characterized in that** the insulating box (1000) has a tooth (1006) projecting in the longitudinal direction towards the inside of the said container and able to form a stop surface for the tongue (16) of the fast-on connector so as to fix it in the vertical direction (Z-Z).
24. Terminal block according to Claim 23, **characterized in that** said tooth (1006) is arranged above the hole (1002) for entry of the wire (1b) inside the terminal block.
25. Terminal block according to Claim 16, **characterized in that** said electrical connection component (10;110) comprises two pairs of pins (11), each of which lies in a respective vertical plane (Z-Z).
26. Terminal block according to Claim 24, **characterized in that** the fourth electrical connection pin (10;110) is an earth pin (111).
27. Terminal block according to Claim 16, **characterized in that** each pin (11) of the pair lying in the same vertical plane (Z-Z) of the electrical connection component (10;110) is integral with a body (12) in turn parallel to the vertical plane.
28. Terminal block according to Claim 27, **characterized in that** each body (12) of the electrical connection component (10;110) has a lug (13) projecting transversely outwards for fixing the fast-on connector in position.
29. Terminal block according to Claim 28, **characterized in that** said lugs (13) are staggered with respect to each other in the longitudinal direction (X-X).
30. Terminal block according to Claim 27, **characterized in that** the two bodies (12) of the electrical connection component (10;110) are connected together in the transverse direction (Y-Y) by a bridge-piece (15) lying in a horizontal plane (X-X).
31. Terminal block according to Claim 30, **characterized in that** said bridge-piece (15) is connected to the bodies (12) along a folding line (15a).
32. Terminal block according to Claim 30, **characterized in that** a tongue (16), the free end (16a) of which is folded upwards, extends from the bridge-piece (15) of the electrical connection component (10;110) outwards and towards the rear part of the fast-on connector.
33. Terminal block according to Claim 16, **characterized in that** the dimensions of the resilient means (200) for gripping the wire (1b) are such as to remain within the dimensions of the electrical connection component (10;110).
34. Terminal block according to Claim 16, **characterized in that** said means (200) for gripping the end (1b) of the wires (1a) of the electric cable comprise a resilient lamina (210) which is folded so as to form a closed ring.
35. Terminal block according to Claim 34, **characterized in that** said closed ring comprises a substantially flat side (212) for resting on the bridge-piece (15) of the fast-on connector (10;110) and a curved resilient reaction part (213) with a rear side (214) inclined towards the outside.
36. Terminal block according to Claim 35, **characterized in that** said inclined rear side (214) has an eyelet (214a) suitable for insertion of the tongue (16).
37. Terminal block according to Claim 16, **characterized in that** the pitch (p) of the pins (11) of the electrical connection component is constant also for pins of (11) of fast-on connectors inserted inside adjacent seats (1001).

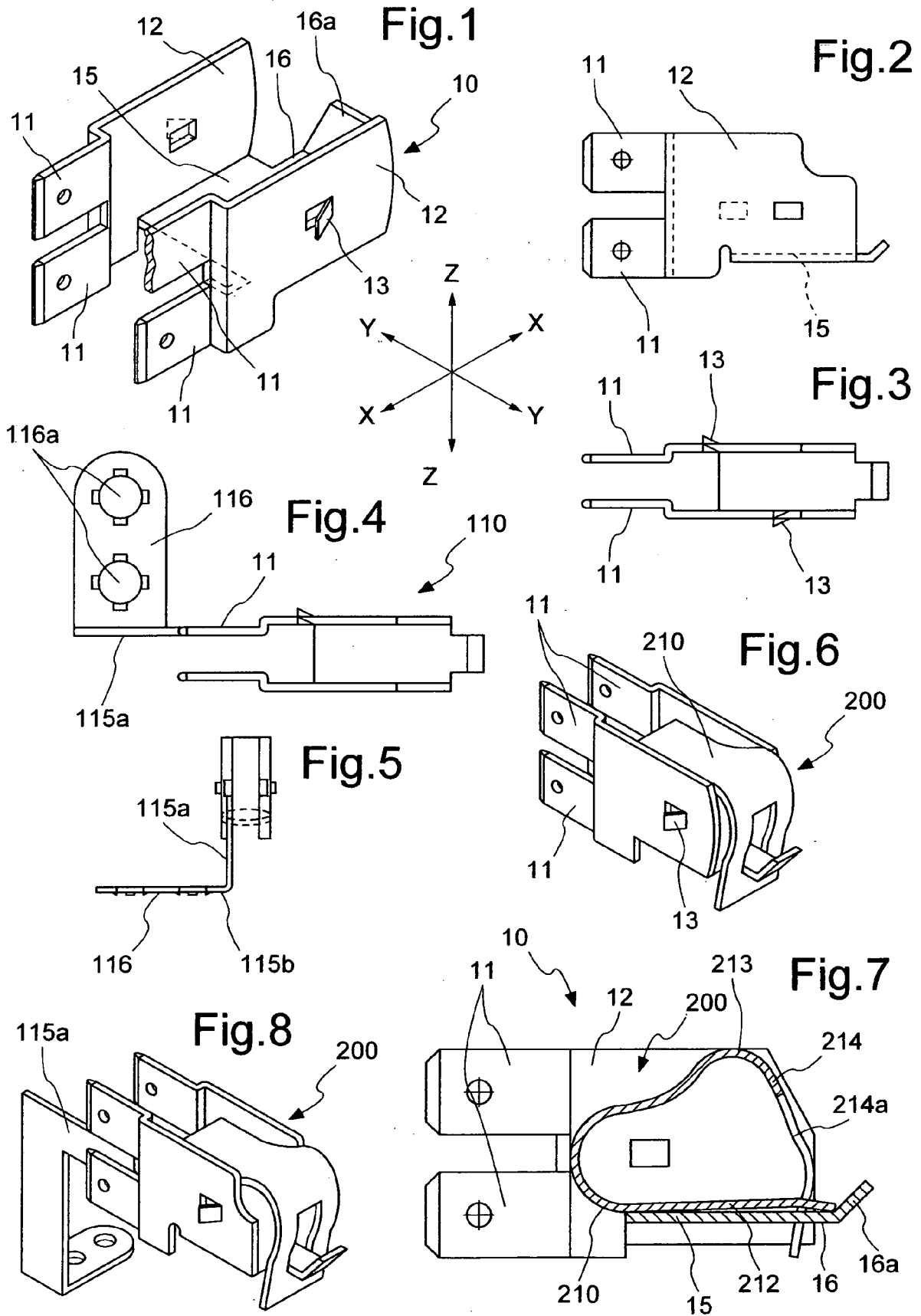


Fig.11

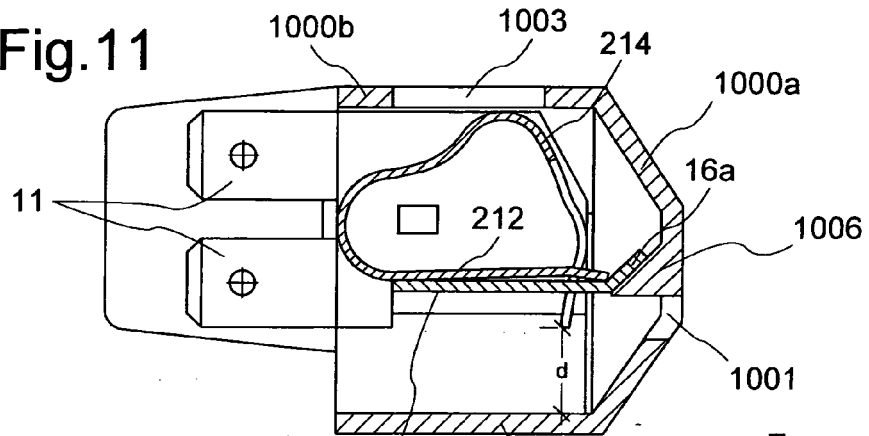


Fig.12

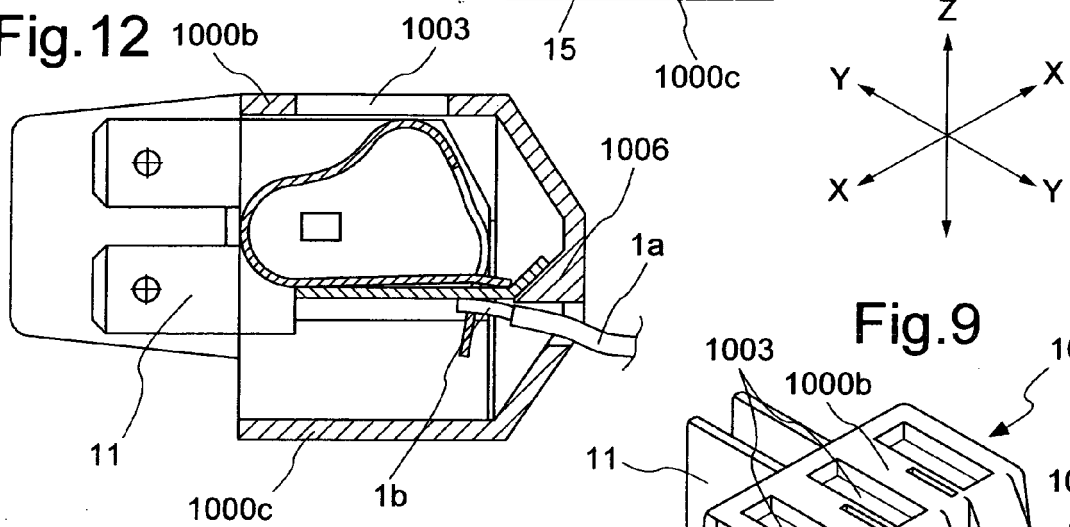


Fig.9

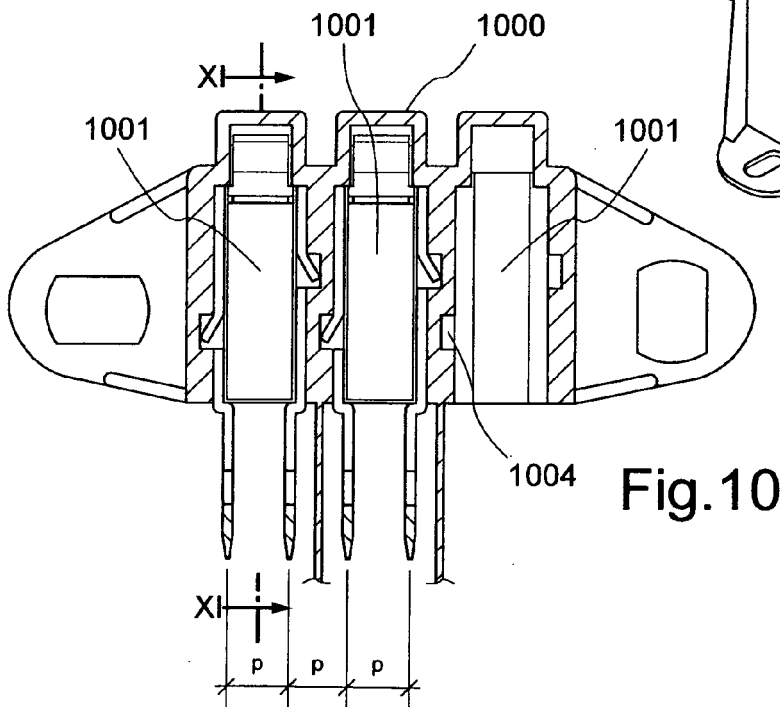
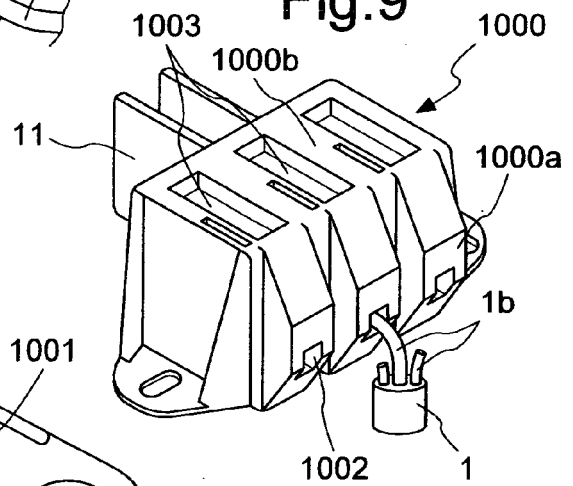


Fig.10