



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**11.06.2008 Bulletin 2008/24**

(51) Int Cl.:  
**H02G 3/08 (2006.01) B60R 16/023 (2006.01)**

(21) Application number: **06425812.2**

(22) Date of filing: **04.12.2006**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR**  
Designated Extension States:  
**AL BA HR MK RS**

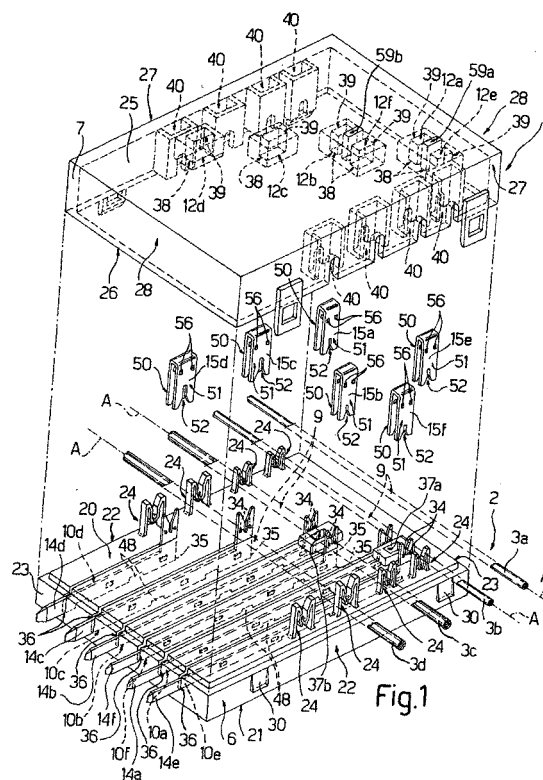
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(54) **Junction device for an electrical system, in particular for automobile applications**

(57) Described herein is an electrical junction device (1) for an electrical system comprising: a first body (6) and a second body (7), which can be coupled together and define a compartment (8) for housing a portion (9) to be connected up of a cable (3a, 3b, 3c, 3d); the cable (3a, 3b, 3c, 3d) comprises a core (4) and a sheath (5); the first body (6) and the second body (7) define, respectively, a first seat (10a, 10b, 10c, 10d) and a second seat (12a, 12b, 12c, 12d) that can be made to face a junction section (R) of the portion to be connected up (9); the device (1) comprises a first element (14a, 14b, 14c, 14d) and a second element (15a, 15b, 15c, 15d) that can be selectively inserted, respectively, in the first seat (10a, 10b, 10c, 10d) and in the second seat (12a, 12b, 12c, 12d) so that they can be made to face the section (R); the first element (14a, 14b, 14c, 14d) and the second element (15a, 15b, 15c, 15d) can be pressed together to cut the sheath (5) of the portion (9) to be connected up; one (14a, 14b, 14c, 14d) between the first element (14a, 14b, 14c, 14d) and the second element (15a, 15b, 15c, 15d) is made of conductive material, and can be electrically connected to an electrical user device (16) and, once the sheath (5) has been cut, to the core (4) of the cable (3a, 3b, 3c, 3d).



## Description

**[0001]** The present invention relates to an electrical junction device for an electrical system, in particular for automobile applications.

**[0002]** Electrical systems used in the automotive sector comprise, in a known way, a plurality of cables arranged and tied together, by means of tapes or other gripping elements, to form bundles or harnesses, which have junctions for connecting up to various electrical user devices, such as for example the instrumentation of the automobile or other electrical connectors of the electrical system.

**[0003]** In greater detail, each junction is obtained by connecting a first connection element projecting from the bundle with a second connection element connected, via an electrical line, to one of the aforesaid electrical user devices.

**[0004]** In particular, the first connection element and the second connection element comprise, respectively, a plurality of first terminals and a plurality of second terminals, which can be coupled together electrically with the first terminals.

**[0005]** The first connection elements are provided at the moment of assembly of the bundle of cables, whilst the connection of the electrical user devices to the cables occurs after installation of the bundle of cables and during assembly of the motor vehicle.

**[0006]** The solutions of a known type described above present the drawbacks outlined in what follows.

**[0007]** During assembly of the motor vehicle, it is possible to create a junction from the bundle only in a position corresponding to the sections of the bundle itself where the first connection elements are present.

**[0008]** Consequently, it is possible to create a junction of the bundle only in a limited and predetermined number of sections of the bundle itself.

**[0009]** The length of the cables envisaged for connecting each electrical user device to the bundle of cables is moreover predetermined and equal to the distance that separates each electrical user device from the corresponding first connection element.

**[0010]** In the sector, there is felt the need to be able to select, during the assembly step, the section of the bundle of cables from which to make the junction, and to be able to select, once again in the assembly step, whether to connect or not the electrical user device and the bundle of cables in the aforesaid section.

**[0011]** The aim of the present invention is to provide a junction device for an electrical system that will enable, in a simple and economical way, at least one of the drawbacks specified above to be overcome and the needs specified above to be met.

**[0012]** The aforesaid aim is achieved by the present invention in so far as it relates to a junction device for an electrical system, as defined in Claim 1.

**[0013]** For a better understanding of the present invention, described in what follows is a preferred embodiment,

provided purely by way of non-limiting example and with reference to the attached plate of drawings, wherein:

- Figure 1 is an exploded perspective view of an electrical junction device built according to the present invention in an open configuration;
- Figure 2 is a view from above of the junction device of Figure 1 with parts removed for reasons of clarity;
- Figure 3 is a side view of the junction device of Figure 1 in a closed configuration;
- Figure 4 is a cross section along the line IV-IV of Figure 2 and representing the device of Figure 1 in an open configuration;
- Figure 5 is a cross section along the line V-V of Figure 4;
- Figure 6 is a cross section along the line VI-VI of Figure 4;
- Figure 7 is the cross section taken along the same plane of cross section as that of Figure 4, but representing the device of Figure 1 in a closed configuration;
- Figure 8 is a cross section along the line VIII-VIII of Figure 7;
- Figure 9 is a cross section along the line IX-IX of Figure 7;
- Figure 10 is a cross section taken along the same plane of cross section as that of Figure 4, but representing the device of Figure 1 in an intermediate configuration between the open configuration and the closed configuration;
- Figure 11 is a cross section along the line XI-XI of Figure 10;
- Figure 12 is a cross section along the line XII-XII of Figure 10;
- Figure 13 is a cross section along the line XIII-XIII of Figure 2 representing some details of the device of Figure 1 in a first operating position;
- Figure 14 illustrates the details of Figure 13 in a second operating position;
- Figures 15 and 16 illustrate a further embodiment of the details of Figure 13 and 14, respectively, in a first operating position and a second operating position;
- Figure 17 illustrates the details of Figure 13 in a third operating position;
- Figure 18 is a circuit diagram illustrating the device of Figure 1 and an electrical user device according to a first modality of electrical connection; and
- Figure 19 is a circuit diagram illustrating the device of Figure 1 in an electrical user device according to a second modality of electrical connection.

**[0014]** With reference to the annexed plate of drawings, designated by 1 is a junction device for an electrical system 2 of a motor vehicle (not illustrated).

**[0015]** The electrical system 2 is illustrated limitedly to a plurality of electrical cables, in the case in point four in number and designated by 3a, 3b, 3c, 3d, and arranged parallel to one another.

**[0016]** In greater detail (Figures 3 to 17), each cable 3a, 3b, 3c, 3d comprises an internal core 4 made of electrically conductive material, and a sheath 5 made of insulating material and coaxially surrounding the core 4.

**[0017]** Advantageously, the device 1 comprises a base 6 and a lid 7, which can be coupled together and define, once coupled together, a compartment 8 (indicated only in Figures 7, 16 and 17) for housing a portion 9 to be connected up of each of the cables 3a, 3b, 3c, 3d. The base 6 and the lid 7 define, respectively, a plurality of first seats 10a, 10b, 10c, 10d and a plurality of second seats 12a, 12b, 12c, 12d that can face, on opposite sides, a junction section R of the portion 9 to be connected up. The device 1 further comprises a plurality of elements 14a, 14b, 14c, 14d, each of which can selectively be inserted in a corresponding seat 10a, 10b, 10c, 10d so that it can be made to face the section R of the portion 9 of the corresponding cable 3, and a plurality of elements 15a, 15b, 15c, 15d, each of which can selectively be inserted in a corresponding seat 12a, 12b, 12c, 12d so that it can be made to face, on the opposite side of a corresponding element 14a, 14b, 14c, 14d, the section R of the portion 9 of the corresponding cable 3a, 3b, 3c, 3d. Each element 14a, 14b, 14c, 14d can be pressed against a corresponding element 15a, 15b, 15c, 15d to cut, in a point corresponding to the section R, the sheath 5 of the portion 9 of the corresponding cable 3a, 3b, 3c, 3d. The element 14a, 14b, 14c, 14d is moreover made of conductive material and can be electrically connected to an electrical user device 16 (Figures 18 and 19) on one first side of its own, and can be electrically connected, once the sheath 5 of the portion 9 of the corresponding cable 3a, 3b, 3c, 3d has been cut, to the core 4 of the corresponding cable 3a, 3b, 3c, 3d on a second side of its own, opposite to the first side, so as to create an electrical connection between the portion 9 of the corresponding cable 3a, 3b, 3c, 3d and the electrical user device 16.

**[0018]** In greater detail, the base 6 has a prismatic shape and comprises a pair of plane parallel walls 20, 21, arranged in use, respectively, at the top and at the bottom. The walls 20, 21 are connected together by a pair of sides 22 parallel to one another that extend orthogonally with respect to the walls 20, 21, and by a pair of sides 23 parallel to one another that extend orthogonally with respect to the walls 20, 21 and to the sides 22.

**[0019]** Likewise, the lid 7 has a prismatic shape and comprises a pair of walls 25, 26 parallel to one another and arranged in use, respectively, at the top and at the bottom. The walls 25, 26 are connected together by a pair of sides 27, which are parallel to one another and extend orthogonally with respect to the walls 25, 26, and a pair of sides 28, which extend orthogonally with respect to the walls 25, 26 and to the sides 27.

**[0020]** The base 6 moreover comprises a plurality of retention elements 24 (Figures 1, 2, 4, 6 and 7) projecting in cantilever fashion from the wall 20 outside the base 6 itself.

**[0021]** In the case in point, the retention elements 24

are eight in number, and are arranged four in a position adjacent to one side 22 and four in a position adjacent to the other side 22.

**[0022]** More precisely, each retention element 24 adjacent to one side 22 is set in front of a corresponding retention element 24 set adjacent to the other side 22.

**[0023]** In particular, corresponding retention elements 24 co-operate with one another, each with a corresponding end of the portion 9 of the corresponding cable 3a, 3b, 3c, 3d.

**[0024]** Each retention element 24 defines a groove that is to engage the corresponding end of the portion 9 of the cables 3a, 3b, 3c, 3d.

**[0025]** The retention elements 24 are coupled to corresponding retention elements 40 (visible in Figures 1, 2, 4, 6 and 7) carried by the lid 7.

**[0026]** More in particular, the retention elements 40 are eight and are arranged in a position homologous to the retention elements 24. Four retention elements 40 project in cantilever fashion from the wall 26 in a position adjacent to one side 27, and four retention elements 40 project in cantilever fashion from the wall 26 in a position adjacent to the other side 27.

**[0027]** When the base 6 and the lid 7 are coupled together, the portion 9 of each cable 3a, 3b, 3c, 3d is withheld by the coupling between a corresponding pair of retention elements 24 and a corresponding pair of retention elements 40. In particular, each cable 3a, 3b, 3c, 3d is withheld within the compartment 8 parallel to a direction A (indicated in Figures 1 to 17).

**[0028]** As may be seen in Figures 1 to 4, 7 and 10, each side 22 of the base 6 defines, on the side opposite to the retention elements 24, a plurality of projections 30, in the case in point two in number.

**[0029]** The projections 30 are designed to couple by snap action with corresponding engagement elements 31 projecting externally from the sides 27 of the lid 7. Once the projections 30 and the engagement elements 31 are coupled together, the wall 20 of the base 6 and the wall 26 of the lid 7 delimit between them the compartment 8.

**[0030]** The wall 20 of the base 6 defines the seats 10a, 10b, 10c, 10d, which have an elongated conformation and have a direction of extension orthogonal to the direction A and parallel to the plane of lie of the wall 20 itself. Each seat 10a, 10b, 10c, 10d has a longitudinal end 36 (Figures 1 and 2) defined by one of the sides 23, and an end 35, opposite to the blind end 36 (Figures 1 and 2).

**[0031]** Once the base 6 and the lid 7 have been coupled together, the end 35 of each seat 10a, 10b, 10c, 10d faces, in a position corresponding to the section R, the portion 9 of a corresponding cable 3a, 3b, 3c, 3d.

**[0032]** The elements 14a, 14b, 14c, 14d have an L-shaped conformation, and each comprises a main body 41 (indicated only in Figures 6, 9 and 12) having a first end connectable to the electrical user device 16 and an expansion portion 42 (which is also indicated only in Fig-

ures 6, 9 and 12) projecting in cantilever fashion from a second end, opposite to the first, of the main body 41.

**[0033]** In particular, the main body 41 of each element 14a, 14b, 14c, 14d comprises a plurality of elastically deformable pawls 33, designed to bear upon the area surrounding the corresponding seat 10a, 10b, 10c, 10d for withholding the element 14a, 14b, 14c, 14d itself within the corresponding seat 10a, 10b, 10c, 10d.

**[0034]** The main body 41 moreover comprises a plurality of grooves 47 (just one of which may be seen in Figures 6, 9 and 12), which are arranged on the opposite side with respect to the expansion portion 42 and can be coupled with respective dowels 48 (just one of which may be seen in Figures 6, 9 and 12) projecting from the base 6 within the seat 10a, 10b, 10c, 10d for fixing each element 14a, 14b, 14c, 14d in the respective seat 10a, 10b, 10c, 10d in a predetermined position.

**[0035]** As illustrated in Figures 6, 9 and 12, the expansion portion 42 of each element 14a, 14b, 14c, 14d terminates, on the side opposite to the main body 41, with a groove 43 having a direction of extension orthogonal to the direction of extension of the main body 41.

**[0036]** The groove 43 comprises a semicircular end stretch 44 (indicated only in Figures 6 and 12), defining an end of the groove 43 set proximally with respect to the main body 41 and a V-shaped end stretch 45 (indicated only in Figures 6 and 12) set on the opposite side of the stretch 44. The groove 43 moreover comprises a stretch 46 (indicated only in Figures 6 and 12), which is intermediate between the stretches 44, 45 and is defined by two mutually parallel segments, arranged orthogonal to the direction A.

**[0037]** As illustrated in Figures 2, 4, 7 and 10, each element 14a, 14b, 14c, 14d is inserted home in the corresponding seat 10a, 10b, 10c, 10d so that its own expansion portion 42 comes to bear upon the end 35 of the corresponding seat 10a, 10b, 10c, 10d, and the groove 43 faces, in a position corresponding to the section R, the portion 9 of the corresponding cable 3a, 3b, 3c, 3d.

**[0038]** The main body 41 of the element 14a, in conditions of complete insertion in the seat 10a and before the base 6 and the lid 7 are coupled together, extends (Figure 2) at the bottom of and at a distance from the portion 9 of the cables 3b, 3c, 3d so as not to interfere therewith, whilst the expansion portion 42 of the element 14a itself lifts the cable 3a with respect to the wall 20.

**[0039]** Likewise, in conditions of insertion in the seat 10b and before the base 6 and the lid 7 are coupled together, the main body 41 of the element 14b extends (Figure 2) at the bottom of and at a distance from the portion 9 of the cables 3c, 3d so as not to interfere therewith, whilst the expansion portion 42 lifts the cable 3b with respect to the wall 20.

**[0040]** In conditions of insertion in the seat 10c and before the base 6 and the lid 7 are coupled together, the main body 41 of the element 14c extends (Figure 2) at the bottom of and at a distance from the portion 9 of the cable 3d so as not to interfere therewith, whilst the ex-

pansion portion 42 lifts the cable 3c with respect to the wall 20.

**[0041]** In conditions of insertion in the seat 10d and before the base 6 and the lid 7 are coupled together, the expansion portion 42 of the element 14d lifts the cable 3d with respect to the wall 20 (Figures 2 and 6).

**[0042]** The wall 26 defines the seats 12a, 12b, 12c, 12d, which extend orthogonally with respect to the direction A and to the plane of lie of the wall 26 itself.

**[0043]** In greater detail, each seat 12a, 12b, 12c, 12d comprises an open end 38, defined by the wall 20, and a blind end 39, opposite to the end 38.

**[0044]** When the base 6 and the lid 7 are coupled together, each seat 12a, 12b, 12c, 12d has its own end 38 facing the end 35 of the corresponding seat 10a, 10b, 10c, 10d. In said conditions of coupling, each seat 12a, 12b, 12c, 12d has, moreover, its own end 38 facing the section R of the corresponding cable 3a, 3b, 3c, 3d.

**[0045]** The elements 15a, 15b, 15c, 15d have a substantially U-shaped cross section and comprise two walls 50, 51 (indicated in Figures 1, 4, 6, 7, 9, 10, 12, 13, 14, 15, 16 and 17) parallel to one another.

**[0046]** The walls 50, 51 have first ends radiused together and second ends, opposite to the first, which are free.

**[0047]** As indicated in Figures 1, 6, 7, 10, 12, 13, 14, 15, 16 and 17, the free end of each wall 50, 51 defines a groove 52 (indicated only in Figures 6 and 12).

**[0048]** The groove 52 comprises a semicircular end stretch 53 and a V-shaped end stretch 54 (indicated only in Figures 6 and 12). The groove 52 moreover comprises an intermediate stretch 55 (indicated only in Figures 6 and 12) between the stretches 53, 54, which is defined by two mutually parallel segments.

**[0049]** Each element 15a, 15b, 15c, 15d is inserted in the corresponding seat 12a, 12b, 12c, 12d so that, following upon coupling of the base 6 and the lid 7, the groove 52 faces the section R of the portion 9 of the corresponding cable 3a, 3b, 3c, 3d and is set in a position corresponding to the groove 43 of the corresponding element 15a, 15b, 15c, 15d.

**[0050]** The walls 50, 51 of the elements 15a, 15b, 15c, 15d each comprise a pair of pawls 56 (indicated for reasons of simplicity only in Figure 1) that are elastically deformable and arranged laterally to the corresponding groove 52.

**[0051]** The pawls 56 of each element 15a, 15b, 15c, 15d are designed to co-operate with the corresponding seat 12a, 12b, 12c, 12d so as to prevent the element 15a, 15b, 15c, 15d itself from sliding out accidentally.

**[0052]** As indicated in Figures 7 and 9, when the base 6 and the lid 7 are coupled together and the portions 9 of the cables 3a, 3b, 3c, 3d are housed within the compartment 8, the walls 50, 51 of each element 15a, 15b, 15c, 15d surround the expansion portion 42 of a corresponding element 14a, 14b, 14c, 14d in a position corresponding to the sections R of the corresponding cables 3a, 3b, 3c, 3d.

**[0053]** More precisely, the section R of the portion 9 of the corresponding cable 3a, 3b, 3c, 3d is housed, on opposite sides, within the grooves 43, 52.

**[0054]** The device 1 moreover comprises a press 57 (visible in Figures 7 to 12) designed to co-operate with the wall 25 for pressing the lid 7 against the base 6.

**[0055]** The press 57 is provided for exerting on the lid 7 a pressure such as to ensure that the joint action of the stretches 45, 54 of each pair of corresponding elements 14a, 15a; 14b, 15b; 14c, 15c; 14d, 15d together cuts the sheath 5 of the corresponding cable 3a, 3b, 3c, 3d in a point corresponding to the respective section R, thus setting in electrical communication the core 4 of the cut cable 3a, 3b, 3c, 3d with the electrical user device 16.

**[0056]** Each prong of the expansion portion 42 has a pair of spring clips 34 (indicated in Figures 1, 6, 9 and 12) arranged at the sides of the groove 43 and designed to reinforce the electrical contact between the expansion portion 42 of each element 14a, 15b, 14c, 14d and the core 4 of the corresponding cable 3a, 3b, 3c, 3d.

**[0057]** As indicated in Figure 19, the device 1 can be used moreover for electrical connection of the user device 16 and two distinct sections R, S of the portion 9 of at least one cable 3a, 3b, 3c, 3d and electrical insulation from one another of the sections R, S themselves of the cable 3a, 3b, 3c, 3d to provide a modality of connection, known as "daisy chain", between the cables 3a, 3b, 3c, 3d and the electrical user device 16.

**[0058]** For this purpose, the wall 20 of the base 6 defines two further seats 10e, 10f having a conformation altogether similar to that of the seats 10a, 10b, 10c, 10d.

**[0059]** In greater detail, the ends 35 of the seats 10e, 10f face the section S of the portion 9, respectively, of the cable 3a and of the cable 3b.

**[0060]** In particular, the seat 10f is set between the seats 10a, 10b, whilst the seat 10e is set alongside the seat 10a so that the seat 10a itself is set between the seats 10e and 10f.

The device 1 moreover comprises two further elements 14e, 14f, which are altogether similar to the elements 14a, 14b, 14c, 14d and can be inserted within the seats 10e, 10f.

**[0061]** The wall 26 of the lid 7 moreover defines two further seats 12e, 12f having a conformation altogether similar to that of the seats 12a, 12b, 12c, 12d.

**[0062]** When the base 6 and the lid 7 are coupled together, each seat 12e, 12f has its own end 38 set in a position corresponding to a corresponding seat 10e, 10f and facing the section S of the portion 9 of the corresponding cable 3a, 3b.

**[0063]** The device 1 moreover comprises two further elements 15e, 15f, which are altogether similar to the elements 15a, 15b, 15c, 15d and can be inserted within the seats 12e, 12f.

**[0064]** Once the base 6 and the lid 7 are coupled together, the elements 14e, 15e are set facing a section S of the portion 9 of the cable 3a, whilst the elements 14f, 15f are set facing a section S of the portion 9 of the cable

3b.

**[0065]** As may be seen in Figures 1, 2 and 4, the base 6 moreover comprises a through opening 37a set in the direction A between the seats 10a, 10e and a through opening 37b (visible also in Figures 13 to 17) and set in the direction A between the seats 10b, 10f.

**[0066]** As may be seen in Figures 1 and 4, the lid 7 comprises a through opening 59a set in the direction A between the seats 12a, 12e, and a through opening 59b (visible also in Figures 13 to 17) set in the direction A between the seats 12b, 12f.

**[0067]** The openings 37a, 37b and 59a, 59b extend, respectively, within the base 6 and the lid 7 in a direction orthogonal to the direction A and to the plane of lie of the walls 20, 26.

**[0068]** Once the base 6 and the lid 7 are coupled together, the openings 59a, 59b are set facing the openings 37a, 37b, respectively.

**[0069]** More precisely, the openings 37a and 59a face one another in a position between the sections R, S of the cable 3a. Likewise, the openings 37b and 59b face one another in a position between the sections R, S of the cable 3b.

**[0070]** In order to cut the sections R, S of the portion 9 of the cables 3a, 3b, the device 1 comprises, instead of the press 57, a press 57' (Figures 15 and 16), which is altogether similar to the press 57 but differs therefrom in so far as it comprises two double-bladed knives 60' (just one of which may be seen in Figures 15 and 16).

**[0071]** More precisely, the knives 60' project in cantilever fashion from the press 57' and extend orthogonally with respect to the press 57' itself.

**[0072]** The device 1 moreover comprises a supporting element 58' (Figures 15 and 16), which also comprises two double-bladed knives 61' (just one of which may be seen in Figures 15 and 16).

**[0073]** The knives 61' project in cantilever fashion from the supporting element 58' and extend orthogonally with respect to the supporting element 58' itself.

**[0074]** In particular, the press 57' and the supporting element 58' are designed to co-operate, respectively, with the walls 25, 21 for gripping between them the lid 7 and the base 6.

**[0075]** The press 57' and the supporting element 58' are shaped so that, when the base 6 and the lid 7 are coupled together, a first knife 60' traverses the opening 59a, whilst a second knife 60' traverses the opening 59b. Simultaneously, a first knife 61' traverses the opening 37a and a second knife 61' traverses the opening 37b.

**[0076]** In this way, the first knives 60', 61' cut the portion 9 of the cable 3a in a position between the sections R, S, whilst the second knives 60', 61' cut the portion 9 of the cable 3b in a position between the sections R, S.

**[0077]** In use, the device 1 is used for connecting the sections R of the cables 3a, 3b, 3c, 3d with the electrical user device 16. The device 1 is used, moreover, for connecting further sections S of the cables 3a, 3b with the electrical user device 16, and for insulating from one an-

other the sections R, S of the portion 9 of each cable 3a, 3b.

**[0078]** In greater detail, the elements 14a, 14b, 14c, 14d, 14e, 14f are electrically connected to the electrical user device 16 and are inserted home in the seats 10a, 10b, 10c, 10d, 10e, 10f.

**[0079]** Positioning of the elements 14a, 14b, 14c, 14d, 14e, 14f within the seats 10a, 10b, 10c, 10d, 10e, 10f is facilitated by the coupling between each dowel 48 and the corresponding groove 47.

**[0080]** The pawls 33 are effective in preventing each element 14a, 14b, 14c, 14d, 14e, 14f from sliding out of the corresponding seat 10a, 10b, 10c, 10d, 10e, 10f.

**[0081]** Likewise, the elements 15a, 15b, 15c, 15d, 15e, 15f are inserted home in the seats 12a, 12b, 12c, 12d, 12e, 12f.

**[0082]** The pawls 56 are effective in preventing each element 15a, 15b, 15c, 15d, 15e from sliding out of the corresponding seat 12a, 12b, 12c, 12d.

**[0083]** The portion 9 of each cable 3a, 3b, 3c, 3d is fixed, in a point corresponding to its own opposite ends, to a respective pair of retention elements 24 carried by the base 6.

**[0084]** The expansion portion 42 of each element 14a, 14b, 14c, 14d lifts the section R of the corresponding cable 3a, 3b, 3c, 3d with respect to the wall 20 (Figure 10).

**[0085]** Likewise, the expansion portion 42 of each element 14e, 14f lifts the section R of the corresponding cable 3e, 3f with respect to the wall 20 itself (Figure 10).

**[0086]** At this point, the base 6 and the lid 7 are brought up to one another so that the retention elements 40 couple with the corresponding retention elements 24, clamping the portions 9 of the cables 3a, 3b, 3c, 3d in a predetermined position with respect to the base 6 and the lid 7.

**[0087]** The base 6 and the lid 7 are fitted together via the coupling of each projection 30 and of the corresponding engagement element 31.

**[0088]** Once the base 6 and the lid 7 are coupled together, the portion 9 of each cable 3a, 3b, 3c, 3d is housed, in a position corresponding to the section R, in part within the stretch 45 of the groove 43 of the corresponding element 14a, 14b, 14c, 14d and in part within the stretch 54 of the groove 52 of the corresponding element 15a, 15b, 15c, 15d (Figure 9).

**[0089]** The portion 9 of the cables 3a, 3b is moreover housed, in a position corresponding to the section S, in part within the stretch 45 of the groove 43 of the corresponding element 14e, 14f and in part within the stretch 54 of the groove 52 of the corresponding element 15e, 15f.

**[0090]** At this point, the press 57' presses the lid 7 against the base 6, bringing about cutting of the sheath 5 of each cable 3a, 3b, 3c, 3d in a position corresponding to the respective section R and of the sheath 5 of the cables 3e, 3f in a position corresponding to the respective sections S.

**[0091]** In this way, the sections R of the cables 3a, 3b,

3c, 3d and the sections S of the cables 3e, 3f are electrically connected to the electrical user device 16.

**[0092]** Simultaneously (Figures 15 and 16), the first knives 60', 61' traverse the openings 59a, 37a so as to cut the cable 3a completely in a position between the sections R, S in the direction A. The sections R, S of the cable 3a are consequently electrically insulated.

**[0093]** In a way altogether similar, the second knives 60', 61' traverse the openings 59b, 37b so as to cut the cable 3b completely in a position between the sections R, S of the cable 3b. The sections R, S of the cable 3b are consequently electrically insulated.

**[0094]** The device 1 can moreover be used for performing connection of the portions 9 of the cables 3a, 3b, 3c, 3d, 3e, 3f at the sections R, S, without electrically insulating the sections R, S from one another.

**[0095]** In this case, it is sufficient to use, instead of the press 57' and the supporting element 58', the press 57 without the knives 60' and a supporting element, for example of the type designated by 65 in Figure 14, without the knives 61'.

**[0096]** Finally, the device 1 can be used for performing connection of the portions 9 of the cables 3a, 3b, 3c, 3d only in the section R. In this case, it is sufficient not to insert the elements 14e, 14f, 15e, 15f in the seats 10e, 10f, 12e, 12f and to use, instead of the press 57' and of the supporting element 58', the press 57.

**[0097]** In the case where it is not desired perform connection of one of the cables 3a, 3b, 3c, 3d in a point corresponding to the section R, S it is sufficient not to insert the corresponding element 14a, 14b, 14c, 14d, 14e, 14f in the corresponding seat 10a, 10b, 10c, 10d, 10e, 10f or else not to insert the corresponding element 15a, 15b, 15c, 15d, 15e, 15f in the corresponding seat 12a, 12b, 12c, 12d, 12e, 12f.

**[0098]** From an examination of the characteristics of the device 1 according to the present invention, the advantages that it enables are evident.

**[0099]** In particular, the device 1 enables selection, during assembly of the motor vehicle and following upon installation of the electrical system 2, of the position of the junction sections R of the cables 3a, 3b, 3c, 3d.

**[0100]** Likewise, the device 1 enables selection, following upon installation of the electrical system 2 and during assembly of the motor vehicle, of the position of the further junction sections S of the cables 3a, 3b.

**[0101]** In fact, following upon installation of the electrical system 2, the device 1 is set with respect to the electrical system 2 in a position in which the ends 35 of the seats 10a, 10b, 10c, 10d and the ends 38 of the seats 12a, 12b, 12c, 12d are facing any desired section of the cables 3a, 3b, 3c, 3d.

**[0102]** Consequently, the length of the cables necessary for connecting the electrical user device 16 to the elements 14a, 14b, 14c, 14d, 14e, 14f is not determined prior to installation of the electrical system 2.

**[0103]** The device 1 moreover enables selection of whether to connect the user device 16 electrically or not

to a predetermined cable 3a, 3b, 3c, 3d.

[0104] In fact, in the case where it is desired, for example, to exclude electrical connection between the user device 16 and the cable 3a, it is sufficient not to insert the element 15a in the seat 12a or else not to insert home the element 14a in the seat 10a.

[0105] Finally, it is clear that modifications and variations can be made to the device 1 described and illustrated herein, without thereby departing from the sphere of protection defined by the ensuing claims.

[0106] In particular, the device 1 could comprise a single seat 10, a single seat 12, a single element 14, and a single element 15.

## Claims

1. A junction device (1) for an electrical system (2), in particular for automobile applications, **characterized in that** it comprises:

- a first supporting body (6) and a second supporting body (7), which can be coupled together and define, once coupled together, a compartment (8) for housing a portion (9) to be connected up of at least one electrical cable (3a, 3b, 3c, 3d) of said electrical system (2); said electrical cable (3a, 3b, 3c, 3d) comprising a core (4) made of electrically conductive material, and a sheath (5) surrounding said core (4) and made of insulating material;

said first supporting body (6) and said second supporting body (7) defining, respectively, a first seat (10a, 10b, 10c, 10d) and a second seat (12a, 12b, 12c, 12d), which can be made to face, on opposite sides, a junction section (R) of said portion to be connected up (9);

said device (1) moreover comprising a first element (14a, 14b, 14c, 14d), which can be selectively inserted within said first seat (10a, 10b, 10c, 10d) so that it can be made to face said section (R), and a second element (15a, 15b, 15c, 15d), which can be selectively inserted within said second seat (12a, 12b, 12c, 12d) so that it can be made to face, on the opposite side of the first element (14a, 14b, 14c, 14d), said section (R); said first element (14a, 14b, 14c, 14d) and said second element (15a, 15b, 15c, 15d) being, moreover, pressable against one another to cut, in a point corresponding to said section (R), said sheath (5) of said portion (9) to be connected up; at least one (14a, 14b, 14c, 14d) between said first element (14a, 14b, 14c, 14d) and said second element (15a, 15b, 15c, 15d) being made of electrically conductive material, and being electrically connectable with an electrical user device (16) on a first side (36) of its own and being electrically connectable, once said sheath (5) has been cut, to said core (4)

of said cable (3a, 3b, 3c, 3d) on a second side (35) of its own, opposite to said first side (36), so as to create an electrical connection between said portion (9) to be connected up and said electrical user device (16).

2. The device according to Claim 1, **characterized in that** it comprises pressing means (57, 57', 58') designed to co-operate with at least one between said first supporting body (6) and said second supporting body (7) to grip together said supporting bodies (6, 7) during cutting of said sheath (5).

3. The device according to Claim 1 or Claim 2, **characterized in that** said first supporting body (6) defines a further first seat (10e, 10f) that can be made to face a further junction section (S) of said portion (9) of said cable (3a, 3b, 3c, 3d), and **in that** said second supporting body (7) defines a further second seat (12e, 12f) that can be made to face, on the side opposite to said further first seat (10e, 10f), said further junction section (S) of said portion (9) of said cable (3a, 3b, 3c, 3d); said device (1) moreover comprising a further first element (14e, 14f) that can be inserted in said further first seat (10e, 10f) of said first supporting body (6), and a further second element (15e, 15f) that can be inserted in said further second seat (12e, 12f) of said second supporting body (7); said further first element (14e, 14f) and said further second element (15e, 15f) being pressable with respect to one another to cut said sheath (5) in a point corresponding to said further junction section (S).

4. The device according to Claim 3, **characterized in that** it comprises cutting means (60', 61'), which can be selectively housed in an opening (37a, 37b; 59a, 59b) defined by one between said first supporting body (6) and said second supporting body (7); said opening (37a, 37b; 59a, 59b) being faceable to said portion (9) in a position between said junction sections (R, S); said cutting means (60', 61') being designed to cut completely said portion (9) so as to insulate said junction sections (R, S) electrically from one another.

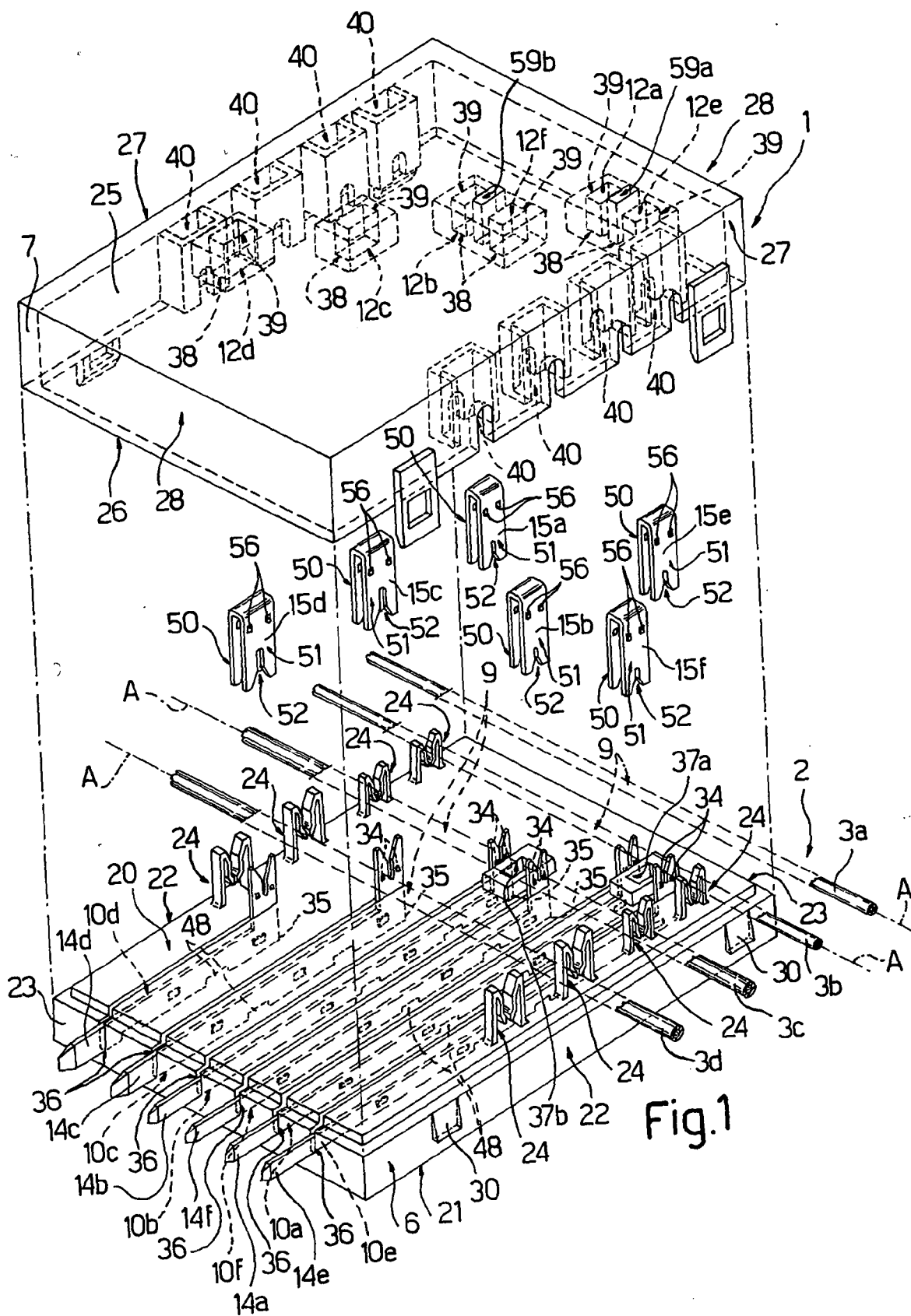
5. The device according to Claim 4, **characterized in that** said cutting means (60', 61') are carried by said pressing means (57, 57', 58') .

6. The device according to any one of the preceding claims, **characterized in that** it comprises first clamping means (33) set between said first element (14a, 14b, 14c, 14d) and said first seat (10a, 10b, 10c, 10d) and designed to prevent said first element (14a, 14b, 14c, 14d) from sliding out of said first seat (10a, 10b, 10c, 10d).

7. The device according to Claim 6, **characterized in that** said first clamping means (33) comprise at least one pawl (33) carried by said first element (14a, 14b, 14c, 14d).  
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8. The device according to any one of the preceding claims, **characterized in that** it comprises positioning means (48, 47) for keeping said first element (14a, 14b, 14c, 14d) in a desired position with respect to said first seat (10a, 10b, 10c, 10d).  
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9. The device according to Claim 8, **characterized in that** said positioning means (48, 47) comprise at least one dowel (48) carried by the first supporting body (6) and projecting within said first seat (10a, 10b, 10c, 10d), and a groove (47) carried by said first element (14a, 14b, 14c, 14d) and designed to couple with said dowel (48).  
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10. The device according to any one of the preceding claims, **characterized in that** it comprises second clamping means (56), set between said second element (15a, 15b, 15c, 15d) and said second seat (12a, 12b, 12c, 12d) and designed to prevent said second element (15a, 15b, 15c, 15d) from sliding out of said second seat (12a, 12b, 12c, 12d).  
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11. The device according to Claim 10, **characterized in that** said second clamping means (56) comprise a further elastically deformable pawl (56) carried by said second element (15a, 15b, 15c, 15d).  
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12. The device according to any one of the preceding claims, **characterized in that** it comprises releasable engagement means (30, 31) to enable coupling of said first supporting body (6) and said second supporting body (7).  
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13. The device according to any one of the preceding claims, **characterized in that** it comprises retention means (24, 40), designed to withhold said portion (9) of said cable (3a, 3b, 3c, 3d) in a predetermined position with respect to at least one between said first supporting body (6) and said second supporting body (7).  
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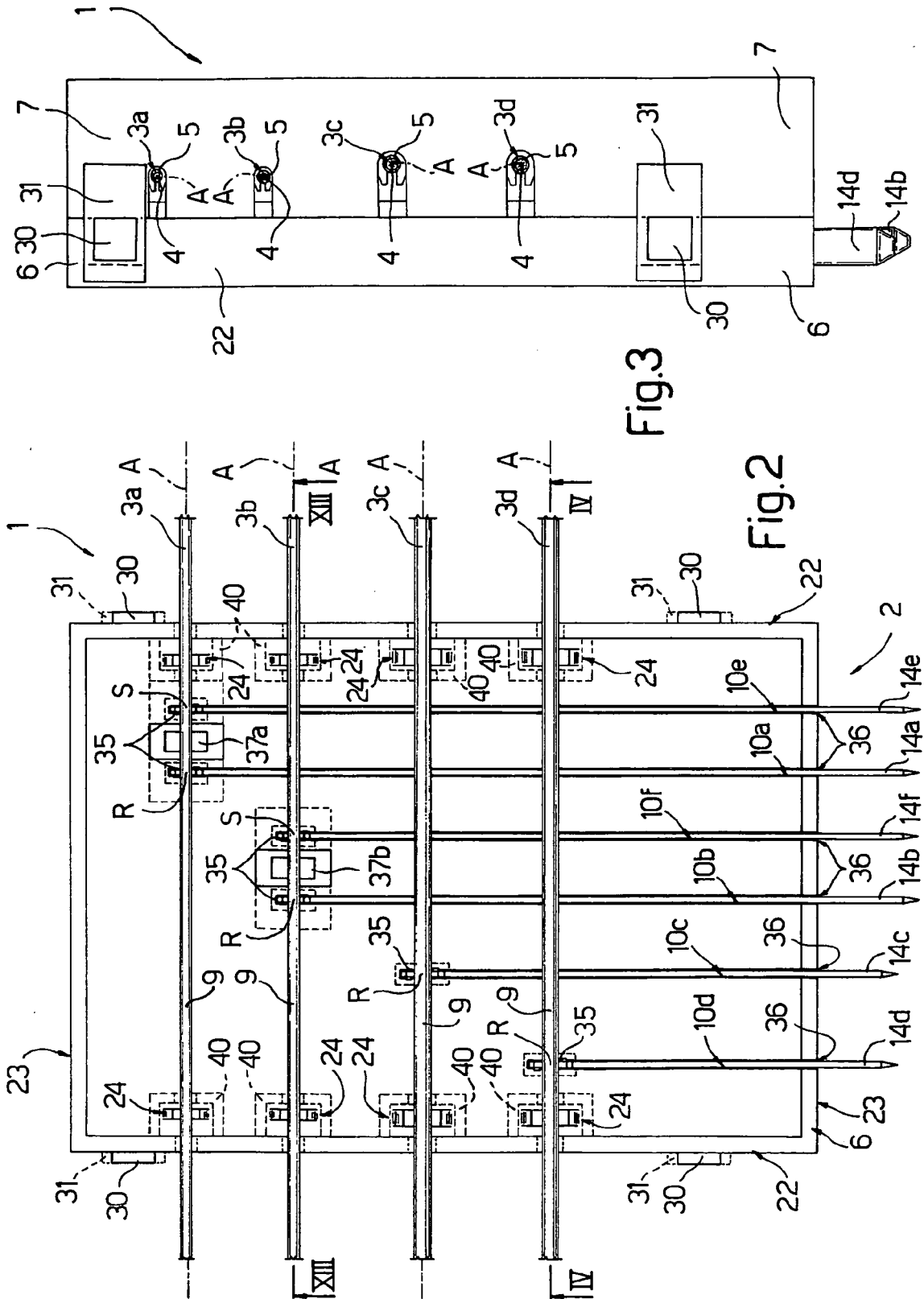
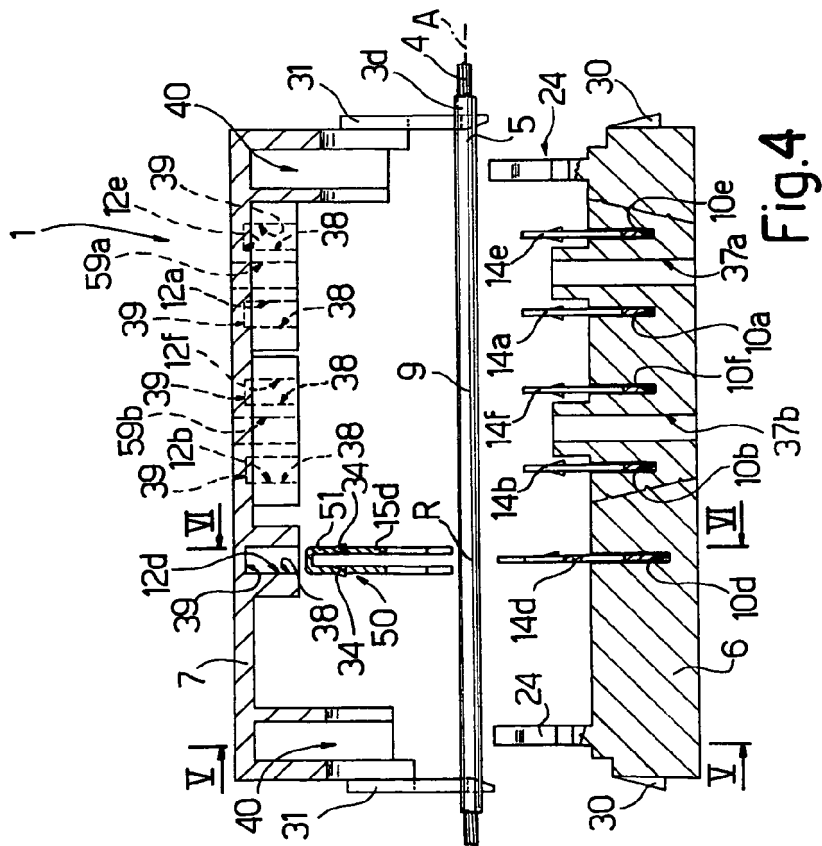
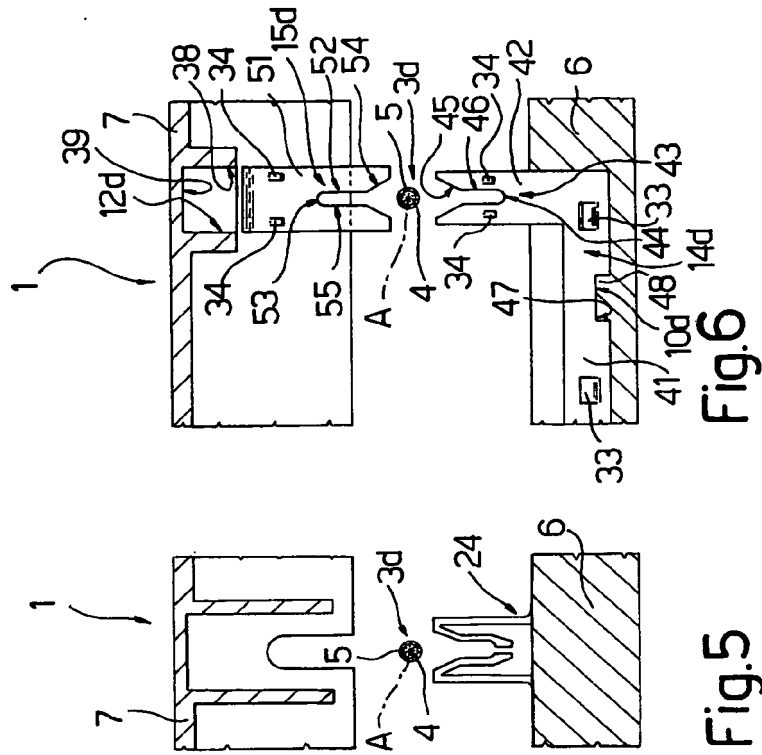
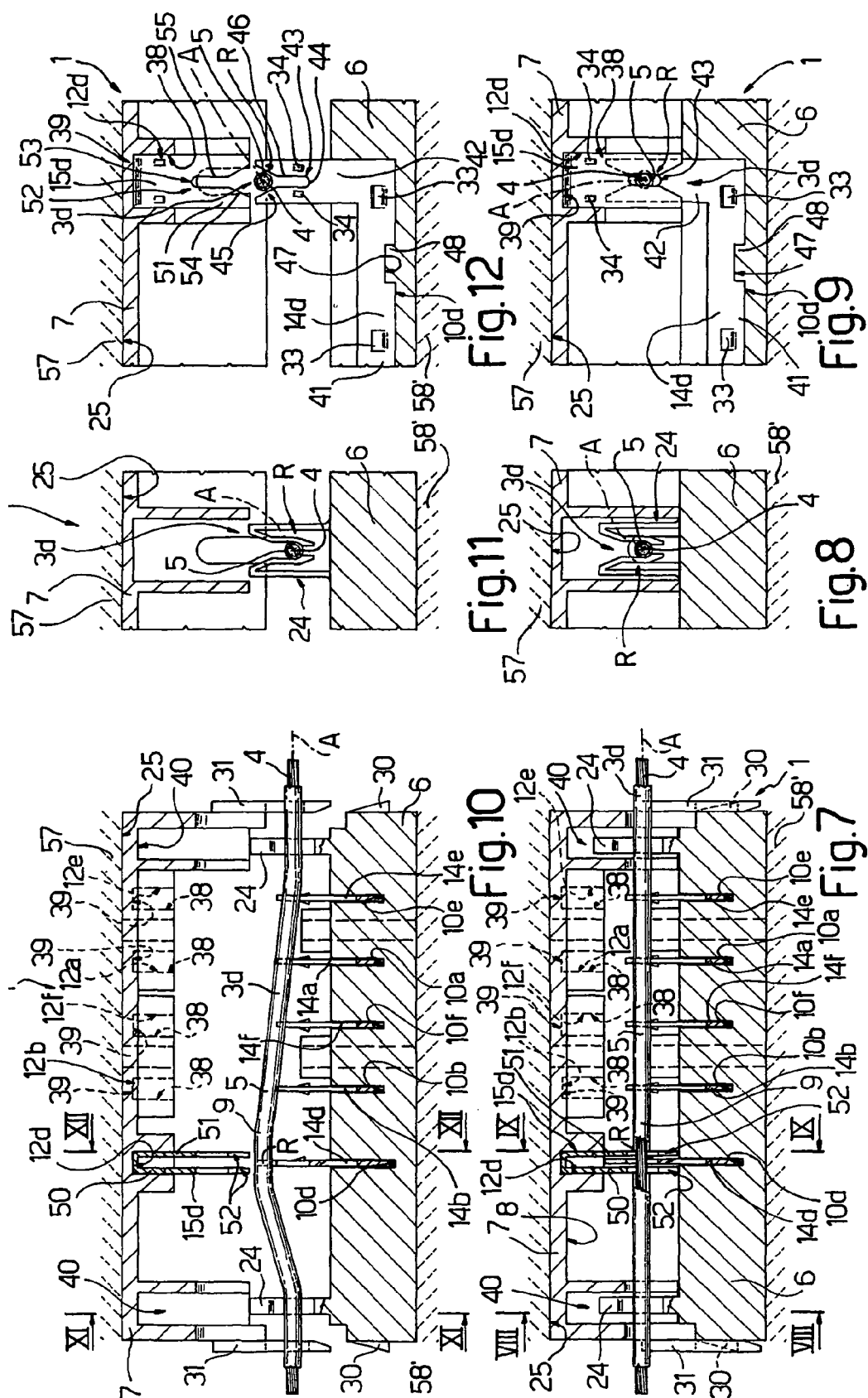


Fig.3

Fig.2





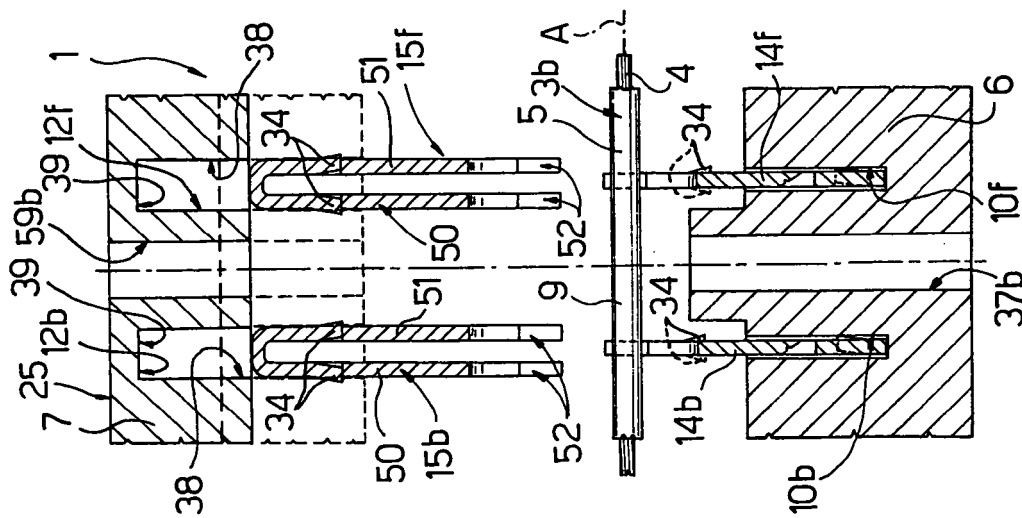


Fig.13

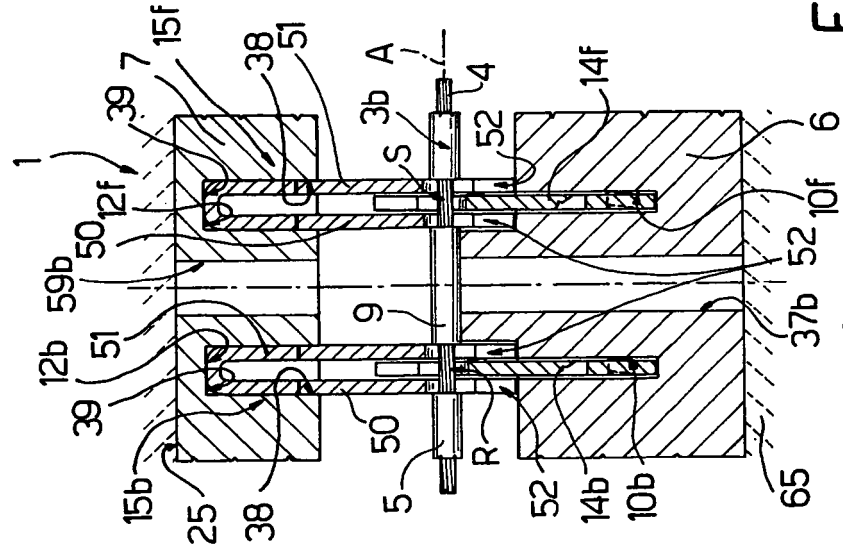


Fig.14

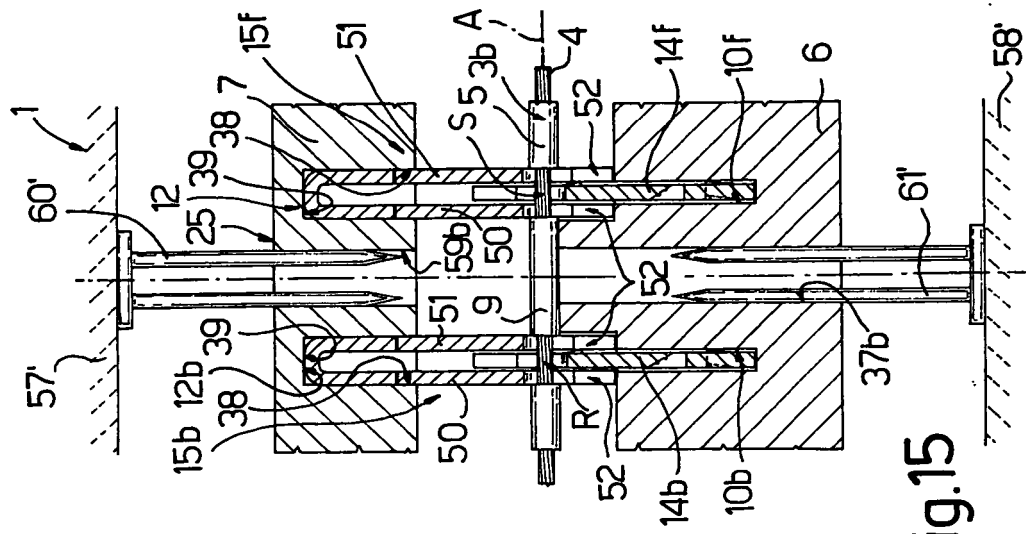
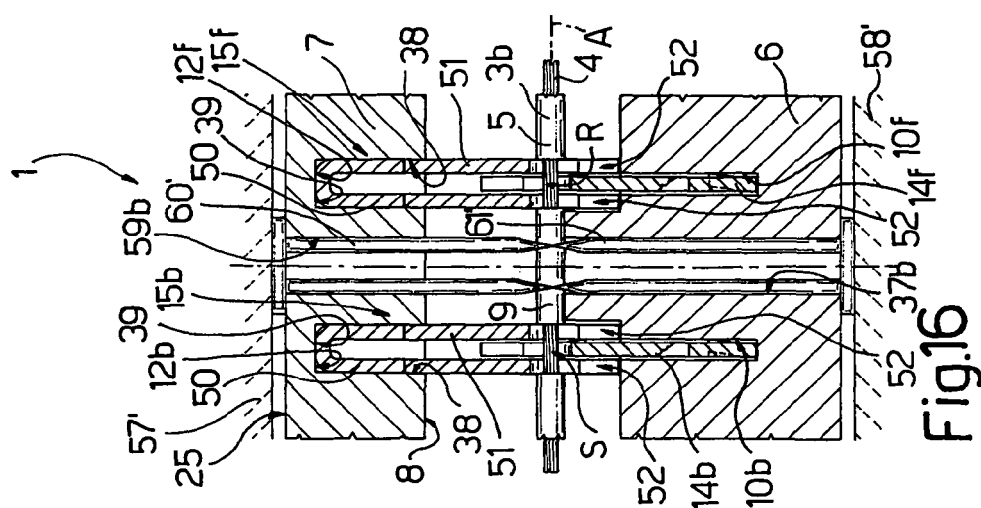
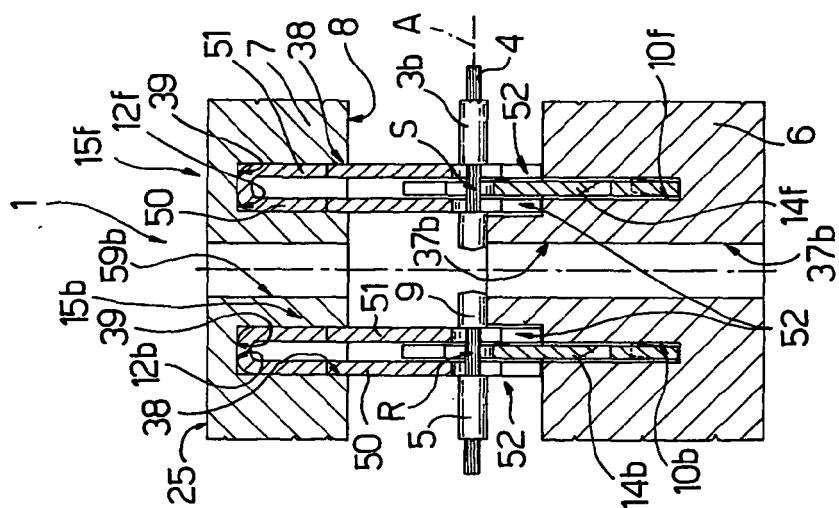
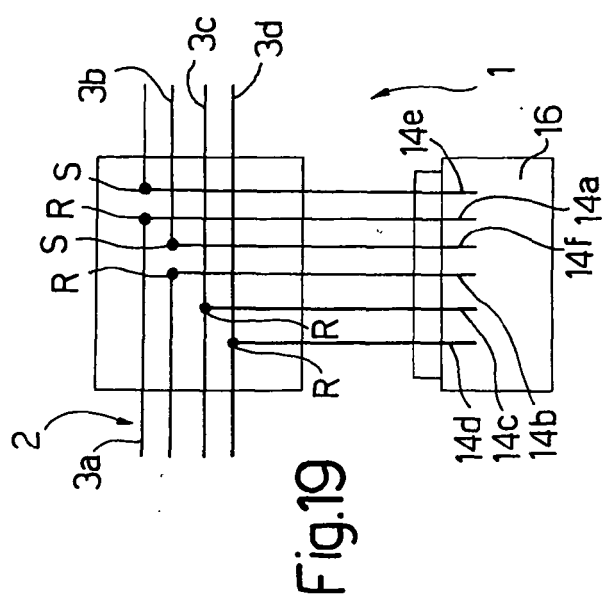
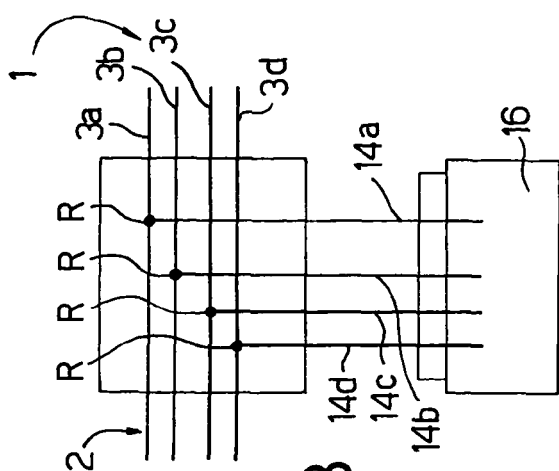


Fig.15





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# EUROPEAN SEARCH REPORT

Application Number  
EP 06 42 5812

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                            |                                                        |                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Citation of document with indication, where appropriate, of relevant passages              | Relevant to claim                                      | CLASSIFICATION OF THE APPLICATION (IPC) |
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| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                            |                                                        |                                         |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                            | Date of completion of the search<br><b>15 May 2007</b> | Examiner<br><b>Brachmann, Patrick</b>   |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                            |                                                        |                                         |

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15-05-2007

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