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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :		(11) International Publication Number:	WO 98/44611
H02G 3/08, H01R 9/24	A1	(43) International Publication Date:	8 October 1998 (08.10.98)

(21) International Application Number: PCT/IT97/00095

(22) International Filing Date: 23 April 1997 (23.04.97)

(30) Priority Data:
MI97A000717 27 March 1997 (27.03.97) IT

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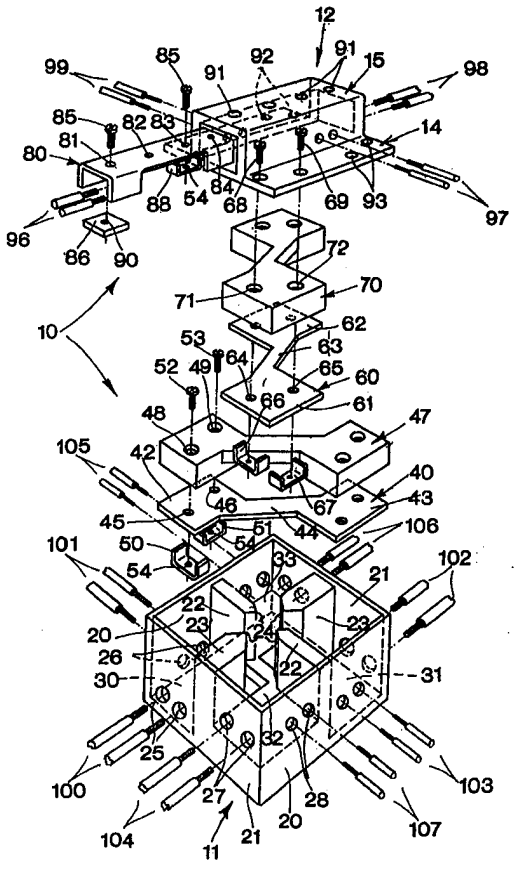
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: MULTIPHASE AND MULTIDIRECTIONAL TERMINAL BOX FOR CONNECTING ELECTRIC LINES GENERALLY, ESPECIALLY FOR CONNECTING PULL BOXES

(57) Abstract

Terminal box (10) for connecting electric lines (96–99) in general, comprising a number of electrically insulated terminal groups (40, 60), at different levels, each with terminals (50, 51, 66, 67, 86, 88) with internal electrical connections and with the geometrical axes of seats for the ends of the electric lines being subsantially parallel, the holes (91–93) for access to the means (52, 53, 68, 69, 85) for tightening all the terminals being similarly parallel one to another so as to permit, for each electric phase, independent electric connections among electric lines laid in the various directions and tightening of all the terminals from the upper deck (14) of the terminal box.



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Multiphase and multidirectional terminal box for connecting electric lines generally, especially for connecting pull boxes

The invention concerns terminal boxes in general used for connecting a large number of electric lines supplying current, for telephones and for other such purposes.

Problems are commonly encountered in connecting up a number of electric lines, especially ones with more than one phase, since, in a group of electric lines, those of the same phase must be associated.

Even if coming from opposite directions, the wires to be connected must be stripped and wound together and each group so formed must be fitted into a unipolar terminal and its contacts made.

For example, if four electric lines going in four directions are to be connected with three conductor cables each, at least three unipolar terminal boards of four conductors each will be needed for the three gorups, corresponding to the three phases.

Risks involved in these operations are commonly known as a board has to be held up in one hand while the other, holding a screwdriver, must tighten up the screw to make a stable connection.

In this precarious position a screwdriver can easily slip off the screw and more or less seriously injure the hand holding the board.

But also as said connections must be fitted into the small space inside a pull box, to reduce the considerable bulk caused by the necessary length of wires, for example twelve wires fixed in the three unipolar terminals,

they must be tightly wound and pressed down so that the lid of the box can then be closed.

In doing so a wire can easily be damaged or become detached from its terminal causing inadequate contacts, overheating or even a fire.

The above invention eliminates these serious drawbacks and offers other considerable advantages as will be explained below.

Subject of the invention is a multiphase and multidirectional box-shaped terminal board for connecting electric lines generally, especially for pull boxes.

This terminal box comprises a number of electrically insulated terminal groups, at various levels, each with internally connected terminals placed close to holes made in the walls for passage of electric wires

The geometrical planes at various levels, on which the geometrical axes of electric lines, housed in the terminals forming groups of terminals, substantially lie, are parellel one to another or in each group.

The holes made in the terminal box for access to means for tightening all the terminals are similarly parallel one to another or in each group.

For each electrical phase it is thus possible to make electrical connections separate from the other phases, between electric lines laid in various directions, and to tighten up the terminals even on a single level of the terminal box.

At the base of this terminal box are extensions such as tabs and the like, these having holes in them for fixing purposes either inside the pull box or on its supporting surfaces generally.

The terminal box may be of any shape to suit different applications.

The terminals in the different groups are connected by printed circuit paths or by electrical conducting bodies using a variety of connecting systems such as direct casting, mechanical connection such as screws, rivets and the like.

The terminal groups are electrically connected together by electric circuits these being internal and reciprocally isolated for each group to form a number of parallel connections in one direction in any through 360°.

In the terminals the electric lines are fixed by screws, bolts, snap-in devices, spring devices or other suitable means as the case requires.

Structure of the terminal board is box-shaped and internal insulation is of electrically insulating and flame-resistent material.

In one preferred execution the box-shaped structure is parallelepiped with a square or rectangular base, with a cover at the top comprising a central oblong body of a constant quadrangular cross section as long as the cover and about 1/3 of its width.

The terminal groups at the different levels are made from a flat conducting lamina of two quadrangular bodies, diagonally connected by an oblong part, that support one or more terminals on the free sides close to the edges.

In one execution the terminals in the groups at the various levels are obtained from a U-shaped body with a threaded hole in the centre, so that two conductors can be simultaneously tightened on both sides by the same screw.

In one type of execution inside the box-shaped terminal board with a square or rectangular base are four diaphragms that depart orthoganally from a central point on the four sides of the box reaching nearly as far as its centre, terminating in dihedral angles, these diaphragms dividing up the box into four quadrangular substantially equal chambers.

Said chambers are joined by central corridors left free by the diaphragms.

The base of the chambers lying on one diagonal, is higher than the base of the other two chambers, lying at 90° to the second diagonal, by a height substantially that of the terminals.

A first terminal group is positioned inside the two deeper chambers with its central part laid over the raised corridor that joins the other two chambers and with the terminals facing downwards.

Above said first group there is a spacer of insulating material of about the same shape and same amplitude as said group but of a thickness substantially that of the height of the terminals.

A second group of terminals, substantially equal to the first, is placed inside the other two chambers with its central part laid over the central part of said spacer.

Above said second group is a second spacer substantially of the same form and amplitude.

The square cover of the box is laid over said second spacer.

Through all the walls inside which there are terminals, and at a short distance from said walls, holes are bored for access to said terminals by the electric lines to be connected, so that all screws fixing the terminals are accessible through holes made in the cover of the box.

Inside the central oblong body of the cover is a third terminal group obtained from a body made of conductive material with a cross section shaped like an overturned "U", whose external dimensions are substantially the same as the internal dimensions of said oblong body, with terminals in an intermediate position and at the ends.

The end terminals are accessible to the electric lines through apertures at the ends of the oblong body.

The intermediate terminals are accessible to the electric lines through holes made in the opposite sides of the lateral walls of said oblong body.

The fixing screws for all terminals are accessible through holes made in the upper part of the oblong body.

The end terminals are substantially formed of a quadrangular plate with a threaded hole in its centre.

The intermediate terminals are formed of a U-shaped body with a central threaded hole.

In another execution the box-shaped terminal board is formed of two opposing bodies, a box and a lid, with walls matching at different levels on a diametral line parallel to the base of the box, with holes, made in said walls for access by electric lines to the terminals, formed of two halves cut in the edges of the matching walls.

A first terminal group is placed on the base of the box and is formed of a smooth U-shaped conducting lamina on whose four edges four upward-facing terminals are fixed.

Above said first terminal group, and after a flat spacer of insulating material has been placed on it, there is a second terminal group substantially consisting of a square lamina with four rectangular extensions to carry upward-facing terminals the geometrical axis of whose screws is parallel to the geometrical axes of the screws for the terminals in the terminal group below.

Above said second terminal group and after a second insulating spacer has been laid, there is a third terminal group substantially equal to the second, geometrical axis of its fixing screws being parallel to the geometrical axes of the screws for the terminals in the group below.

Above said third group, and with interposition of insulating spacers, more terminal groups, substantially similar to the former ones, can be added.

In all walls, close to the inside of which terminals of said groups are placed, holes are made for access by electric lines.

All the geometrical axes of screws for fixing terminals are situated at a reciprocal distance to give access to all such screws through holes made in the cover over the box.

The invention offers evident advantages.

Connection of electric lines of different phases, laid in the required directions, is not only possible but is extremely easy.

In particular, the terminal box can be fixed inside the pull box leaving both the operator's hands free to use the screwdriver to tighten screws on outward-facing contacts that no longer face either him or his hands.

With terminal groups at different levels, as seen in the figures, 8 lines, for example, for each phase can be connected up making a total of 24 lines.

All this is done using the screwdriver on the upper part of the terminal box only, on 12 screws for twelve pairs of terminals.

In conclusiion, maximum safety is assured avoiding any risk of injury or even of a disaster due to badly made contacts that could cause a fire, also using a much smaller quantity of materials.

The construction itself of this terminal box that encloses all terminals and electrically insulating terminal-group spacers of flame-resistent material contributes to safety of plant and equipment.

Characteristics and purposes of the disclosure will be made still clearer by the following examples of its execution illustrated by diagrammatically drawn figures.

Fig.1 The box-shaped terminal box, perspective.

Fig.2 A cross section of said box made at a first group of terminals.

Fig.3 As above, at a second group of terminals.

Fig.4 As above, at an upper group of terminals.

Fig.5 Exploded perspective of the terminal box.

Fig.6 Perspective of a variant of this terminal box.

Fig.7 A cross section of said box made at a first group of terminals.

Fig.8 As above, at a second group of terminals.

Fig.9 As above, at a third group of terminals.

Fig.10 The box cut longitudinally, at the screw-guiding tubes

Fig.11 Exploded perspective of the terminal box.

The terminal box 10 comprises a parallelepiped 11 and cover 12, comprising the deck 14 and upper oblong body 15 substantially central to said cover, about equal to it in length and about 1/3 of its width.

The body 11 has four opposing walls 20 and 21.

About halfway along the inside of the walls 20 there are orthogonal diaphragms 22 while about halfway along the inside of the walls 21 there are orthogonal diagraphms 23.

Thickness of the diaphragms 22 is about half that of diaphragms 23.

Said diaphragms extend up to a short distance from the centre of the box their ends 24 being shaped as dihedral angles to form two orthogonal corridors and two pairs of chambers 30-31 and 32-33 respectively on diagonals at 90° one from another.

The base of chambers 32 and 33 lies higher than that of chambers 30 and 31 being about the height of the terminals in the terminal box.

In the chambers 30 and 31 is a first terminal group 40 obtained from a flat conductive lamina comprising quadrangular plates at the ends 42 and 43 joined by a bridge 44.

At the free edges of said quadrangular plates are holes 45, 46 through

which pass the screws 52, 53 for the U-shaped terminals 50, 51 with a central threaded hole 54.

The central part 44 of said terminal group 40 rests on the raised corridor that joins chambers 32, 33 while terminals 50 and 51 are placed inside the other chambers 30 and 31.

Close to terminals 50, 51, placed at a short distance from the corner between walls 20 and 21, are pairs of holes 25 and 26 through which can pass the ends of electric lines to be connected up.

Holes 25 can receive wires of 6-10 mm2 cross section while holes 26 can receive wires of a 2.5-4 mm2 cross section.

Placed over said terminal group 40 is a spacer 47 of insulating material, of substantially the same shape and size, but of a thickness about the same as the height of the terminals.

In said spacer are holes 48 and 49 for the terminal screws 52 and 53.

Above said spacer and more or less orthogonal to it is a second terminal group 60, substantially equal to the terminal group 40, with quadrangular ends 61, 62 joined by the bridge 63.

In the quadrangular ends are holes 64 and 65 made for the screws 68, 69 that tighten the terminals 66, 67 substantially equal to terminals 50, 51 already described.

Said terminals are placed inside the chambers 32, 33 a short distance from the corners of walls 20 and 21 of the box opposite the pairs of holes 27 and 28 made in said walls.

The pairs of holes 27 can receive wires of 6-10 mm2 while holes 28 receive wires of 2.5-4 mm2.

Above said terminal group 60 is a spacer 70 of substantially the same size and shape as said terminal group 60 but of a thickness substantially the same as the height of the terminals and having in it holes 71, 72 for passage of the screws 68, 69 that tighten the terminals 66, 67.

Above said spacer again is the flat quadrangular cover 12 that fits inside the walls 20 and 21.

Above said cover is the oblong body 15 inside which is a third terminal group 80 formed of a piece of metal shaped like an overturned "U" and as long as the oblong body.

On the upper surface of said "U" are holes 81-84 for passage of screws 85 that fix terminals like 86, 89 and 87, 88.

The terminals 86, 89 are flat in shape, they are placed at the two ends of the terminal group 80 and have a central threaded hole 90, while terminals 87, 88 are intermedially situated, are U-shaped and have a central hole 54 for the fixing screws 85.

All the tightening screws pass through holes 91-93 made in the deck 14 of the cover 12 and in the oblong body 15.

Opposite the intermediate terminals 87, 88, pairs of holes 18, 19 to take wires of a 2.5-4 mm2 cross section, are made in walls 16 and 17.

Larger wires, diameter 6-10 mm2, can be connected to terminals 86, 89.

As the drawings clearly show, all screws for tightening terminals like 50, 51, 66, 67, 86-89 are accessible through the holes made in the terminal box 40, 60, 80, in the spacers 47 and 70 and in the cover 12 on either side of the central oblong body and in said body.

Thus three superimposed terminal groups 40, 60, 80 are created to receive wires through the holes, through the apertures in the four walls 20, 21 of the box-shaped body and in walls 16 and 17 of the oblong body 15 at the top.

As shown in the figure, the following can, for example, be connected by tightening the terminals from the top of the terminal box:

- four pairs of wires 100-103 with the first lowest terminal group 40;
- four pairs of wires 104-107 with the second terminal group 60;
- four pairs of wires 96-99 with the upper terminal group 80.

Figures 6-10 illustrate a variant 110 of the described terminal box 10.

The terminal box 110 comprises the box 111 itself and the cover 112. Said cover comprises the upper deck 114 in which is a set of twelve holes 175 circumscribed by a tube, orthogonal to said deck, such as 115, 116, 117, to guide the screws fixing the groups of terminals like 140, 160, 180, and four walls 120.

The box 111 has four walls 121 while on the base are four pins 123 alternating with four more pins 122 about half the height of the first.

In the cover 112 a set of diaphragms like 124, 125, 126 form chambers like 130, 131, 132 that house the terminals.

The terminal group 140 stands on the base of the box 111, said group being formed of a flat U-shaped conducting lamina 142 at whose four corners are fixed four terminals 143 in which are threaded holes 144 for screws 152 and holes 145 through which electric lines 200-203 can be passed for connection to the terminals.

Over said terminal group 140, the spacer 147 is laid resting on pins 122. Said spacer is of insulating material, its shape being substantially the same as that of the second terminal group 160 and its thickness about half the height of the terminals.

Said second terminal group 160 substantially consists of a square lamina 161 with a central hole 166 in it for passage of a screw to fix the terminal group, with four rectangular extensions 162 to carry the upward-facing terminals 163, geometrical axis of the screws being parallel, at a suitable distance, to the axis of the screws that fix terminal group 140 below.

Terminals like 163 are substantially equal to the described terminals like 143 having in them holes 164 for screws 168 to fix the ends of electric lines 206-209 entering through the holes 165.

Placed over the terminal group 160 is a spacer 170 substantially shaped like the third terminal group 180 but of a thickness about half the height of the terminals.

This third terminal group 180 is similar to the second terminal group being obtained from a square lamina 181 with four rectangular extensions 182 to carry the upward-facing terminals 183 whose geometrical axis is parallel, at a suitable distance, to that of the terminals on the group below.

In said terminals 183 are holes 184 for screws 188 to fix the lines 196-199 that pass through holes 185.

Terminals, like 143 in the first terminal group 140, are placed in chambers like 130, terminals like 163 in the second terminal group 160, are placed

in chambers like 131 and terminals like 183 in the third terminal group 180, are placed in chambers like 132.

The holes like 145, 165, 185 through said terminals permit the ends of electric lines to be fixed after passing through holes like 171-173 made in the walls of the terminal box.

Said holes 171-173 are formed by matching the walls 121 of the box 111 with the walls 120 of the cover 112 where the half-holes such as 171',171", 172',172", 173',173" are cut in the edges of walls 120,121.

Said holes 171-173 are surrounded by half-collars 127-129.

A hole 135 is made in the cover 112 for passage of fixing screws.

To said hole there is a cylindrical extension 136 that reaches down to the base 116 of the body 111 at the position of its central hole 117.

From above, screws 152, 168, 188 enter the holes like 175 in tubes like 115 for the first terminal group, like 116 for the second group, like 117 for the third group, so that the base 191, 192, 193 of said tubes 115-117 rests on the relative terminal that guides the screws till they enter the terminal's threaded hole.

When the terminal box is assembled, hooks 137 lock into the inside 139 of rings like 138 on the cover 112 to hold the assembly firmly together.

The hooks are placed close to wall corners low down on the terminal box.

The shape of the terminal box can obviously be different and have a different structure though still ensuring easy connection of numerous wires, respectively of different phases, by screwing all the terminals from the top of the terminal box, orthogonally to the position of the electric lines.

As the above disclosure has been described and explained only as an example not limited to this and to show its essential features, numerous variations may be made to it in accordance with industrial, commercial or other requirements and other systems and means be included in it without thereby causing any departure from its sphere of application.

It is therefore understood that the request to patent the invention comprises every equivalent use of the concepts and every equivalent product executed and/or in operation in accordance with any one or more of the chracteristics set forth in the following claims.

Claims

1. Multiphase and multidirectional terminal box (10, 110) for connection of electric lines (96-107, 196-203, 206-209) in general especially for pull boxes,

characterized in that it comprises a number of electrically insulated terminal groups (40, 60, 80, 140, 160, 180) set at different levels, each having terminals (50, 51, 66, 67, 86-89, 143, 163, 183) electrically connected internally and placed close to holes (18, 19, 25-28, 171-173) present in the walls (16, 17, 20, 21) of the terminal box (10, 110) for the terminals of electric lines (96-107, 196-203, 206-209), the geometrical planes at different levels, on which the geometrical axes of the holes(145, 165, 185) for electric wires substantially lie in the terminals forming the various terminal groups, being parallel one to another or in each grouping, the holes (91-93, 175) made in the terminal box for access to tightening means (52, 53, 68, 69, 85, 152, 168, 188) for all terminals being similarly parallel one to another or in each grouping, it being thus possible to make electrical connections for each electric phase independently from the other phases, among electric wires placed in various directions and to tighten up the terminals even working from the upper plane (14, 114) of the terminal box only.

2. Terminal box as in claim 1,

characterized in that at its base there are extensions such as tabs and the like, these being perforated to make it possible to fix them both inside the pull box and on the supporting surfaces generally.

3. Terminal box (10,110) as in claim 1,

characterized in that its box-like structure (11,12, 111, 112) is of any geometrical shape according to the various applications, possibly provided with internal means (22, 23, 47, 70, 124-126, 147, 170) of electrical insulation.

4. Terminal box (10, 110) as in claim 3,

characterized in that the box-shaped structure (11,12, 111,112) and internal means of electrical insulation (22,23, 47,70, 122-126, 147, 170) are made of electrically insulating and flame-resistent materials.

5. Terminal box (10, 110) as in claim 1,
characterized in that the terminals (50, 51, 66, 67, 86-89, 143, 163, 183) in the terminal groups (40, 60, 80, 140, 160, 180) are electrically connected one to another by internal electric circuits reciprocally insulated for each group to provide a number of connections (96-99, 100-103, 104-107, 196-199, 200-203, 206-209) in parallel.

6. Terminal box as in claim 1,
characterized in that the terminals in the various groups are connected up by printed circuit paths.

7. Terminal box (10, 110) as in claim 1,
characterized in that the terminals (50, 51, 66, 67, 86-89, 143, 163, 183) in the various terminal groups (40, 60, 80, 140, 160, 180) are connected by electrically conducting bodies using a wide variety of connecting systems such as direct casting, mechanical connections in general (42-44, 62-64, 142, 162, 181).

8. Terminal box (10, 110) as in claim 1,
characterized in that, as the case may require, the terminals (50, 51, 66, 67, 86-89, 143, 163, 183) make it possible to tighten the ends of the electric wires (96-99, 100-103, 104-107, 196-199, 200-203, 206-209) by means of screws (52, 53, 68, 69, 85, 152, 168, 188), bolts, snap devices, springs or other suitable means.

9. Terminal box as in claim 1,
characterized in that the number of internal terminals make possible electrical connections in any direction around 360°.

10. Terminal box (10, 110) as in claim 1,
characterized in that the terminals (50, 51, 66, 67, 87, 88) in the terminal groups (40, 60, 80) at the different levels are formed of a U-shaped body in which there is a central threaded hole (54) through which the screws (52, 53, 68, 69, 85) tighten said terminals enabling simultaneous tightening to be made of two electric lines (97, 99-107) one on either side of the tightening screw.

11. Terminal box (10) as in claim 1,

characterized in that it has a parallelepiped box-shaped structure (11) with a square or rectangular base, and having a cover (12) at the top comprising a central oblong body (15) of a constant quadrangular cross section, about as long as said cover and about 1/3 of its width.

12. Terminal box (10) as in claim 11,
characterized in that the terminal groups (40, 60) at the different levels are formed of a flat conducting lamina consisting of two quadrangular bodies (42, 43, 61, 62). diagonally joined by an oblong section (44, 63), that carry the terminals (50, 51, 66, 67) near the edges of their free sides.

13. Terminal box (10) as in claim 11,
characterized in that from a central point along the four walls (20,21) of the box (11) diaphragms (22, 23) orthogonal to said walls, depart and extend to a short distance from the centre of the box, with ends (24) terminating in dihedral angles, dividing the box into four quadrangular substantially equal chambers (30-33), said chambers being joined by the central corridors left free by the diaphragms, the base of chambers (32, 33) lying diagonally, being higher than the base of the other two chambers (30, 31) lying on a second diagonal at 90°, by about the height of the terminals, a first terminal group (40) being placed inside the two chambers (30, 31) of greater depth with the central part of said terminal group (40) lying above the raised corridor that joins the other two chambers (32, 33) and with the terminals (50, 51) facing downward, there being placed over said first terminal group a first spacer (47) of insulating material of a shape and amplitude substantially the same as that of the terminal group but of a thickness about the same as the height of the terminals, a second terminal group (60), substantially the same as the first, being placed inside the other two chambers (32, 33) with its central part lying above the central part of said first spacer, there being placed over the second terminal group a second spacer (70) of substantially the same shape and amplitude, there being placed above said second spacer the square cover (12) of the box, holes (25-28) being made through all the walls close to the insides of which terminals (50, 51, 66, 67) are placed, for passage of electric lines (100-107) to connect to the

terminals, all the screws (52, 53, 68, 69) for tightening the terminals being accessible through holes (92, 93) made in the cover of the box.

14. Terminal box (10) as in claim 11,

characterized in that inside the central oblong body (15) of the cover (12) is a third terminal group (80) made from a body of conducting material whose cross section is shaped like an overturned "U", whose external dimensions substantially correspond to the internal dimensions of said oblong body, terminals (86, 89) being placed at the two ends of said terminal group accessible to electric lines (96, 98) through apertures at the ends of the oblong body (15) and intermediately placed terminals (87, 88) accessible to electric lines (97, 99) through holes (18, 19) made in the two opposite sides of the lateral walls (16, 17) of said oblong body, the screws (85) for tightening all terminals being accessible through holes (91) made in the upper part of said oblong body, the end terminals being substantially formed of a quadrangular plate with a central threaded hole (90) and the intermedate terminals being formed of a U-shaped body with a central threaded hole (54).

15. Terminal box (110) as in claim 1,

characterized in that it exhibits a box-shaped structure, formed of two opposite bodies, here called a box (111) and a cover (112) with walls (120, 121) matching at different levels corresponding to the centre line, parallel to the base (156) to the holes (171-173) made in said walls for access by ends of electric lines (196-199, 200-203, 206-209), a first terminal group (140) being placed on the bottom (156) of the box (111) and being formed of a flat U-shaped conducting lamina (142) to whose four edges are fixed four upward-facing terminals (143), there being placed above said first terminal group and after a flat spacer (147) of insulating material has been laid over it, a second terrminal group (160) substantially formed of a square lamina (161) with four rectangular extensions (162) to carry the upward-facing terminals (163), the geometrical axis of the tightening screws (168) being parallel to the geometrical axes of the screws (152) for tightening the terminals of the first terminal group below, there being placed above said second terminal group and after a spacer

(170) of insulating material has been laid over it, a third terminal group (180) substantially the same as the second but having four rectangular extensions (182) to carry four more upward-facing terminals (183), the geometrical axis of the tightening screws (188) being parallel to the geometrical axes of the tightening screws (168, 152) for the terminals of the first and second underlying terminal groups, there being placed over said terminal groups, with interposition of insulating spacers, any further terminal groups substantially similar to the preceding ones, all geometrical axes of the tightening screws (152, 168, 188) for the terminals (143, 163, 183) lying at a reciprocal distance such as will permit accessibility to all the tightening screws through holes (175) made in the cover of the box.

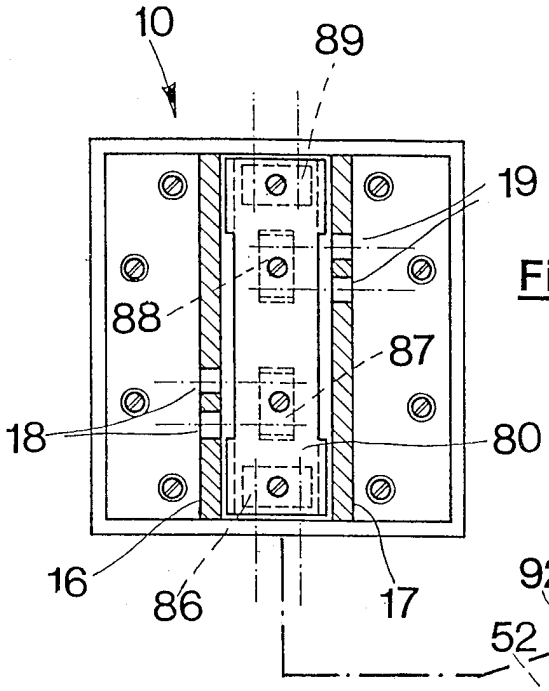

Fig. 4

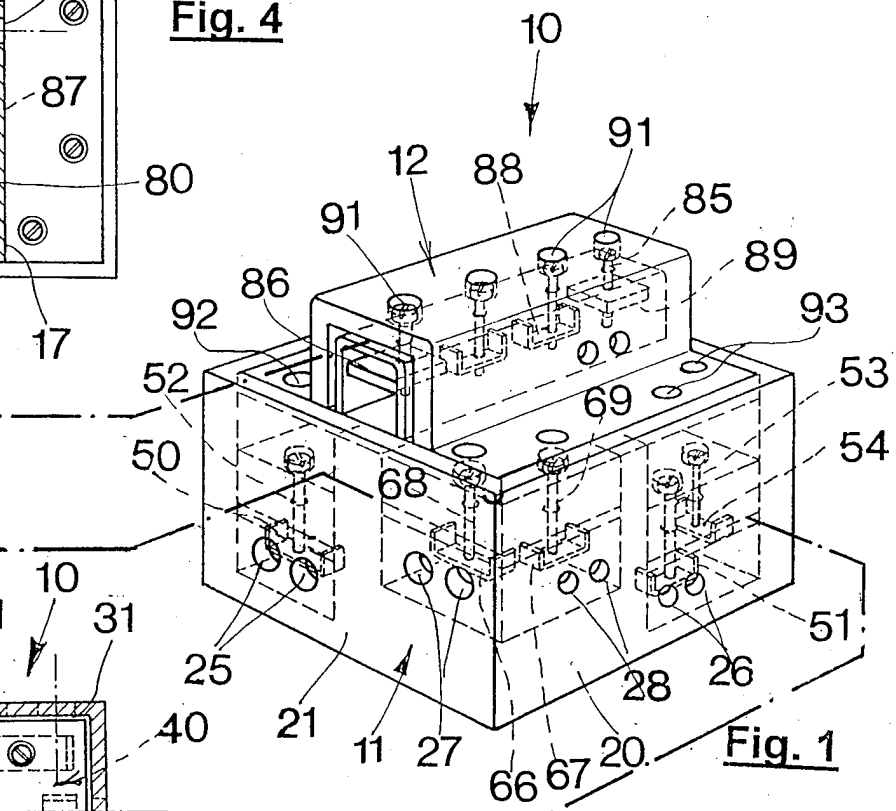

Fig. 1

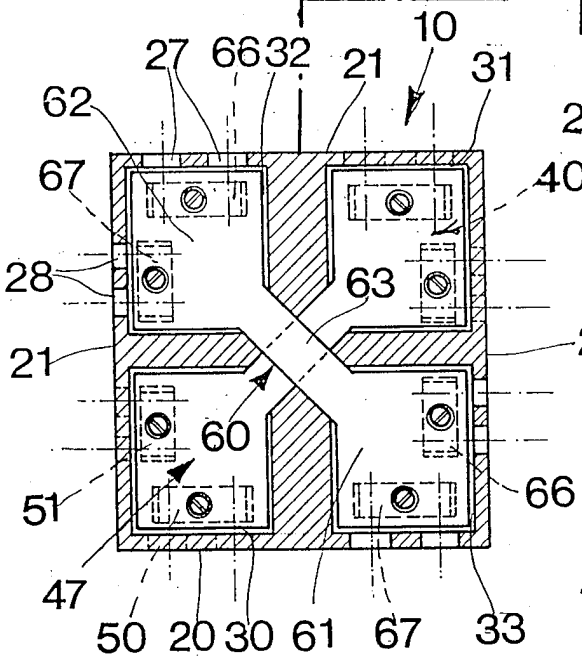

Fig. 3

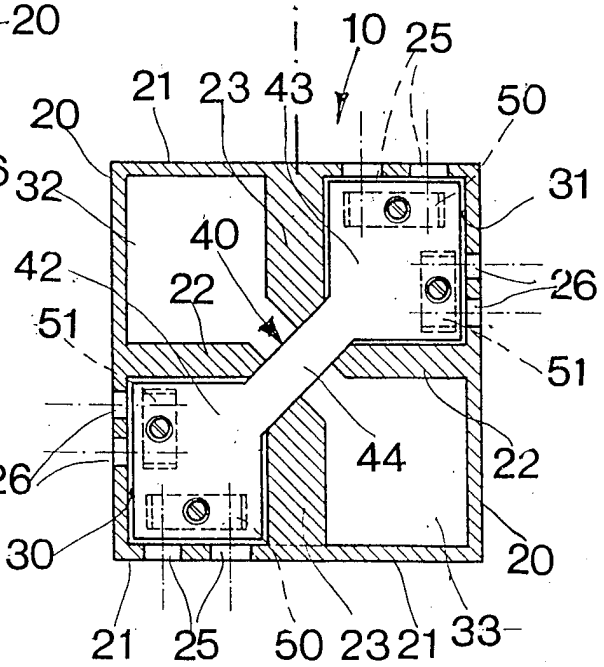

Fig. 2

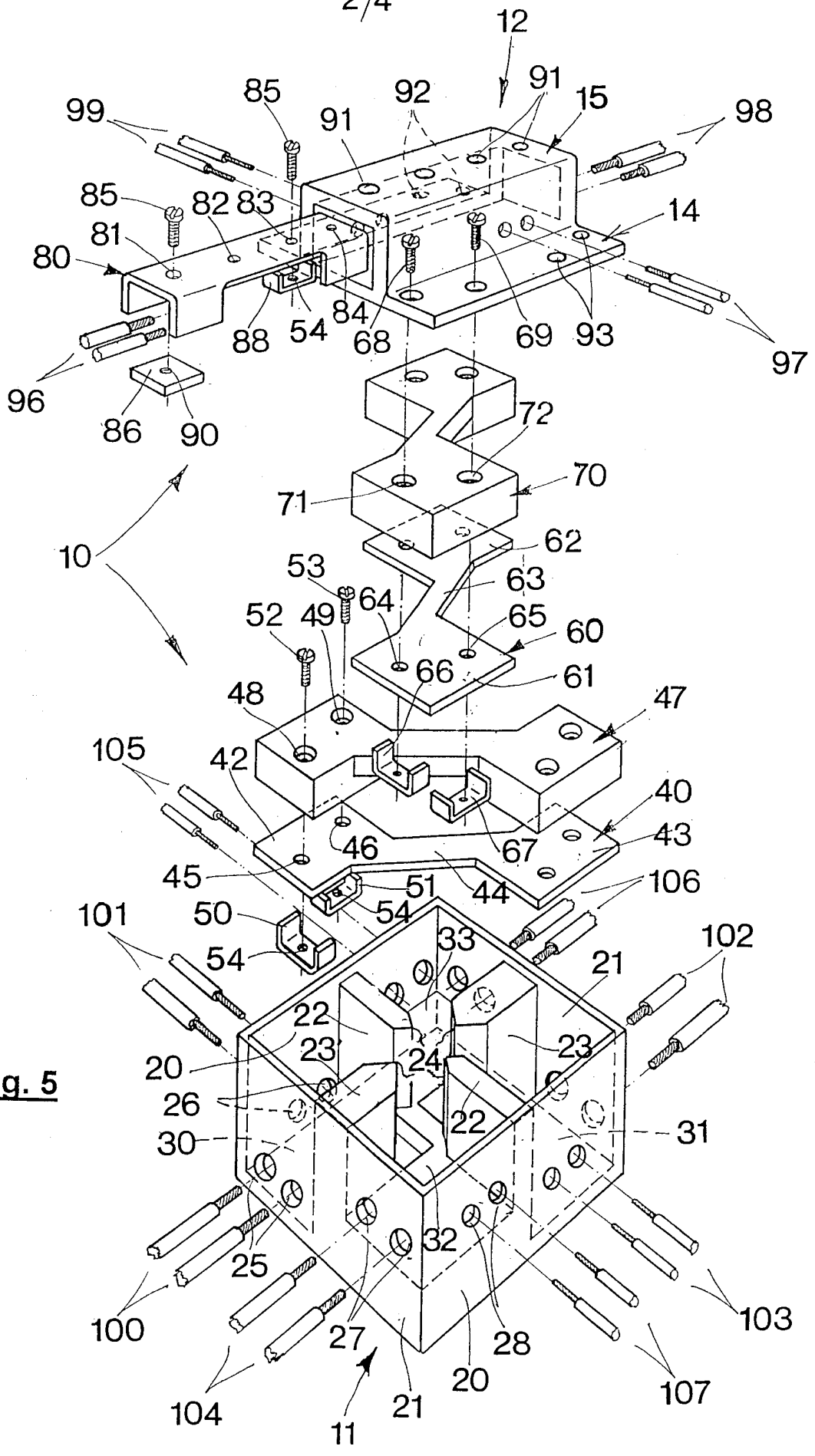
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Fig. 5

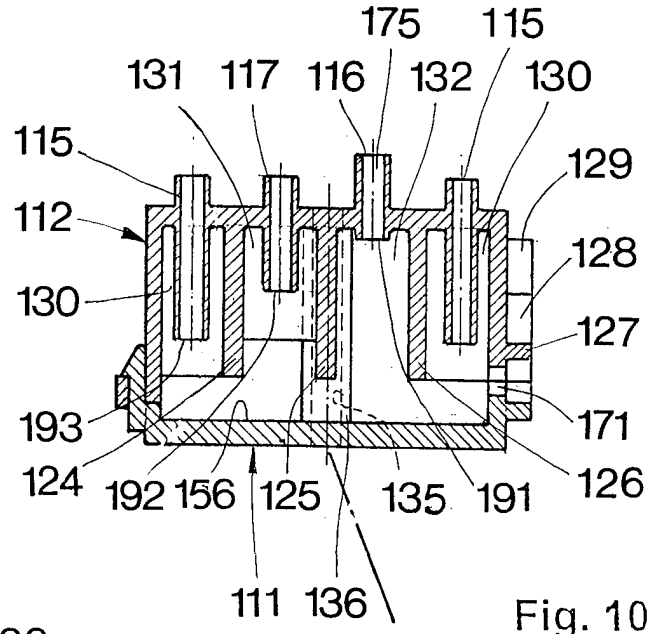

Fig. 10

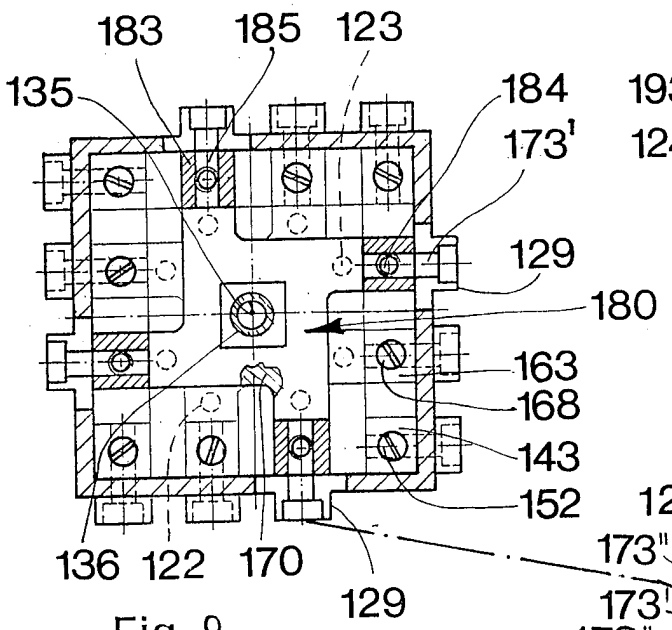

Fig. 9

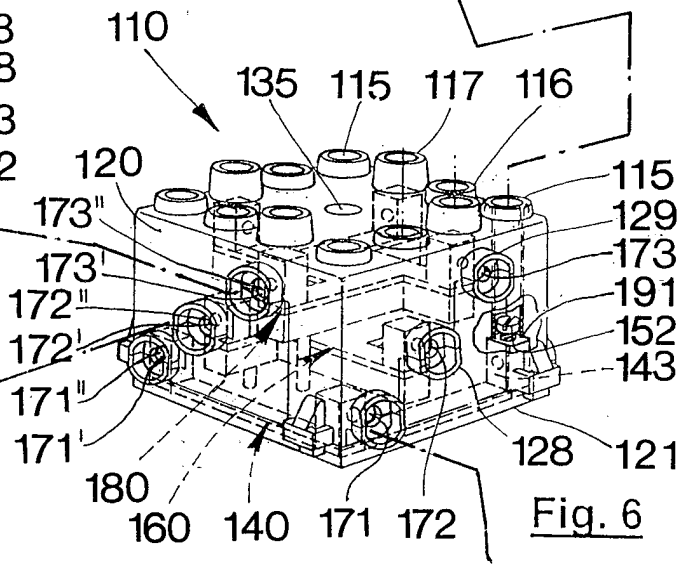

Fig. 6

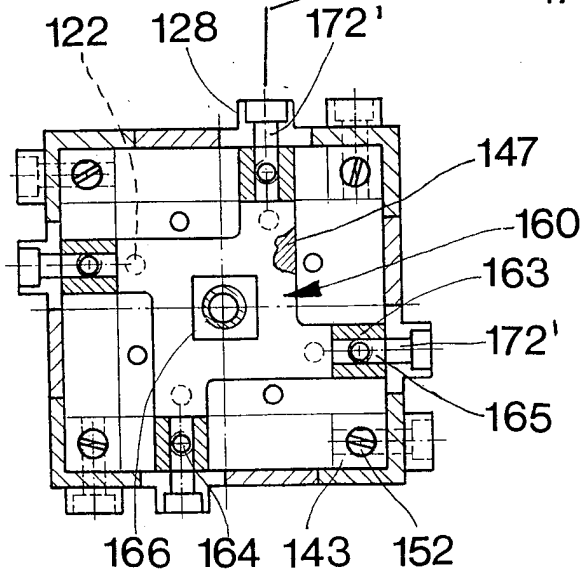

Fig. 8

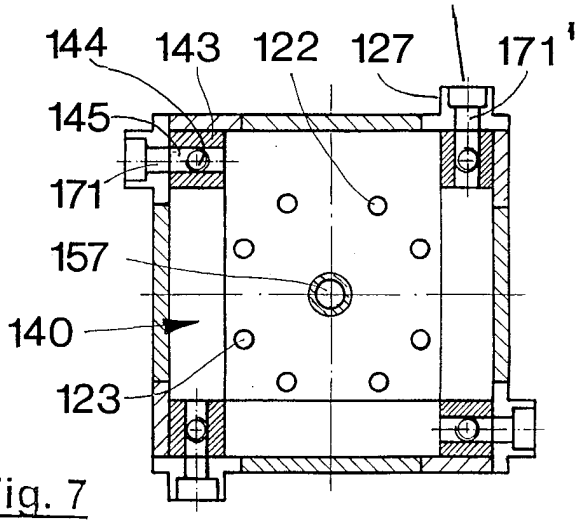

Fig. 7

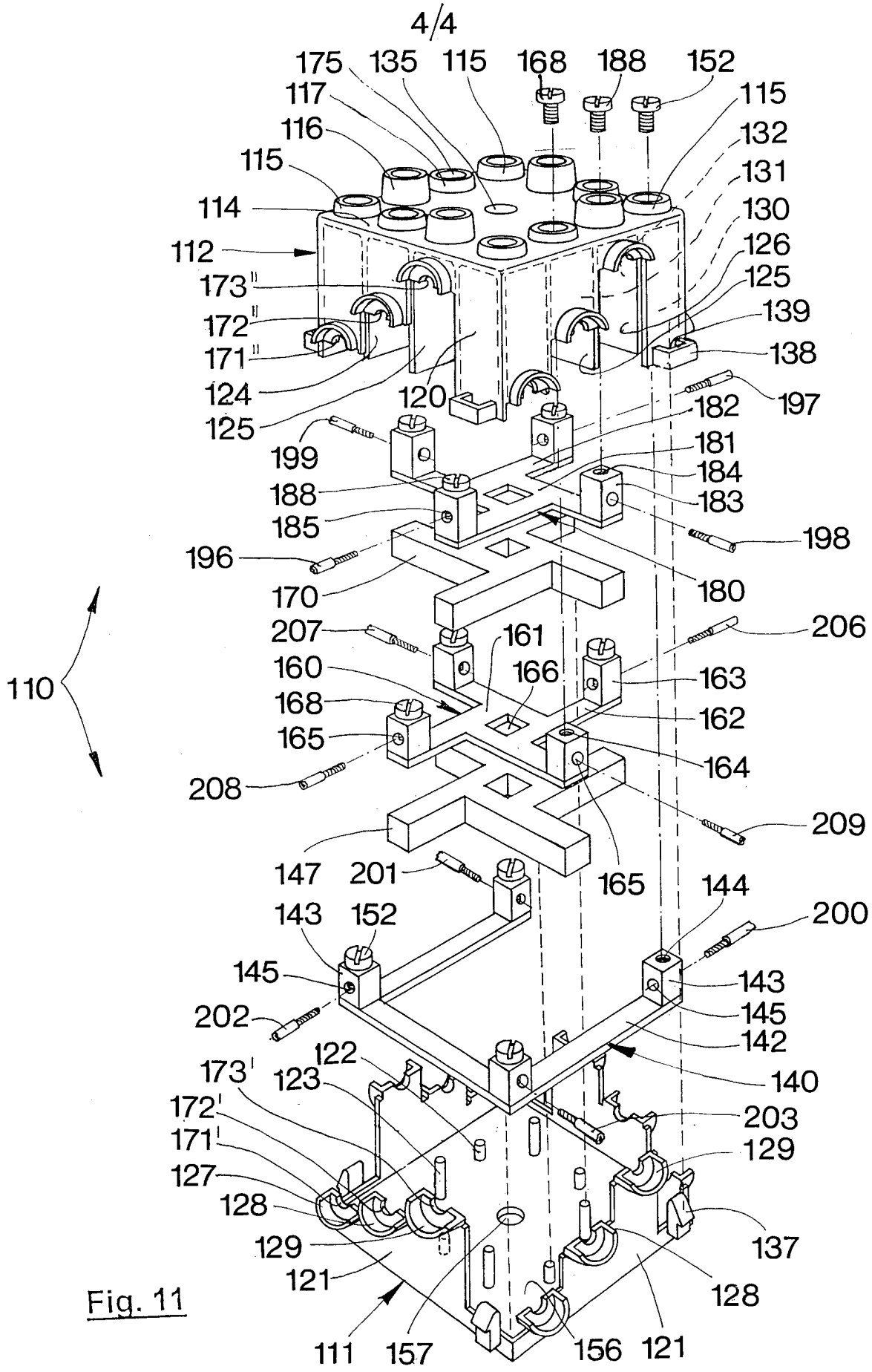
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Fig. 11

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT 97/00095

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H02G3/08 H01R9/24

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H02G H01R

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 3 717 840 A (VAUGHAN W ET AL) 20 February 1973 see column 2, line 31 - line 52 see column 4, line 51 - line 55 see figures 1,1A	1,3-5, 7-9 11,13
X	US 2 463 033 A (A. DE VERE HARNETT) 1 March 1949 see column 2, line 5 - line 39; figures 1,2	1,3-5, 7-9
X	EP 0 352 649 A (ILME SPA) 31 January 1990 see column 1, line 28 - line 49; figures 5,9-11	1,3-5, 7-9

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

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Date of the actual completion of the international search	Date of mailing of the international search report
4 December 1997	- 9. 01. 98

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Moueza, A

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT 97/00095

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 050 770 A (RIGO LARRY E) 27 September 1977 see column 3, line 18 - column 4, line 21; figure 1 ---	1,2
A	US 4 148 546 A (WILSON JR LESTER E ET AL) 10 April 1979 -----	1

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/IT 97/00095

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3717840 A	20-02-73	NONE	
US 2463033 A	01-03-49	NONE	
EP 0352649 A	31-01-90	NONE	
US 4050770 A	27-09-77	NONE	
US 4148546 A	10-04-79	US RE31033 E	21-09-82