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(54) **A device for the connection of electrical conductors to a control unit, preferably for an irrigation control apparatus**

Eine Vorrichtung für die Verbindung von elektrischen Leiter an eine Steuereinheit vorzugsweise für eine Bewässerungssteuereinheit

Dispositif pour la connexion de conducteurs électriques sur une unité de commande en particulier pour un dispositif de contrôle d'irrigation

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(56) References cited:
EP-A- 0 671 782 **GB-A- 2 091 049**
US-A- 4 082 117 **US-A- 4 810 897**
US-A- 5 221 218

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Description

[0001] The present invention relates to a device for the connection of electrical conductors to a control unit, preferably for an irrigation control apparatus.

[0002] In the sector of gardening, irrigation control apparatus are known that allow the control in an automatic manner and at a distance of solenoid valves or of pumps for supplying irrigation water.

[0003] Such units comprise generally an electronic control unit that controls various peripheral units, typically the opening and the closing of one or more solenoid valves, the turning on and off of electric pumps and that can receive signals from transducers.

[0004] For all these purposes, the electronic control unit has to be connected electrically to the solenoid valves, to the electric pumps and to the transducers, allowing at the same time the removability of the electronic computerised nucleus to allow remote programming.

[0005] The problem thus arises of how to make the connections between the external conductors that carry the control signals for the solenoid valves and for the electric pumps, or the signals issued by the transducers, and the electronic control unit.

[0006] EP-A-671 782 and GB-A-2 091 049 disclose a device as defined in the preamble of claim 1.

[0007] According to the present invention, a device is provided as claimed in claim 1.

[0008] Thanks to the device according to the present invention, it is possible to integrate in a casing the functions of terminal board for the mechanical connection of the electrical wires and that of electrical connection of the same wires to the control unit, functions that in the known irrigation control apparatus are provided separately.

[0009] The device of the present invention also allows the electronic part of the control unit to be separated from the conductors providing the connection with the solenoid valves, with the electric pumps and with the transducers, if any.

[0010] The features and the advantages of the present invention will be made more evident by the following detailed description of an embodiment thereof, illustrated as a non-limiting example in the enclosed drawings, wherein:

Fig. 1 is an exploded perspective view of an irrigation control apparatus equipped with the device according to the present invention;

Fig. 2 is a partially sectioned perspective view of the unit shown in Fig. 1;

Fig. 3 is a perspective view of the device according to the present invention, disassembled from the unit;

Fig. 4 is an exploded perspective view of the device shown in Fig. 3; and

Fig. 5 is a cross-sectional view of the unit of Fig. 1 once it has been assembled, taken along a vertical

plane transversal to the connection device.

[0011] With reference to the drawings, there is shown an irrigation control apparatus for use in the sector of gardening.

[0012] The unit comprises a box-like case or shell 1 endowed with a cover 2 and inside which there is obtained a space 3 for housing, with the possibility of extraction, a control unit 4. The control unit 4 is generically of the type comprising a display 5, a keyboard 6 and a rotary switch 7. The control unit 4 will not be described in its structural and functional details since that is altogether inessential for the purpose of understanding the present invention.

[0013] In the shell 1 there is also housed, in front of the control unit 4, a casing 8 constituting an integrated unit comprising a terminal board 9 and an electrical connector 10. The terminal board 9 allows the connection of electrical conductors 50 that are connected, at the other end, to solenoid valves, or to electrical pumps, or to signal transducers for the transmission of control signals from the control unit to the solenoid valves or to the electrical pumps, or for the transmission of measurement signals from the transducers to the control unit. The connector 10 serves to establish the electrical coupling between the conductors 50 fastened to the terminal board 9 and the control unit 4; for this purpose, the latter is provided with a longitudinal opening inside which the connector 10 can be inserted when the control unit 4 is inserted in the space 3 of the shell 1.

[0014] The shell 1 is also provided with an opening 30 for the passage of the conductors 50.

[0015] As can be seen better in Fig. 3, that shows on an enlarged scale the casing 8, the latter comprises a main support 12 in electrically insulating material, preferably plastic, that has two parallel sets 51 and 52 of terminals, one lower and the other upper, each terminal 51, 52 comprising a respective screw 15 or 22 and being separated from the adjacent terminals by respective plates 53 and 54 in insulating material. To each terminal it is possible to fasten mechanically, by means of the screw 15 or 22, a respective electrical conductor 50, for example a cable of copper with insulating sheath. In the figures, only two conductors 50 have been shown, so as not to make the drawings excessively confusing. The terminals of the two sets 51 and 52 are intercalated one with the other, in the sense that proceeding in the longitudinal direction of the two sets, between two generic terminals of the lower set 51 there is always interposed a terminal of the upper set 52.

[0016] The structure and the components of the casing 8 can be seen in their entirety in the exploded perspective view of Fig. 4. As can be seen, in the main support 12 there is a longitudinal succession of holes 13, one for each terminal of the set suitable for receiving respective bushes 14 having a portion of external surface knurled so as to provide friction with the walls of the holes 13. The bushes 14 are threaded internally to

receive the respective screws 15; the latter allow the conductors 50 be tightened on conductor laminas 16, typically metallic, preferably of copper, that have an extended portion 17, a portion 18 curved upward by about 180 and a terminal portion 55 bent to form a projection protruding upward. The conductors 50, once the screws 15 have been tightened, will be in close mechanical and electrical contact with the respective laminas 16.

[0017] The casing 8 also comprises a second support 19 also provided with a longitudinal succession of holes 20 suitable for receiving inside them respective bushes 21 knurled externally and threaded internally to receive respective screws 22. The screws 22 allow the conductors 50 to be tightened on respective conductor laminas 23 that have an initial portion 56 bent to form a projection protruding upward, a portion 57 curved downward by about 180 and a rectilinear terminal portion 24. The conductors 50, once the screws 22 have been tightened, will be in close mechanical and electrical contact with the respective laminas 23.

[0018] In the main support 12 there is also obtained a second longitudinal succession of holes 60, staggered with respect to the holes 13 and internally threaded, to receive the ends of the screws 22.

[0019] The second support 19 also has a protruding longitudinal appendix 25 with rounded end and in which end there are obtained slightly hollowed seats to receive the laminas 16 and 23, that will be intercalated one with the other. Thanks to their conformation, the conductor laminas wind themselves round the appendix 25, with the protruding projections 55 and 56 facing upward (Fig. 3).

[0020] In this way, at the appendix 25 on which the laminas 16 and 23 are wound, an electrical connector is made.

[0021] As can be seen in Fig. 2 and in Fig. 5, when the control unit 4 is inserted in its seat in the shell 1, the appendix 25 with the laminas 16 and 23 wound on it is inserted in the longitudinal opening 11 of the control unit. In order to facilitate the correct insertion of the control unit 4 and in order to ensure that the same maintains its position, two guides 70 are obtained in the support 12. Inside the control unit, the projections 55 and 56 of the laminas 16 and 23 enter into mechanical and electrical contact with as many conductors tracks made on a printed circuit board 29 of the control unit on which the suitable electronic components are mounted. The electrical contact between the conductors 50 and the electronics of the control unit 4 is thus made.

[0022] It should be observed that thanks to the integrated terminal board-conductor unit according to the present invention, the functions of mechanical terminal board and that of electrical connection with the control unit, that in known irrigation control apparatus are made separately, have been combined in a single unit.

[0023] The terminal board-conductor unit of the present invention also allows the electronic part of the control unit to be separated from the conductors con-

necting the solenoid valves, the electric pumps and the transducers, if any.

5 Claims

1. A device for the connection of electrical wire conductors (50) to a control unit (4), preferably for an irrigation control apparatus, provided with a casing (8) comprising a plurality of terminals (51, 52) for the mechanical connection of said electrical wire conductors (50) and an electrical connector (10) provided with a respective plurality of electrical contacts (16, 23), each associated with a respective terminal (51, 52) so as to be electrically connected to a respective electrical wire conductor (50), for the electrical coupling with respective electrical contacts on the control unit (4), each terminal comprising means (13-15; 20-22) for the mechanical connection of a respective electrical conductor wire (50) to a respective lamina (16; 23) of electrically conducting material, said lamina extending to form a respective electrical contact of said connector (50), said casing (8) comprising a support (12, 19) in electrically insulating material that supports said terminals (51, 52), said support also comprising an appendix (25) for supporting said laminas (16, 23), **characterized in that** said laminas (16) comprise a substantially rectilinear portion (17) extending from the respective terminal, and a portion (18) bent round said appendix (25).
2. A device according to claim 1, **characterized in that** that said laminas (16, 23) comprise a curved portion (55, 56) so as to determine a projection suitable for co-operating with a respective contact of the control unit (4).
3. A device according to claim 2, **characterized in that** that said means for the mechanical connection of a respective electrical wire conductor to a respective lamina comprise a screw (15, 22).

45 Patentansprüche

1. Vorrichtung zum Verbinden von elektrischen Leitungsdrähten (50) mit einer Steuereinheit (4), vorzugsweise für eine Berieselungs-Steuereinrichtung, welche ein Gehäuse (8) aufweist, welches eine Mehrzahl von Anschlüssen (51, 52) zum mechanischen Anschließen der elektrischen Leitungsdrähte (50) und einen elektrischen Verbinder (10) aufweist, welcher mit einer Mehrzahl von elektrischen Kontakten (16, 23) versehen ist, welche jeweils einem Anschluß (51, 52) derart zugeordnet sind, daß eine elektrische Anschlußverbindung mit

einem zugeordneten elektrischen Leitungsdraht (50) zur elektrischen Verbindung mit den zugeordneten elektrischen Kontakten an der Steuereinheit (4) hergestellt wird, eine Einrichtung (13, 15; 20, 22) zum mechanischen Verbinden eines zugeordneten Leitungsdrahtes (50) mit einer zugeordneten Lamelle (16; 23) aus elektrisch leitendem Material vorgesehen ist, wobei die Lamelle sich derart erstreckt, daß ein zugeordneter elektrischer Kontakt des Verbinders (50) gebildet wird und ein Träger (12, 19) aus elektrisch isolierendem Material vorgesehen ist, welcher die Anschlüsse (51, 52) trägt, wobei der Träger auch einen Fortsatz (25) zum Halten der Lamellen (16, 23) aufweist, **dadurch gekennzeichnet, daß** die Lamellen (16) einen im wesentlichen rechteckförmigen Abschnitt (17), welcher sich von dem zugeordneten Anschluß weg erstreckt, und einen Abschnitt (18) aufweisen, welcher um den Fortsatz (25) gebogen ist.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, daß** die Lamellen (16, 23) einen gekrümmten Abschnitt (55, 56) aufweisen, so daß ein Vorsprung gebildet wird, welcher in geeigneter Weise mit einem zugeordneten Kontakt der Steuereinheit (4) zusammen arbeiten kann.
3. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet, daß** die Einrichtung zur mechanischen Verbindung eines zugeordneten elektrischen Leitungsdrahtes mit einer zugeordneten Lamelle eine Schraube (15, 22) aufweist.

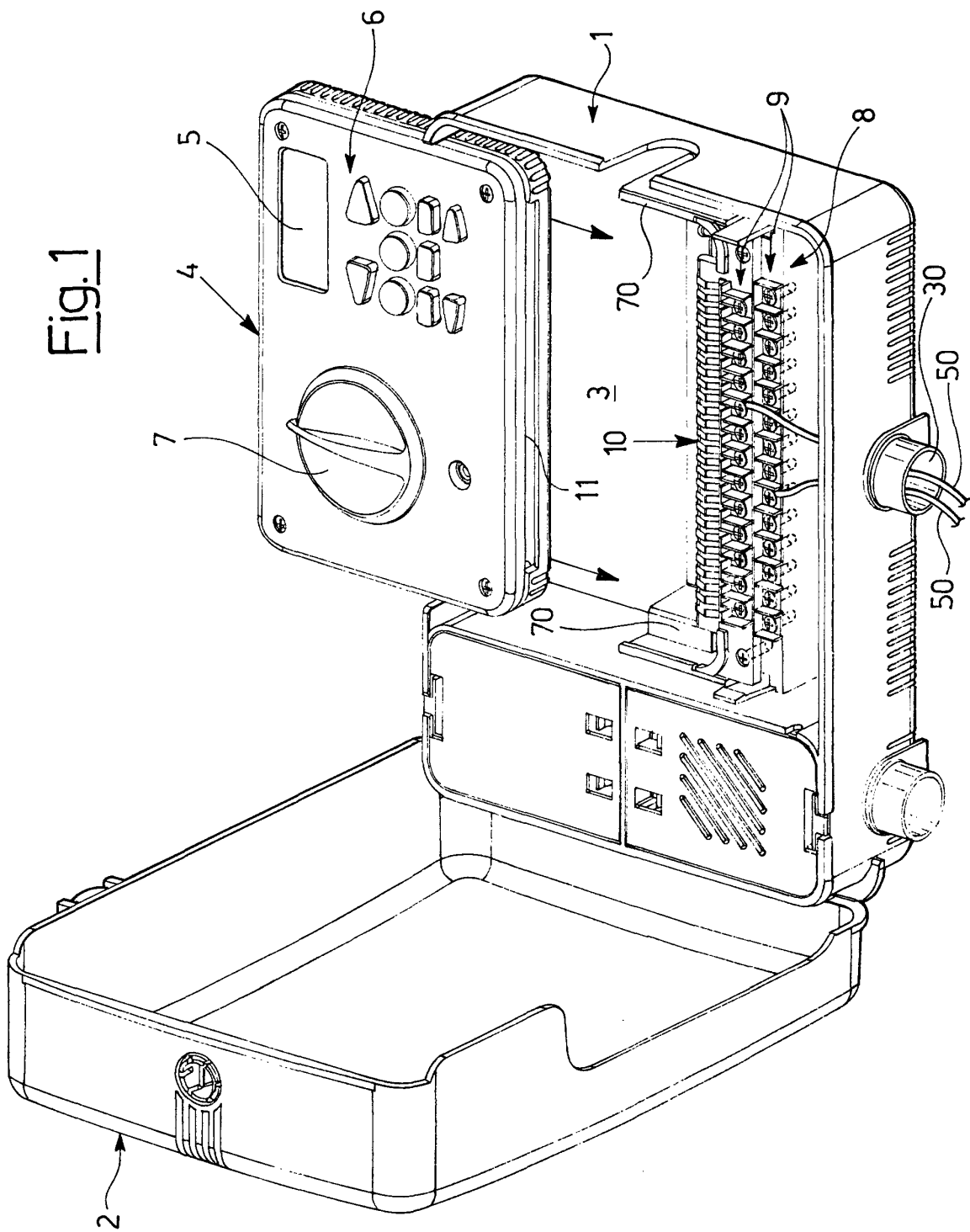
Revendications

1. Dispositif pour le raccordement de fils conducteurs électriques (50) à une unité de commande (4), préférentiellement pour un appareil de commande d'irrigation, pourvu d'un boîtier (8) comprenant une pluralité de bornes (51, 52) pour le raccordement mécanique desdits fils conducteurs électriques (50) et un connecteur électrique (10) pourvu d'une pluralité respective de contacts électriques (16, 23), chacun associé à une borne respective (51, 52) afin d'être électriquement raccordé à un fil de conducteur électrique respectif (50) pour le couplage électrique avec des contacts électriques respectifs sur l'unité de commande (4),
chaque borne comprenant des moyens (13 à 15 ; 20 à 22) pour le raccordement mécanique d'un fil conducteur électrique respectif (50) à un laminé respectif (16 ; 23) d'un matériau conducteur électriquement, ledit laminé s'étendant pour former un contact électrique respectif dudit fil conducteur (50),
ledit boîtier (8) comprenant un support (12, 19) dans un matériau d'isolation électrique qui supporte lesdites bornes (51, 52), ledit support compre-

nant aussi un appendice (25) pour supporter lesdits laminés (16, 23),

caractérisé en ce que lesdits laminés (16) comprennent une partie substantiellement rectilinéaire (17) s'étendant à partir de la borne respective, et une partie (18) courbée autour dudit appendice (25).

2. Dispositif selon la revendication 1, **caractérisé en ce que** lesdits laminés (16, 23) comprennent une partie courbée (55, 56) afin de déterminer une partie faisant saillie appropriée pour coopérer avec un contact respectif de l'unité de commande (4).
3. Dispositif selon la revendication 2, **caractérisé en ce que** ledit moyen pour le raccordement mécanique d'un fil de conducteur électrique respectif à un laminé respectif comprend une vis (15, 22).



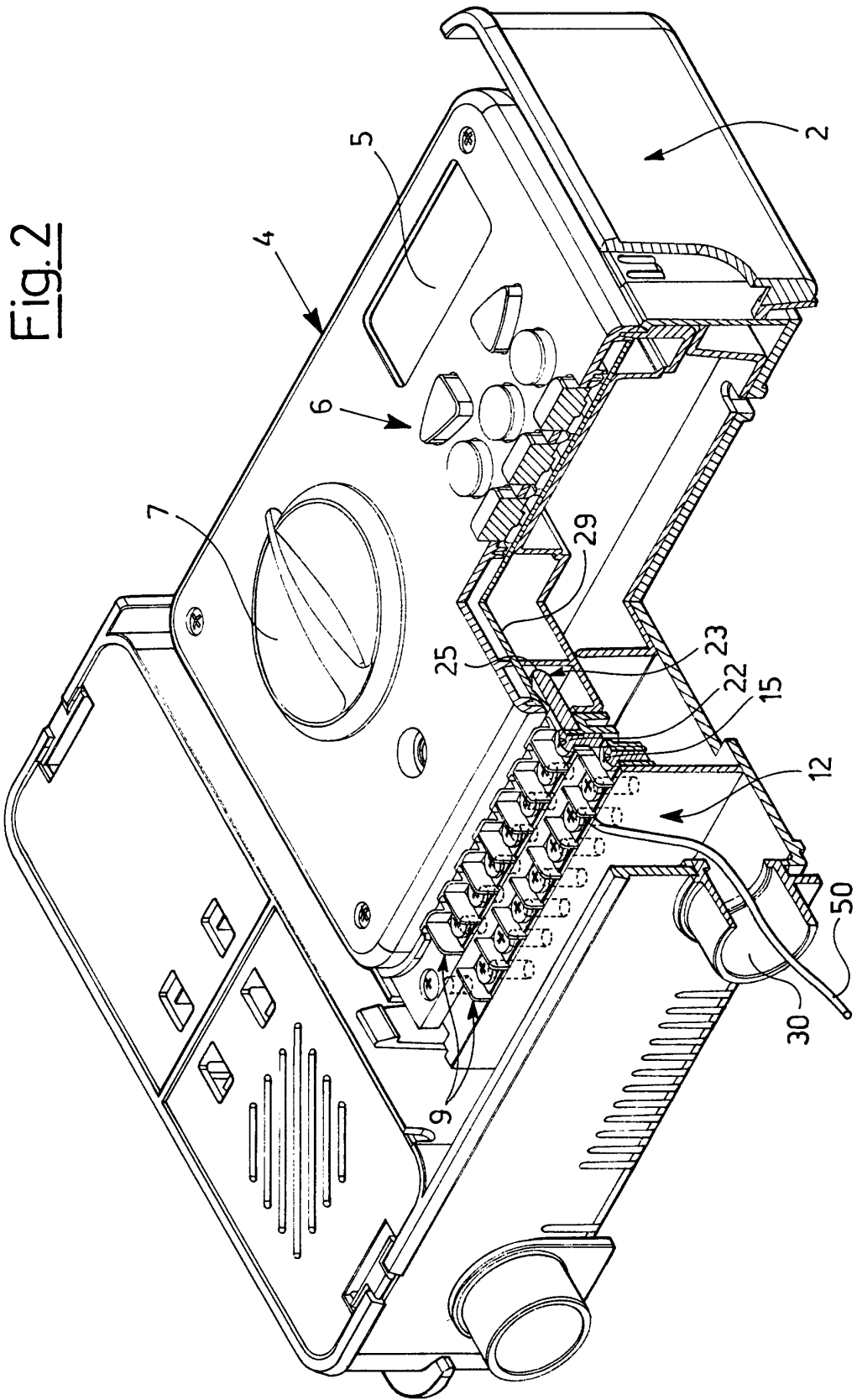
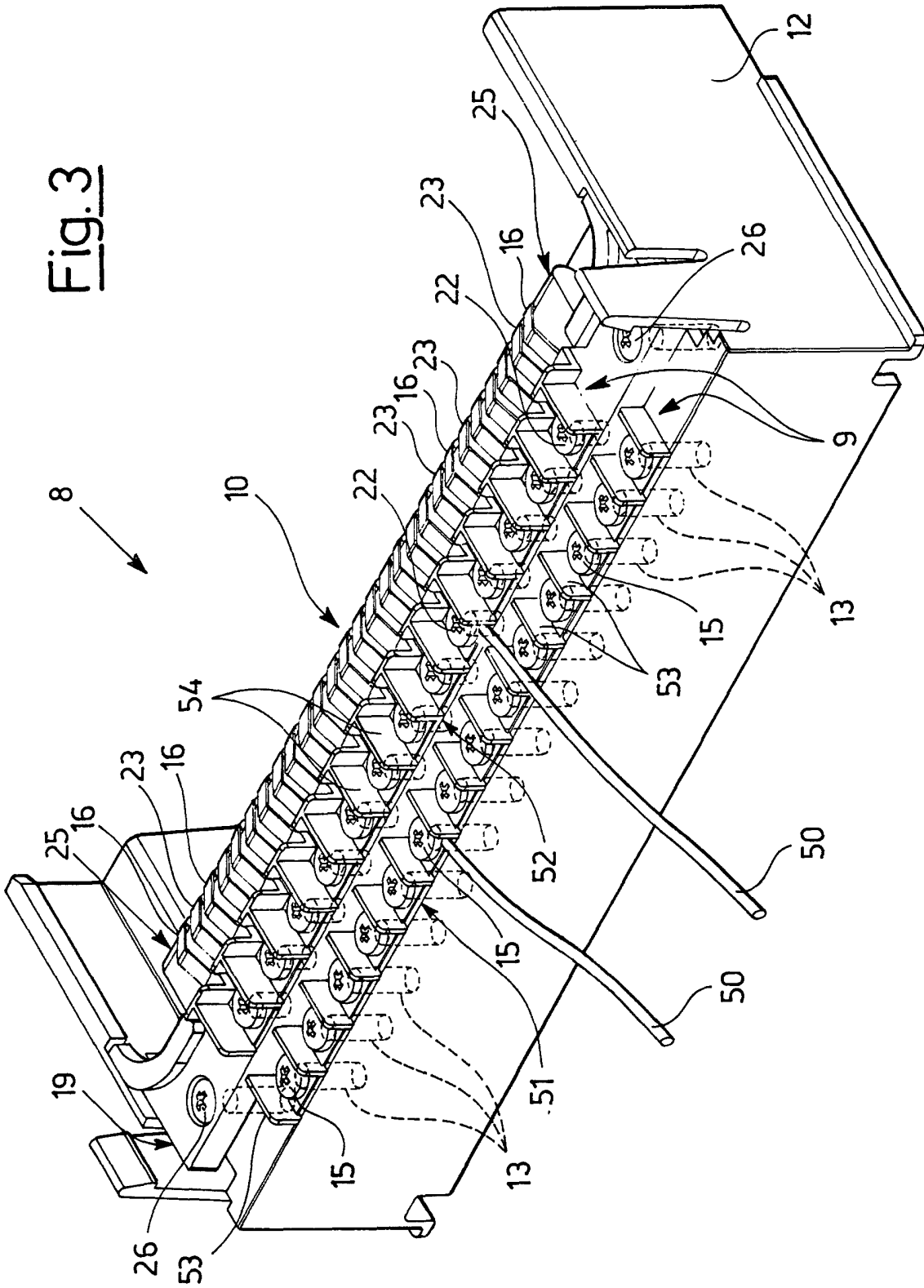
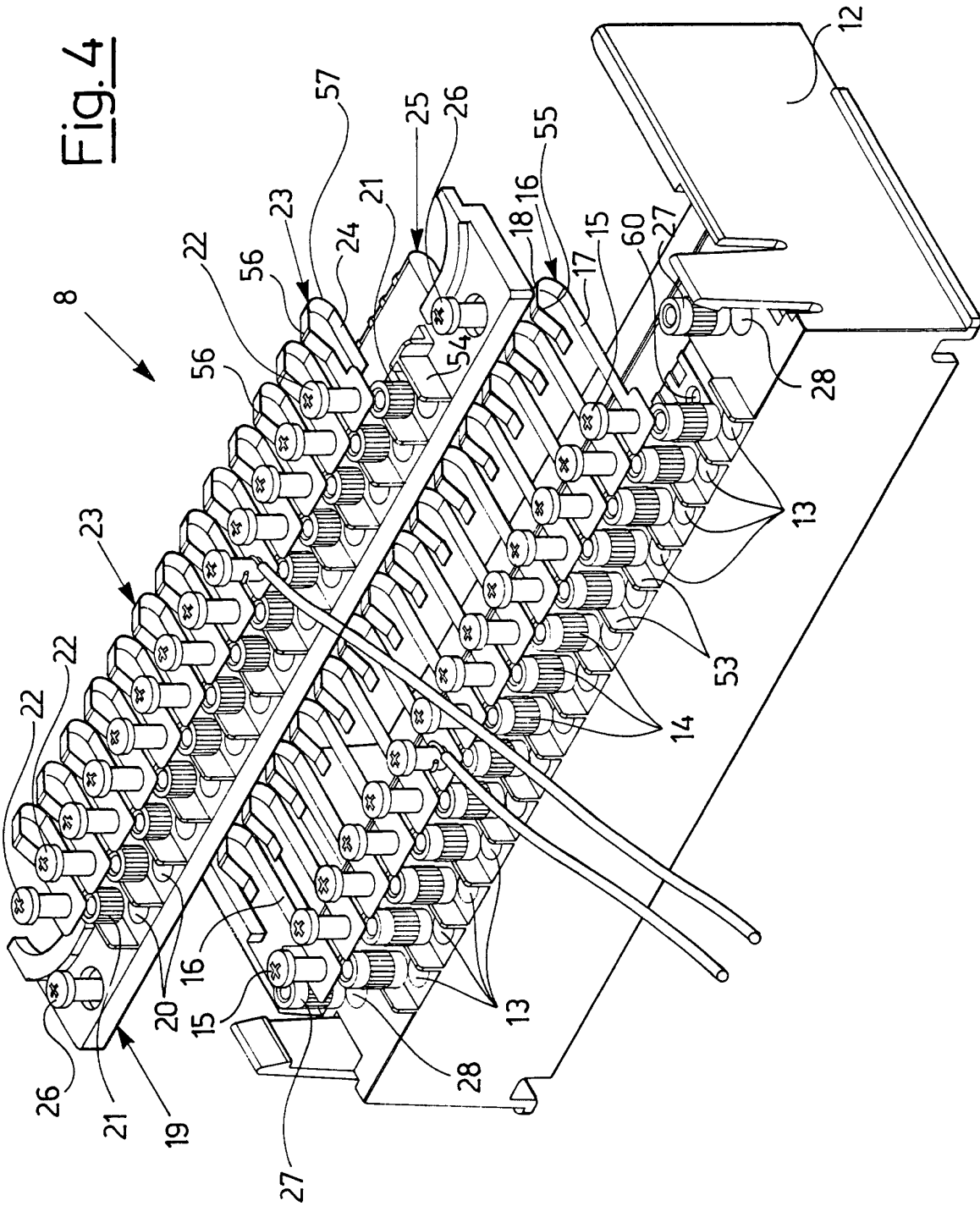


Fig. 3





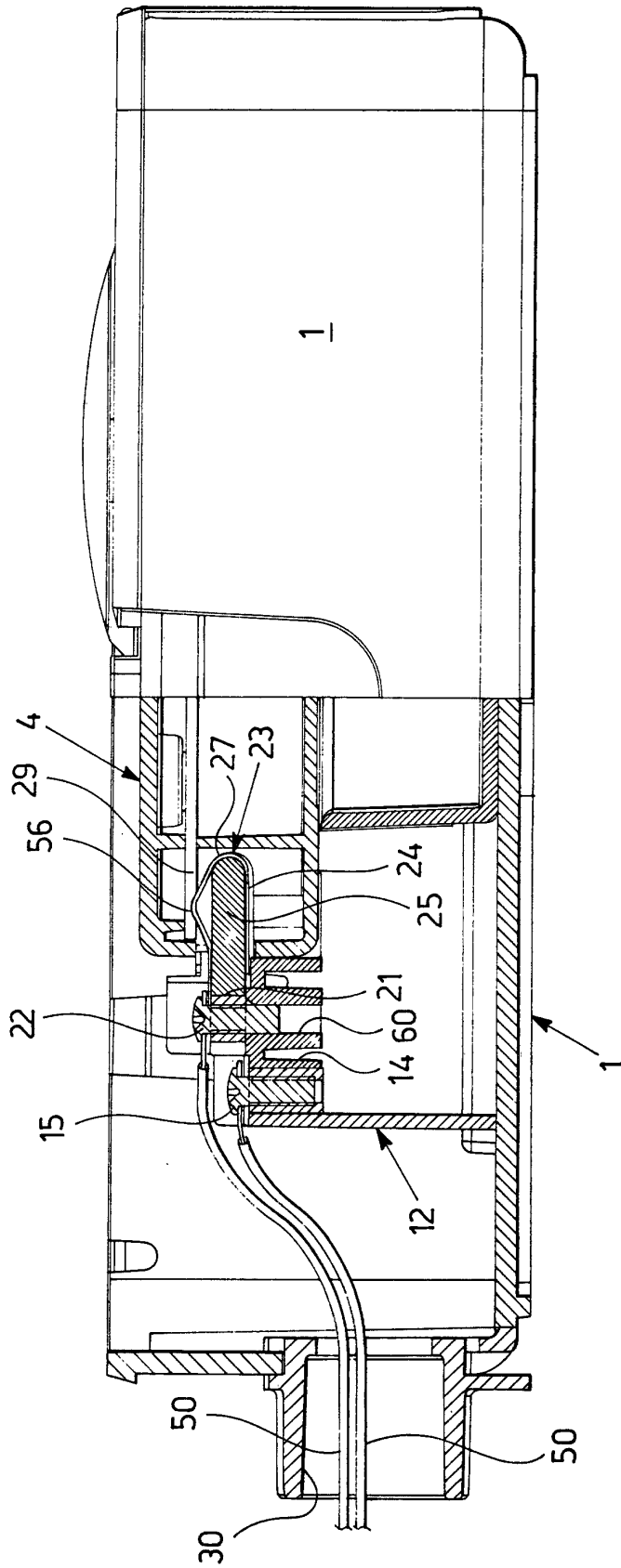


Fig. 5