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(54) Assembly for electrical connection, start on and protection of an electric moto-compressor sealed in hermetic metal shell

(57) An assembly for electrical connection, start up and protection from excessive current absorption and/or overheating of an electrical moto-compressor contained in a sealed metal shell (2) and connectable through electrical pins (5, 6, 7) protruding out of a dielectric pane or *fusite* (4) integrated in the metal wall of the shell (3), comprises a connection unit and a docking metal bracket (3) adapted to be pre-welded to the shell (2), a dielectric body (1) of plastic material of said connection unit having installed therein a plurality of electrical terminals (m1-m14) for the connection of electrical wires of a power cable and of electrical wires of connection of external or remotely installed electrical components of circuits of the appliance. The connection unit is completely pre-fabricated and comprises a motor start up device (PTC) and a device of protection (OLP) from excessive current absorption and/or overheating of the moto-compressor hosted in recesses of the dielectric body (1) of plastic material. A plurality of electrical connection metal lamine have terminations adapted to constitute an electrical terminal board (m1-m14), plug-on sockets (5f, 6f, 7f) for the connection pins of the *fusite* and (8f) for a ground connection pin (8) projecting from a surface of the metal bracket (3) parallel to said pins (5, 6, 7) upon docking the connection unit onto it. A dielectric shroud (19) of plastic material has first engagement means (18f) adapted to slidely engage with said body and second engagement means adapted to engage underneath raised and outwardly bent parallel edges (9-12) of the metal bracket for blocking the connection unit onto the docking bracket while allowing sliding displacements of the shroud (19). Guillotine-type cable stopper devices (15, 21) arc integrally formed and extend from the slideable shroud.

Optionally the slideable dielectric shroud (19) comprises a removable end cap (23) of molded plastic having engagement spikes (24) adapted to slide in and be retained in cooperating channels (24f) formed in the slidable shroud (19) as far as abutting against end surfaces thereof and further having an elastic inner hook (28) adapted to engage itself into a locking recess (14) of the metal bracket (3).

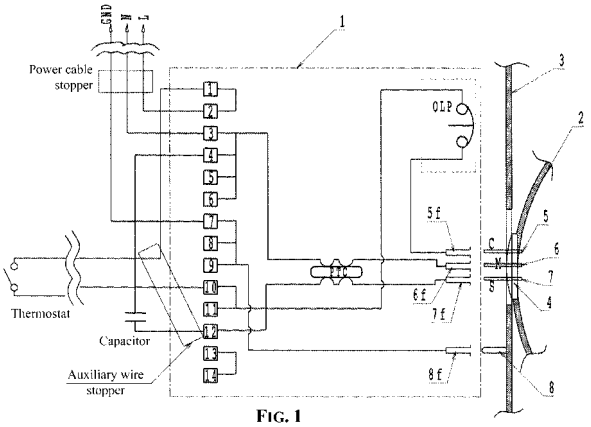

FIG. 1

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Description

[0001] The present disclosure relates in general to the wiring of electrical appliances and the powering of at least an electric motor of the appliance. In particular, this disclosure relates to pre-fabricated assemblies with functions: of wiring terminal block, motor starter and protection device from excessive current absorptions and overheating, for an electrical moto-compressor sealed in a hermetic shell.

[0002] Competitive commercialization of domestic and/or commercial appliances imposes maximum limitation of production costs also through optimization of assembly and finishing processes of parts and functional components of the electrical circuits of the appliance.

[0003] The presence of an electric moto-compressor sealed inside a hermetic metallic shell and electrically connected through electrical leads incorporated in a dielectric window pane fitted in the metal wall of the shell, commonly known with the tradename *"fusite"*, for starting up, controlling and protecting from electrical/thermal overloads the moto-compressor, has induced to fasten the terminals of the power cable of the appliance to be eventually plugged in a electrical distribution socket, to a terminal board conveniently mounted close to *the fusite* from where it is organized the electrical connection of essential control devices and even of devices of ancillary service installed in other locations of the appliance.

[0004] Moreover, the plug-on connectivity of the electrical leads protruding out of the dielectric pane of the so-called *fusite,* has promoted the use of electrical interconnection assemblies that could be installed in a metal box or bracket welded to the metal shell of the moto-compressor, incorporating female contacts (also shortly female contacts) or sockets suited to be slipped over the respective male electrical leads protruding out of *the fusite.*

[0005] The Italian patent No. 1267406 and 1268138, respectively disclose a typical terminal board and an integrated block of electrical interconnection wherein electrical start up components of motor and protection devices from overcurrents and/or overheatings of a moto-compressor, hermetically contained in a metal shell and electrically powerable through a *fusite*, are installed inside a metal box welded to the metal shell of the motocompressor.

[0006] The document EP-1111316-A1 discloses an electrical connection assembly for a moto-compressor particularly for a refrigerator, composed of a terminal board having a plurality of a terminals for connecting the wires of the power cable of the appliance and for connecting other functional devices of the appliance, which is installed on a metal plate welded to the hermetic metal shell of the moto-compressor, and socket means for establishing electrical contacts with the electrical leads protruding out of the *fusite.* The assembly accommodates the motor starter device and a protection device from overcurrents and/or overheating, electrically connected to the control circuit of the electric motor of the sealed moto-compressor.

[0007] Although the architecture of these known electrical connection assemblies provide for a significative improvement compared to the practice of mounting numerous distinct functional components and connecting them to dedicated terminals of a multiterminal board of adequate capacity for simplifying the assembly steps of the appliance, they retains a structure that is not completely pre-assemblable before mounting the assembly on a docking metal bracket eventually welded the outside of the metal shell of the moto-compressor, and/or they still require the execution of an appropriate connection of the ground terminal of the board to the metal body of the sustaining bracket or box and therefore also the hermetic metal shell of the moto-compressor to which the sustaining metal bracket or box is welded. Moreover, the mechanical fastening of the electrical cable and phase distribution wires is accomplished using distinct cable stoppers or require specific assembly operations.

[0008] Minimization of the number of assembly operations is of paramount importance for containing fabrication costs of appliances and also because they entail undesirable conditions of possible assembly errors in the fabrication process.

[0009] A wholly pre-assembled article of manufacture, implementing all necessary electrical connections, ready to be installed on a cooperating metal bracket or support suitably shaped, that can be pre-welded to the metal shell (in practice to one of the two semishells) of the motor-compressor, would be highly desirable also because it would permit such pre-assembled electrical connection articles, to be supplied already pre-tested by the supplier, to the manufacturer of the appliances. Ideally, such typically sub-applied component would be installable onto the moto-compressor as a unique piece without requiring the use of assembly hardware (for example screws) and implying only the need of connecting the conductors of the power cable to a terminal board of the unit and other connectors (eventually terminating with a so-called "Faston" socket) wires of connection of control devices and ancillary service devices of the appliance to respective "Faston" plugs on such a connector unit and the mechanical fastening of the insulated electrical conductors of the power cable and of the other connection wires.

[0010] These and other advantageous results are accomplished with the multifunctional unit of electrical connection, start up and protection from overcurrents and overheatings, for an electric moto-compressor in hermetic metallic shell and relative docking bracket of the present disclosure.

[0011] According to a first aspect of the architecture of the connection unit of this disclosure, the electrical continuity (short circuiting) between the hermetic metallic shell of the moto-compressor and a ground terminal of the terminal board to which the conductors of the power cable of the appliance are connected, does not require any dedicated assembly operation, being ensured, in full

respect of safety regulation, upon presenting in correct alignment and pushing the pre-assembled electrical connection unit to its definitive position on a rest surface of a metal bracket welded to the metal shell for establishing plug-on contacts to the electrical leads or pins protruding out of the *fusite* pane.

[0012] The ground connection to the metal bracket and to the shell to which the sealed moto-compressor is welded, is securely established before establishing a contacts with the leads (active leads) of electrical power supply of the moto-compressor, upon installing the unit of electrical connection and sequentially after it, should the electrical connection unit be lifted off for repair or substitution, as imposed by safety rules.

[0013] Preferably, the ground connection is established by a plug-on female semi-contact termination of an inner metal lamina of the connection unit having a second termination, for example a male Faston wingled termination over which a suitable female Faston contact termination, for example a Faston socket, of a relative ground wire of the power cable of the appliance, is eventually coupled and a metal pin contact that may be directly welded or in any case projecting parallel to the electrical leads of the *fusite,* from the surface of the metal bracket welded to the shell. The male metallic pin (semicontact or shortly contact) may be easily shielded by a plastic cap that is successively stripped-off, during surface cleaning and varnishing treatments of the metal shell and of the metal bracket welded to it. The height of the male ground semicontact or shortly contact (i.e. metal pin) is greater than the height of the powering and start up leads protecting out of the *fusite* pane, thus ensuring the required sequentiality of grounding of the metallic mass and contacting of the active phases of start up and control of the motor.

[0014] All the interconnection metal laminae as well as commonly pre-encapsulated start up and protection devices are accommodated and stably retained in dedicated seats, slots, undercut profiles or channels defined in a body of plastic material of the multifunction connector unit during its formation by injection molding.

[0015] A coordinated definition of geometries of the metal laminae and of their male contact and/or female contact appendixes for establishing the required circuital connections, form also an array of male semicontacts (or shortly contacts) for connecting suitably terminated insulated wires, respective female contacts or sockets for contacting in a plug-in fashion the leads of the fusite pane and of the ground connection male contact, and of connection of commonly "encapsulated" electrical start up and protection devices, installed in dedicated recesses formed in the molded plastic body, permits the mounting of all the above mentioned electrical components of the relative functional electrical circuits that are thus implemented in the pre-assembled connection unit by automated actuators, according to common automation practices, for minimizing fabrication costs of the wholly pre-assembled connection unit of this disclosure.

[0016] The connection unit includes a plastic shroud slidely engaged on guides purposely defined on the upper and lower sides of the body of plastic material to be eventually pushed to an end stop position in abutment against an end wall or flange of the body of plastic material. In doing so, purposely formed relieves on the outer surface of the upper side and of the lower side of the slidable shroud engage under one or more folded edge portions that are purposely formed along the two parallel upper and lower sides of the supporting metal bracket, thus ensuring stability of the preassembled connection unit once is installed over it, by preventing accidental extraction or detachment of the installed unit therefrom.

[0017] According to another important feature of the connection unit of the present disclosure, the slideable shroud defines or incorporates also two distinct cable stoppers. One is dedicated to hold fast the end of the power cable of the appliance and the other is dedicated to the fastening of connecting wires of remotely installed electrical components and devices of the appliance.

[0018] In practice, the slideable shroud once is pushed to its end stop position, completely covers otherwise exposed parts of the body of plastic material and of the elements installed therein, leaving accessible only the side of the body of plastic material at the opposite end of this side wall or flange against which the slidable shroud abuts and where are arranged the terminals or array of contacts (for example of male Faston contacts) that constitute an electrical terminal board for connecting all the insulated wire of connection to the mains and to components and electrical devices remotely installed in the appliance.

[0019] In the preferred embodiment contemplating an array of plug-in terminals (for example male Faston contacts) for connecting the insulated wires of the power cable of the appliance and of the other wires or cables for connecting control and ancillary service devices remotely installed in the appliance, closing the relative electrical circuits of start up and control of the moto-compressor, the terminals may have their longitudinal axis parallel to each other such to permit even an optional constitution and use of multipolar plug-on connectors of geometry suitably coordinated with the geometric distribution of the parallel terminals.

[0020] In case of plugging on singularly individual female contacts of termination of the electrical wires onto the respective male contacts of the connection board of the pre-assembled connection unit, all the connections may be shrouded by the slideable shroud itself of suitably designed length and geometry for a longer travel of sliding in engagement with the docking bracket, or alternatively, as in the exemplary embodiment illustrated in the figures, by a second shrouding element in the form of a plastic end cap adapted to be momentarily removed in order to facilitate connections of all wires and the blocking of the cables and insulated wires in the relative stoppers and finally re-engaged in position.

[0021] Yet another alternative would be to provide the

molded plastic slideable shroud with a liftable portion, either snap-on or hinged, for exposing the electrical terminal board on which connecting the cables and wires.

[0022] According to the exemplary embodiment illustrated in the figures, a plastic end cap of the slideable shrouding element has spines that are eventually inserted in receiving channels formed in the slideable shroud to be pushed to an end stop position with a rim of the end cap in abutment against an end rim of the slidable shroud. With this conclusive step of the assembly of the connection unit, engagement of an inner elastic hook of the end cap into a retention slot of the metal bracket takes place, for more securely covering all electrified accessible parts of the connection unit, like terminals and connectors of the electrical cables and wires, and the relative cable stoppers.

[0023] The preassembled connection unit of this disclosure satisfies all the stated objectives such as:

- singularity of the unit to be installed (absence of parts to be assembled and/or connected separately);
- no accessorial hardware needed for installing the unit;
- practical minimization of the number of mounting actions to be performed;
- fully pre-assembled unit to be plugged on and retained on a pre-welded metal bracket for simplifying and making more economic the management of component inventories by the manufacturer of the appliances.

[0024] The invention is defined in the annexed claims.

Figure 1 is an electrical mechanical diagram of a pre-fabricated unit of electrical connection, start-up and protection for moto-compressor sealed in a hermetic metal shell, according to the present disclosure.

Figure 2 is a rendering of the details of a metal bracket welded to the metal shell according to an embodiment of the pre-assembled connection unit of this disclosure.

Figure 3A is a rendering of only the body of plastic material housing the electrical components and related laminas and metal *contacts* of interconnection and of cable connection, installed on the metal bracket, freed of covering elements, according to an exemplary embodiment.

Figure 3B is a rendering of the body of plastic material showing the arrangement on a side face of the body of male contacts of Faston type on which plug-on female contacts terminations of electrical wires (electrical terminal board).

Figure 3C is a rendering of electrical components and related metal laminas and contacts shown in their spatial arrangement of installation in the body of plastic material according to an exemplary embodiment.

Figure 3D is a rendering of the connection unit mounted on the metal bracket with its slideable shroud integrating two distinct cable stoppers according to an exemplary embodiment.

[0025] The two series of renderings of **Figures 4-6** and **7-9** illustrate the geometry of the body of plastic material, of the cover elements and of the engagement details among the elements, according to an exemplary embodiment, as observed from opposite points of observation.

[0026] **Figure 10** is a rendering of an exploded view of the body of plastic material and of the docking metal bracket partially sectioned for showing the ground connection pin of the metal bracket and the locking details between the metal bracket and the electrical connection unit mounted thereon.

[0027] **Figure 11** is a rendering showing the pre-assembled connection unit as manufactured and eventually packed in transportation and storage containers.

[0028] Figure 1 is an electrical-mechanical diagram that is useful for identifying the relevant electrical components and their interconnection in the complete electrical circuit of the appliance and illustrating the plug-on contacting of electrical connection pins projecting out of *the fusite* pane for starting up and controlling the electrical motor of the hermetically sealed moto-compressor and for grounding the metallic shell 2.

[0029] The rectangular perimeter drawn with a dot line identifies the paths of the functional electrical circuit of the appliance that are integrated within the body of plastic material 1 of the electrical connection unit of this disclosure, incorporating also pre-encapsulated start-up and protection devices of the moto-compressor.

[0030] The two pre-encapsulated components OLP and PTC, accommodated within the connection unit, are clearly observable in the diagram and the way they connect respectively to the functional start-up and control circuit of the motor.

[0031] The diagram of Figure 1 further illustrates an array of plug-on terminals (as a preferred embodiment of electrical terminal board) shown in the form of an array of male Faston contacts, which for the exemplary application considered, comprises fourteen distinct connection terminals for as many conductors of electrical cables and wires. Of course the number may be smaller or larger depending on the specific application (appliance).

[0032] In the considered exemplary application, there is a number of electrical wiring connection terminals in excess of those effectively utilized such to make readily available electrical power phases for possible optional add-on accessory services of the appliance (internal lighting, electronic controller, signalling lights and alike), that may be located far from the connection unit mounted at the exterior of the moto-compressor.

[0033] The exemplary diagram of Figure 1 is typical of

a domestic refrigerator.

[0034] In the considered application, the start-up circuit of the electric motor of the moto-compressor comprises a pre-encapsulated positive coefficient termistor (PTC), electrically connected in parallel to a capacitor C that may be mounted externally of the connection unit and, as will be described later, preferably hanging it to a dedicated outer hook purposely formed on the exterior surface of the end wall of the body of plastic material opposite to the end side at which the electrical wiring terminal board is organized.

[0035] From the diagram may be observed the connection of the three conductors of a power cable of connection to the mains, of the wires that distribute the electrical means phases and of the ground connection to electrical devices remotely installed in the appliance, and the electrical path of the active phase L through a control thermostat T of the temperature inside the refrigerated space of the device and through a protection device OLP from abnormal over absorption of current and/or from overheating, both commonly pre-encapsulated and fitted into the pre-assembled connection unit, and to the connection pin 5 of the *fusite* 4.

[0036] All the electrical connections within the broken line perimeter are established by metal lamine installed and retained in channels, slots, of suitable shape or cross action profile purposely defined and formed in the molded plastic body 1 upon molding it. The metal lamina, eventually provided with male winglet terminations and/or of flexible sockets and/or female terminations for the contemplated plug-in electrical connections, realize the inner electrical circuit path in the pre-fabricated connection unit, as exemplarily shown in Figure 1.

[0037] Figure 2 shows an embodiment of the metallic bracket 3 that is welded to the shell 2 of the hermetically sealed moto-compressor of the appliance, for sustaining the connection unit.

[0038] The metal bracket 3 has a docking surface of the connection unit to be installed thereon that may be substantially planar, having an opening through which the outermost part of the *fusite* 4 and the relative electrical connections 5, 6 and 7 for connecting the sealed moto-compressor to the external world that project out along parallel axis orthogonal to a rest planar surface of the bracket.

[0039] In the illustrated exemplary embodiment, the bracket 3 has the upper and the lower parallel edges bent at 90°, both having winglets 9-10 and 11-12 outwardly oriented. These output winglets may be single or even more than two per each side and their blocking function (as will be described later in the description) could even be satisfied by alternative different geometrical features, such as for example guides, channels, holes or slots that may be stably engaged by cooperating guides, ridges, channels or pins formed in a plastic rider shroud element the molded plastic body 1 of the pre-fabricated connection unit of this disclosure, as will be described in ensuring description.

[0040] In the illustrated embodiment, a metal pin or male contact 8 protrudes from the rest surface of the bracket 3, and from one end side of the rest surface of the bracket 3 a wing extends firstly downwards below the level of the rest surface and successively raises back above the rest surface and terminates with a hole 14.

[0041] Figure 3A shows the molded plastic body 1 without any covering element in order to make visible its structure, as installed on the docking metal bracket 3.

[0042] The three pins 5, 6 and 7 (re: Figure 2) for the electrical connection of the electrical motor of the sealed moto-compressor, and the ground connection pin 8, plug into respective female sockets or contacts (not visible in Figure 3A) upon installing the pre-fabricated connection unit on the docking metal bracket 3 (as will be described with reference to other illustrations contained in successive figures).

[0043] Having omitted any covering element in Figure 3A, makes possible to observe the location of the positive coefficient termistor PTC or really the exterior of the cavity purposely provided in the molded plastic body 1 that contains it.

[0044] It is also observable the pre-encapsulated protection device OLP (for example a so-called 3/4" device) also accommodated within the body of plastic material 1 in a position such that a heat sensing surface of the device be in contact with or immediately close to the planar rest surface of the metal bracket 3 near the *fusite*, in order to track the thermal excursion during operation of the appliance and eventually determine the interruption of the electrical powering of the motor of the moto-compressor upon exceeding a limit threshold value of temperature, whether caused by an abnormally high current absorption exceeding the relative threshold of intervention of the device, or by any other cause. Protection from over absorption of current and/or overheating may be implemented even with specific protection devices of different type from the one mentioned above, for example specific electronic devices, suitably encapsulated, that may be similarly pre-installable and connectable within the pre-fabricated connection unit of this disclosure even not necessarily placed in contact or in proximity of the planar rest surface of the metal bracket, according common alternative practices well known to the skilled technician.

[0045] Figure 3A allows also to observe the electrical connection to the circuit of the appliance of the protection device OLP through the relative metal lamine 16 and 17. In particular, the lamina 16 establishes the connection of one of the two terminals of the OLP device to the female socket 5f that is in contact with a pin 5 of the *fusite* (re: Figure 1), while the lamina 17 establishes the electrical connection of the second terminal of the protection device OLP to the Faston winglet m9 of the "terminal board" to which the return wire from a remotely installed thermostat T of the appliance (re: Figure 1) will be connected upon completing the installation of the electrical connection unit of this disclosure.

[0046] A positive coefficient thermistor device PTC, as

it is commonly employed in the start up circuit of typical motocompressor of refrigerators, has its terminal contacted by the same metal lamine of interconnection of the female sockets 6f and 7f in contact with the respective pins 6 and 7 of the *fusite*, corresponding to start-up terminal of the starter winding of the sealed moto-compressor. These lamine are not entirely visible in the view of Figure 3A of the unit but are partially observable their respective winglet m2 and m10 of connection to external wires (re: Figure 1).

[0047] Figure 3 B is useful view for identifying and observing also the spatial arrangement of the Faston winglets m1-m14 of the terminal board of the electrical diagram of Figure 1, all extending along parallel axis from the same end surface of the molded plastic body 1 of the unit.

[0048] This arrangement of male Faston contacts for the connection of the three conductors of the power cable as well as of the electrical wires of power distribution and closing of the start-up and control circuits of the motocompressor, permits even a possibly modified embodiment of the connection unit that may contemplate the use of one or more multipolar connectors having a plurality of female contacts, co-coordinately disposed such to permit the connection of external wires and cables thus terminated, by a multipolar connector by simply plug-in on one or more or such multipolar connectors on the respective male contacts protruding from one terminal surface on the pre-fabricated connection unit.

[0049] Figure 3C shows the electrical devices PTC and OLP, the related electrical interconnection lamine, the contacts m1-m14 of the electrical terminal board and the socket terminations 5f, 6f and 7f for contacting the pins of the *fusite* and of the other socket termination 8f for connecting to the ground pin, in their spatial arrangement of assembly in or on the molded plastic body 1, that is suitably shaped for accommodating and holding fast them.

[0050] Figure 3D shows the body of plastic material 1 with its external shroud 19 incorporating also two distinct cable stoppers 21 and 15 (shown without the respective guillotine) in the state in which the completely pre-fabricated connection unit may be presented and stably engaged on the supporting metal bracket 3 before connecting all the electrical wires to the respective Faston male contacts by the workman carrying out the final assembly and wiring of the appliance (e.g. a refrigerator).

[0051] The two series of renderings of Figures 4-6 and 7-9, show, from respectively opposite points of observation, the engagement among the guide 18 of the body of plastic material 1, of the slidable shroud (also definable as rider or slider) 19 and, upon having completed the connection of the external wires, how the momentarily removed terminal cap 23 is the re-applied.

[0052] In the first series of figures, is clearly observable also the bracket or hook 25 that may be optionally defined on the outer surface of the end wall 26 of the molded plastic body 1, to hold fast an eventual capacitor to be connect in the start up circuit of the moto-compressor in case it is contemplated by the specific electrical device of the moto-compressor (re: the exemplary electrical scheme of Figure 1). In such a case, a capacitor of appropriate size with a suspension appendix and provided with insulated connecting wires suitably terminated for connecting to dedicated terminals of the connection unit, would be stably hanged on the provided outer bracket 25.

[0053] According to the embodiment shown in the figures, the covering shroud 19 has channels 18f that engage in a slidable manner purposely formed guides 18 defined over the outer surfaces of the upper and lower sides of the body of plastic material 1, while a lower relief or ridge that defines the channel of engagement on the guide 18, slides sequentially underneath the two outwardly oriented winglets of the edge bent at 90° of the metal bracket 3, respectively 11 and 12 in the views of Figures 4 and 5, and respectively 9 and 10 in the views of Figures 7 and 8, thus stably fixing the pre-fabricated connection unit to the docking metal bracket 3 welded to the shell 2 of the moto-compressor.

[0054] The plastic rider 19 has an appendix or channel shaped guide 21s parallel to and facing toward a second tubular appendix 21b having a longitudinal cut 21a, into which a guillotine 21g (re: Figure 9) will be eventually introduced to be then forced onto the outer insulation of electrical wires and/or electrical multiconductor cables of connection of external or remotely installed electrical devices of the appliance introduced in the cable stopper indicated as a whole with 21.

[0055] A second cable stopper 15, also integral to the sliding shroud 19 for the power cable of the appliance may be realized by forming as in the former example, a second appendix in which are defined two parallel channel-like guides facing each other 15a and 15b (re.: Figure 7), between which will be eventually introduced a bridge-shaped guillotine 15g (re.: Figure 11) having flexible side arms terminating with hooks or undercut portions suitable to engage into co-operating retaining cavities (not visible in the figures but easily figured out by the skilled technician) formed in the channel like guides 15a and 15b and that are reached by forcing the elastic bridge-shaped guillotine to squeeze over, the outer insulating sleeve of a power cable introduced between the two parallel guides. The three insulated wires of the power cable, terminating with female Faston contacts will then be connected onto respective male Faston contacts m1, m2 and m3 of the terminal board organized in the body of plastic material 1 of the unit.

[0056] Both guillotines 21g and 15g may be commonly formed at the free end of thin flexible plastic bands of connection to the main body of the sliding shroud 19 upon molding the parts by injecting plastic material in the mould, thus forming the two guillotines as appendixes connected to the main body of the sliding shroud 19 from which they will be separated by cutting the connecting bands at the moment of being introduced in the receiving guides of the two cable stoppers integrally formed with

the sliding shroud 19.

[0057] In the shown embodiment, the blocking of the guillotine 21g of the first cable stopper over the electrical wires and/or multiconductor cables of connection of external or remote electrical devices of the appliance may be ensured by introducing a common self-threading screw 21v through a hole in the tubular base 21b of the guillotine slidely introduced inside the tubular appendix 21i ,and screwing it in a star hole defined through an inner boss (21a) visible in the cut open portion of Figure 3D).

[0058] The sliding shroud 19 is provided with guides 24f for receiving respective parallel hooking stems 24 of the molded plastic end cap 23.

[0059] As may be observed in Figure 7, two indentations 27 spaced from one other present along one or both guides 18 present on the opposite lower and upper sides of the body of plastic material 1, set two positions from and to which the sliding shroud 19 may be shifted by exercising a slight though deliberate displacing force. In fact, in the so provided indentation, cooperating point-form relieves will eventually fall upon displacing the sliding shroud 19, by virtue of its elastic memory, "confirming" the displacement of the sliding rider 19 over the body of plastic material 1 to one or the other of the two positions. The pre-fabricated connection unit may be supplied with the sliding covering shroud 19 in the slightly backed-off position such that the assembler may simply plug the object on the connection pins 5, 6 and 7 of *the fusite* and on the ground pin 8, by correctly presenting and pushing the unit against the docking surface of the metal bracket 3, after which the assembler will simply force the sliding shroud cover 19 to slide toward and reach its end run position against the end wall 26 of the main body 1, thus engaging itself underneath the outwardly extending winglets 9-10 and 11-12 of the metal bracket 13 (re: Figure 2), and finally reaching its stop position, confirmed by the "falling" of the point-form relieves in the respective indentations.

[0060] Figures 7-9 are renderings from different point of observation of the connection unit installed on the docking bracket with the covering element namely the plastic shroud 19 and the removable molded plastic end cap 23, either set in position or shifted/exploded, in order to better illustrate geometrical and functional features of the different elements of the connection unit.

[0061] Figure 10 is a rendering of the view that would be hypothetically observed from underneath the docking metal bracket 3 with parts of the unit assembly such as the metal bracket, the sliding shroud and the associated end cap, partially cut out in order to illustrate the manner in which the connection unit is presented in alignment with the electrical connection pins 5, 6, 7 and 8 when installing it over the docking bracket 3.

[0062] This Figure permits also to observe the inner appendix in form of a flexible hook 28, integrally defined in the molded plastic end cap 23 when the removable end cap 23 is finally re-applied at the end of the other covering element represented by the sliding plastic shroud 19, after having completed the connection of the external electrical wires and crimped the insulated wires and cables in the respective cable stoppers integrally formed with the molded plastic shroud 19, the inner hook 28, from a slightly flexed position caused by interference with the end portion of the bent elongated wing 13 of the metal bracket 3 terminating with the slotted hole 14, eventually falls into the slot 14 by virtue of its elastic memory, thereafter impeding involuntary removal of the electrically insulating end cap of molded plastic 23 that covers the connected terminations of the electrical wires.

[0063] Removal of the end cap 23 will be possible only by forcibly releasing the locking hook 28 out of engagement into the slot 14 of the metal bracket, using a special tool while simultaneously pulling the end cap out of the guides in the sliding shroud 19.

[0064] Figure 11 is a rendering showing the pre-assembled connection unit, containing all the above described components and electrical devices, as manufactured and eventually packed in suitable transportation/storage boxes. From this figure, it may also be observed the first guillotine 21g for blocking the power cable, a tubular base of which 21b is introduced inside the receiving tubular appendix 21i, and its upper cross-shaped profile edge that slidely engages in the channel like shaped guide 21s, as well as the head 21v of a self-threading screw that may be finally tightened to push and retain in place the cable stopping guillotine, passing through the tubular base 21b and screwing in a star shaped hole that is formed in the inner boss 21n, observable in the cut-out portion of Figure 3D of the tubular appendix 21i.

[0065] In practice, the electrical wiring assembler needs to simply pull off momentarily the end cap 23 from the sliding shroud 19, install the connection unit on the docking bracket 3 and block it in place by pushing the plastic shroud (rider) 19 to its end-travel position engaging it under the outwardly oriented winglets present along the upper and lower bent edges of the metal bracket. Thereafter, he will connect all the suitably terminated electrical wires and power cable multiconductors to the respective terminals (Faston contacts) and finally block the power cable and the other electrical wires in their respective cable stoppers inserting the guillotines 21g and 15g in the respective stoppers 21 and 15 formed integrally to the sliding shroud 19, before replacing the end cap 23, causing its locking because of the engagement of its inner flexible hook 28 into the slotted hole 14 at the end of the wing extension of the metal bracket.

[0066] The geometry of the molded plastic body 1 and of the two covering elements 19 and 23 is such to permit their fabrication by injection molding in purposely made molds using a thermoplastic resin of adequate mechanical and dielectric characteristics as commercially available, such for example a polyamide or a polybutylterephthalate.

Claims

1. An assembly for electrical connection, start up and protection from excessive current absorption and/or overheating of an electrical moto-compressor contained in a sealed metal shell (2) and connectable through electrical pins (5, 6, 7) protruding out of a dielectric pane or *fusite* (4) integrated in the metal wall of the shell (2), comprising a connection unit and a docking metal bracket (3) adapted to be welded to the shell (2), a dielectric body (1) of plastic material of said connection unit having installed therein a plurality of electrical terminals (m1-m14) for the connection of electrical wires of a power cable and of electrical wires of connection of external or remotely installed electrical components of circuits of said appliance, **characterized in that** said connection unit is completely pre-fabricated and comprises:

   at least a motor start up device (PTC) and a device of protection (OLP) from excessive current absorption and/or overheating of said moto-compressor hosted in recesses of said dielectric body (1) of plastic material;
   a plurality of electrical connection metal lamine with terminations adapted to constitute said plurality of electrical terminals (m1-m14) and plug-on sockets (5f, 6f, 7f, 8f) adapted to plug-on respective connection pins of said *fusite* and on a ground connection pin (8) projecting from a docking surface of the metal bracket (3) parallel to said pins (5, 6, 7) upon docking the connection unit onto the metal bracket;
   the spatial disposition of said plug-on sockets and of said pins being such to ensure establishment of said ground connection (8f-8) before establishment of electrical connection with said pins of said *fusite*;
   at least a dielectric shroud (19) of plastic material having first engagement means (18f) adapted to slidely engage with said body and second engagement means (adapted to engage underneath raised and outwardly bent parallel edges (9-12) of said metal bracket (3) for blocking the connection unit onto the docking bracket while allowing sliding displacements of said shroud (19);
   at least two guillotine cable stopper devices (15, 21) integrally formed and extending from said slideable shroud (19).

2. The assembly of claim 1, wherein said ground connection pin (8) protruding from the docking surface of said metal bracket (3) is in the form of a male contact metal pin connected to the metal bracket, provided as manufactured with a strippable plastic sleeve for shielding the electrical contactable pin surface during anticorrosion and varnishing treatments of the metal shell and metal bracket welded thereto, strippable at the moment of installing the connection unit.

3. The assembly of claim 1, further comprising a removable dielectric end cap (23) of molded plastic having engagement spikes (24) adapted to slide in and be retained in cooperating channels (24f) formed in said slidable shroud (19) as far as abuting against end surfaces of the shroud.

4. The assembly of claim 3, wherein said end cap (23) has an inner elastic hook (28) adapted to engage itself into a locking recess (14) of said metal bracket (3).

5. The assembly of claim 1, wherein said locking recess is in the form of a slotted hole (14) formed at the end of an elongated metal tail (13) extending from the side of the docking area of the connection unit on the bracket (3) underneath said plurality of electrical terminals (m1-m14) in the body (1) of plastic material and of said cable stopper extensions (15, 21) of said slidable shroud (19), firstly below the level of the plane of rest of the body of plastic material on the bracket and thereafter raising above said level for ending with said slotted hole (14) into which said elastic hook (28) is eventually forced to snap into it.

6. The assembly of claim 1, wherein said body (1) of plastic material has on its outer surface of the side opposite to the side of locking engagement a bracket or hook (25) for hanging thereon an external capacitor, the terminals of which connect through insulated electrical wires to respective terminals or male contacts of said first plurality.

7. The assembly of claim 1, wherein the terminals (m1-m14) of said first plurality are all male Faston contacts of parallel longitudinal axis.

8. The assembly of claim 7, wherein the wires of said power cable have female Faston contact terminations adapted to plug-on respective male Faston contacts (m1-m14) of said first plurality.

9. The assembly of claim 3 wherein said body (1) of plastic material, said slidable shroud (19) and said end cap (23) are all of a thermoplastic material formed by injection molding.

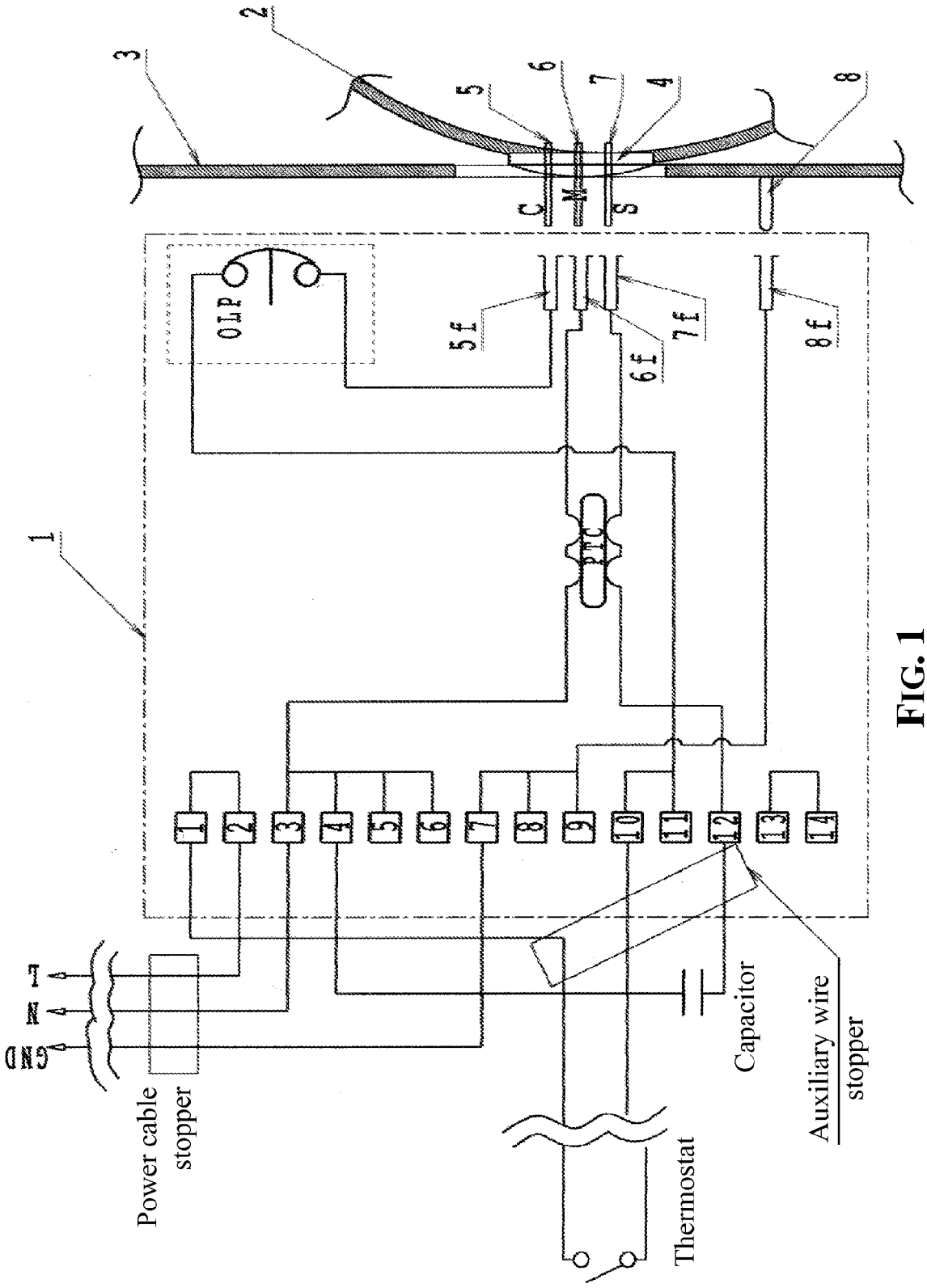
2
3
5
6
7
4
8
C
M
S
OLP
5f
6f
7f
8f
PTC
1
1
2
3
4
5
6
7
8
9
10
11
12
13
14
L
N
GND
Power cable stopper
Thermostat
Capacitor
Auxiliary wire stopper

FIG. 1

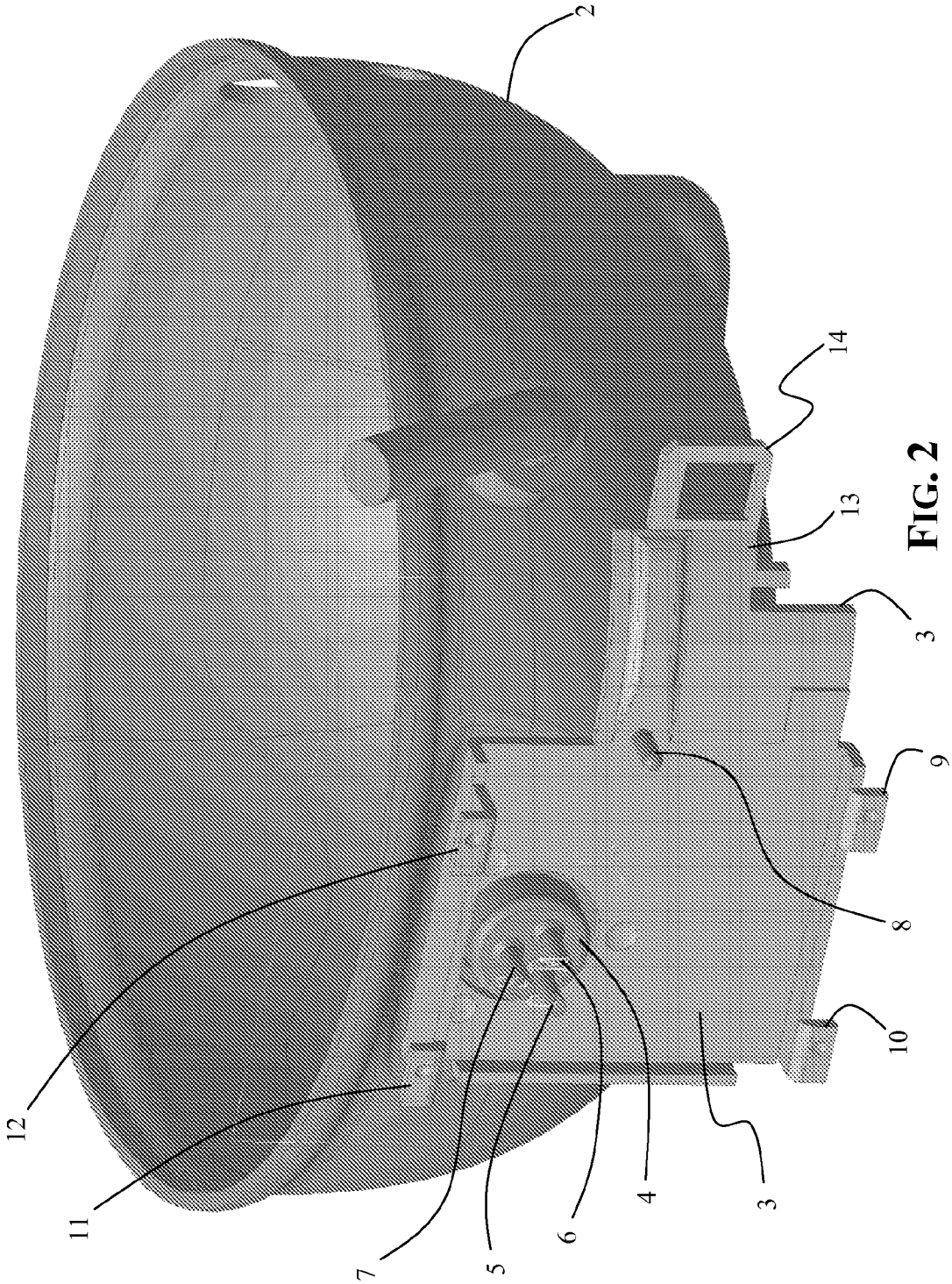

FIG. 2

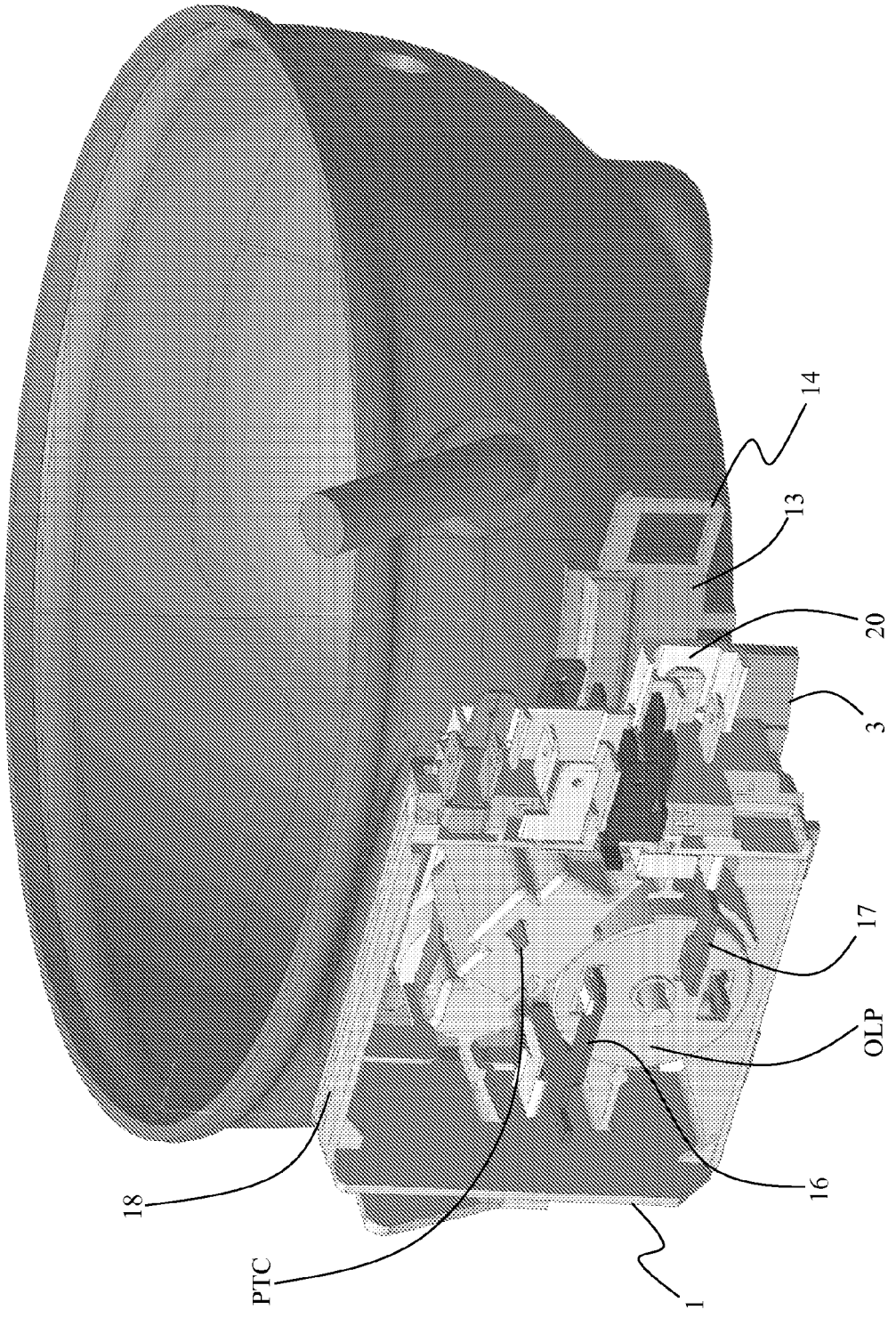

FIG. 3A

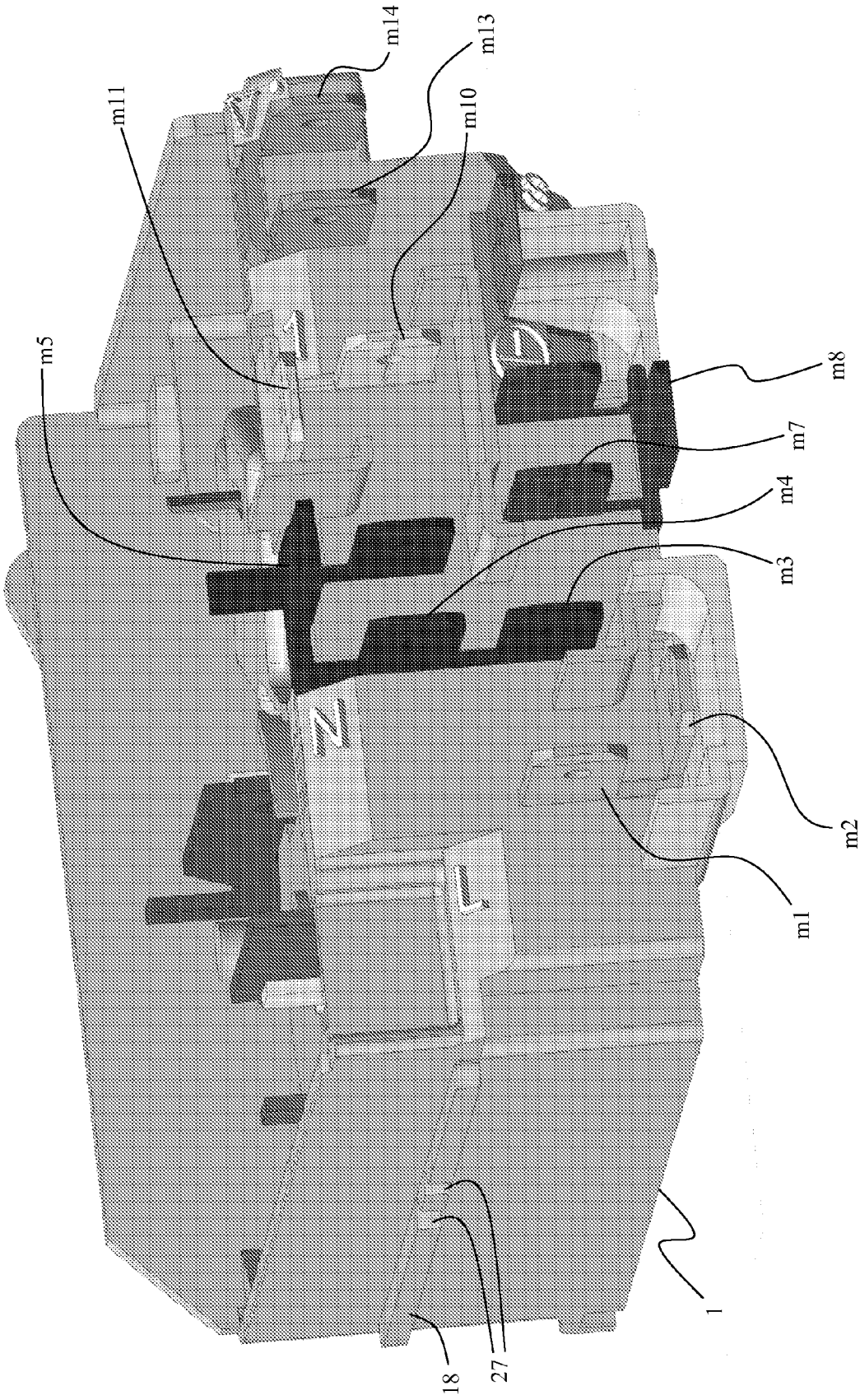

FIG. 3B

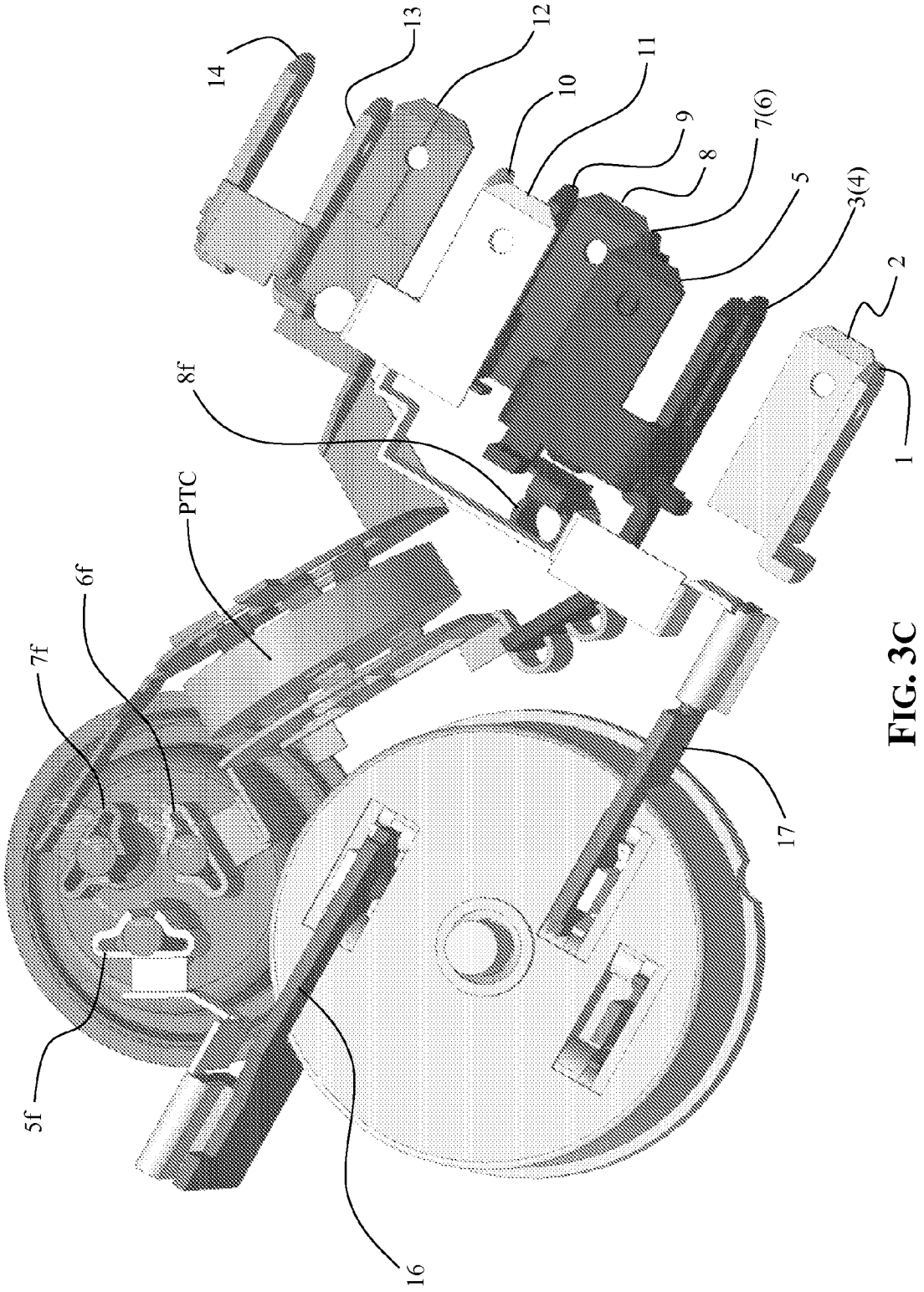

FIG. 3C

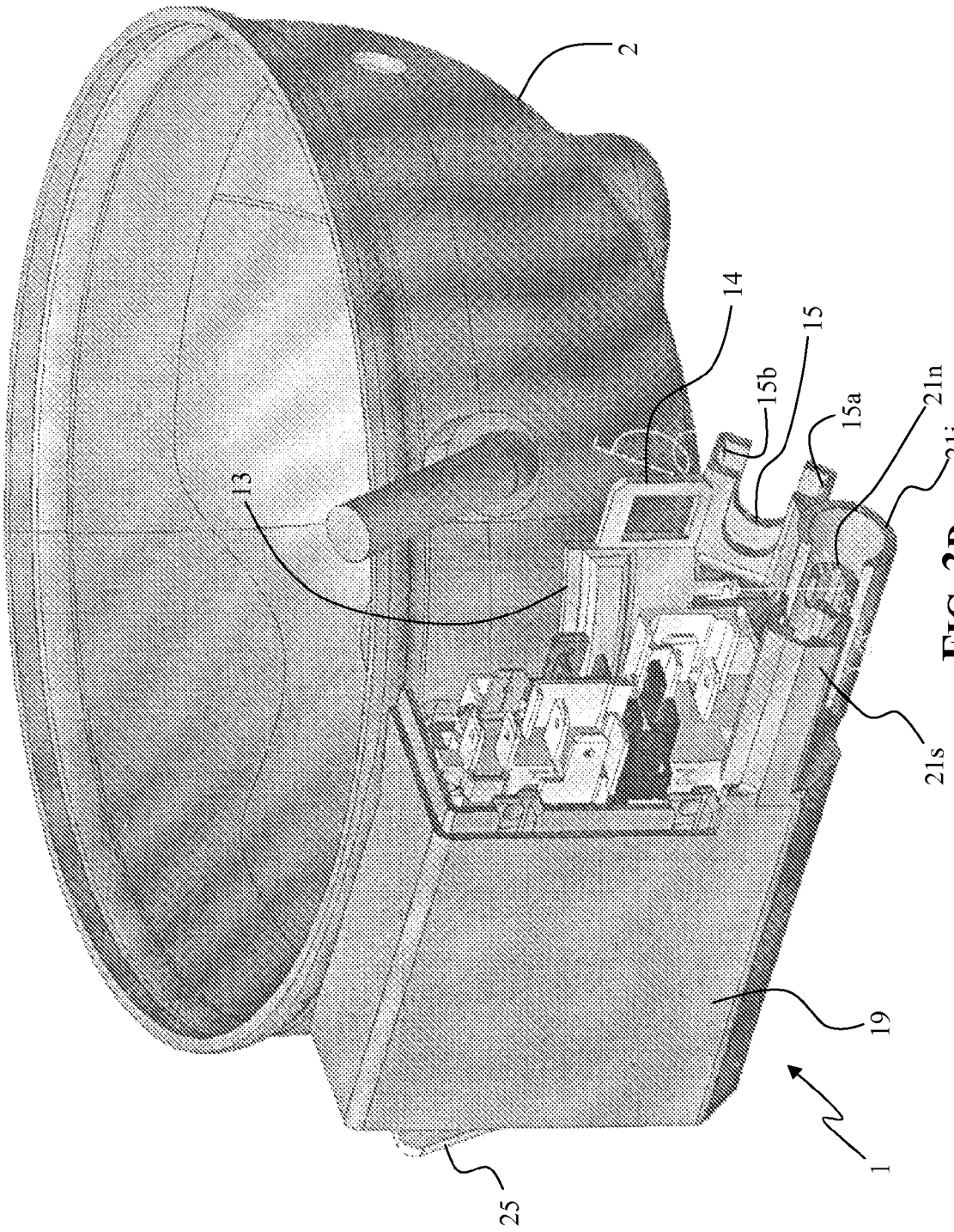

FIG. 3D

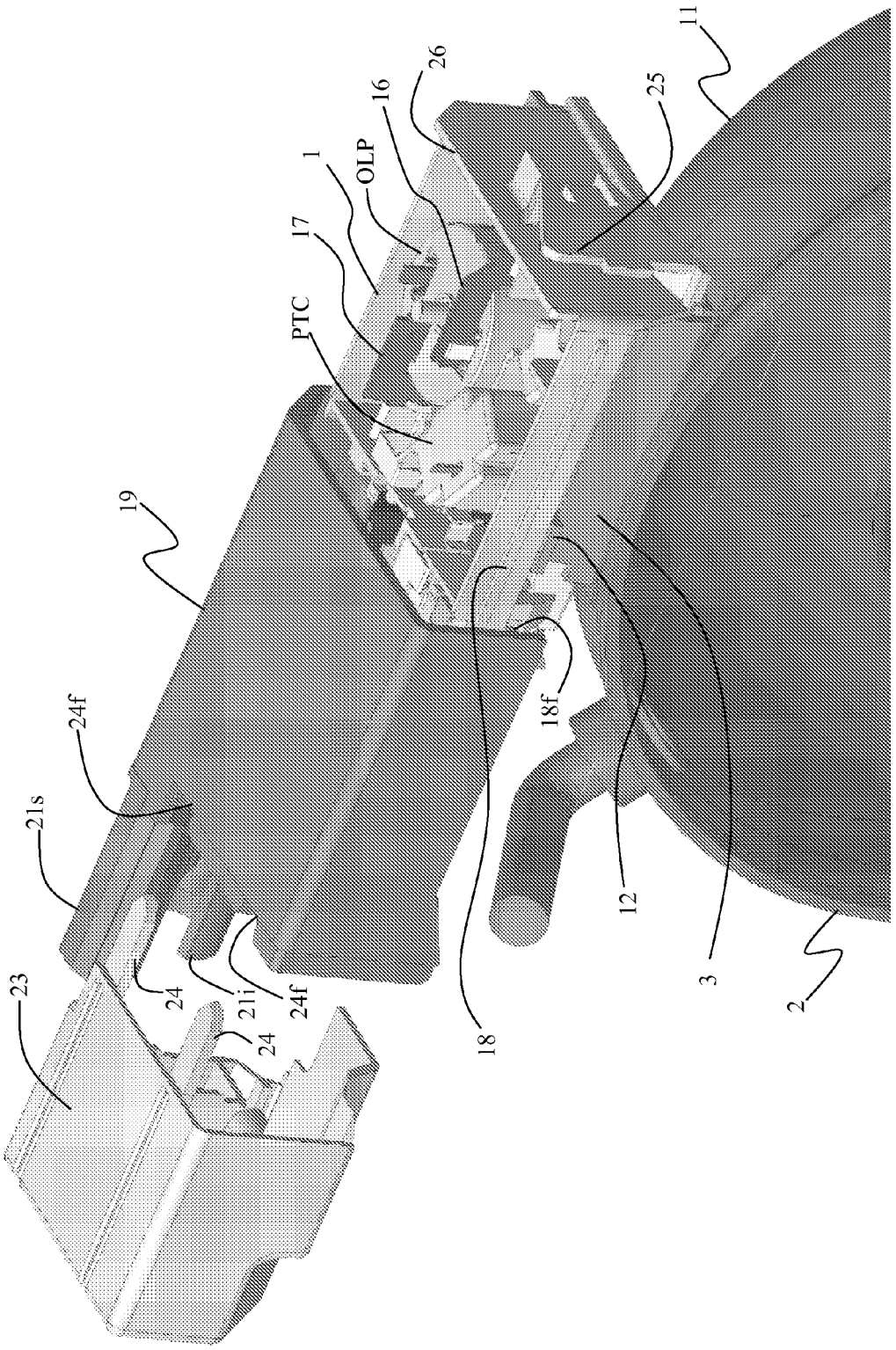

FIG. 4

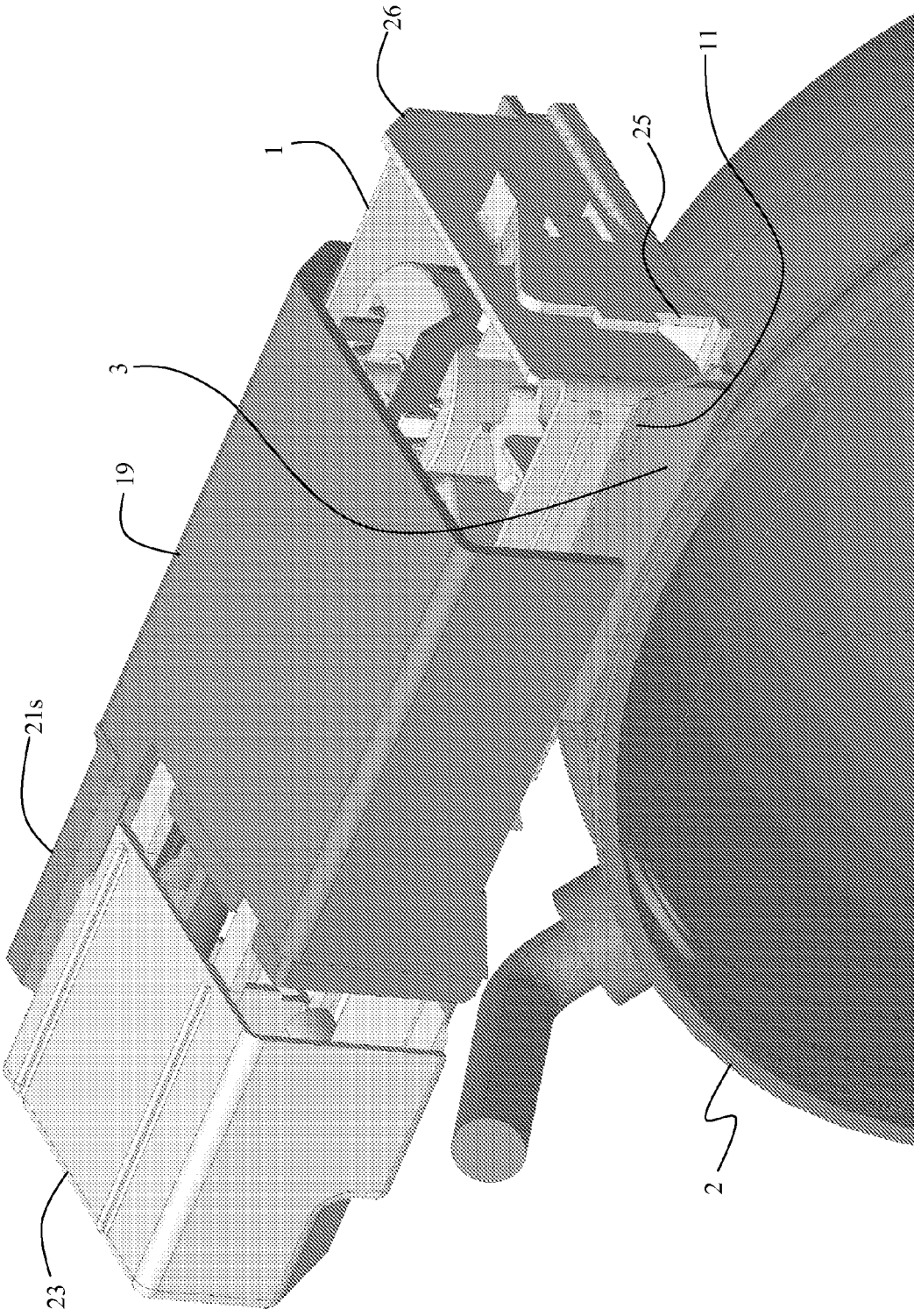

FIG. 5

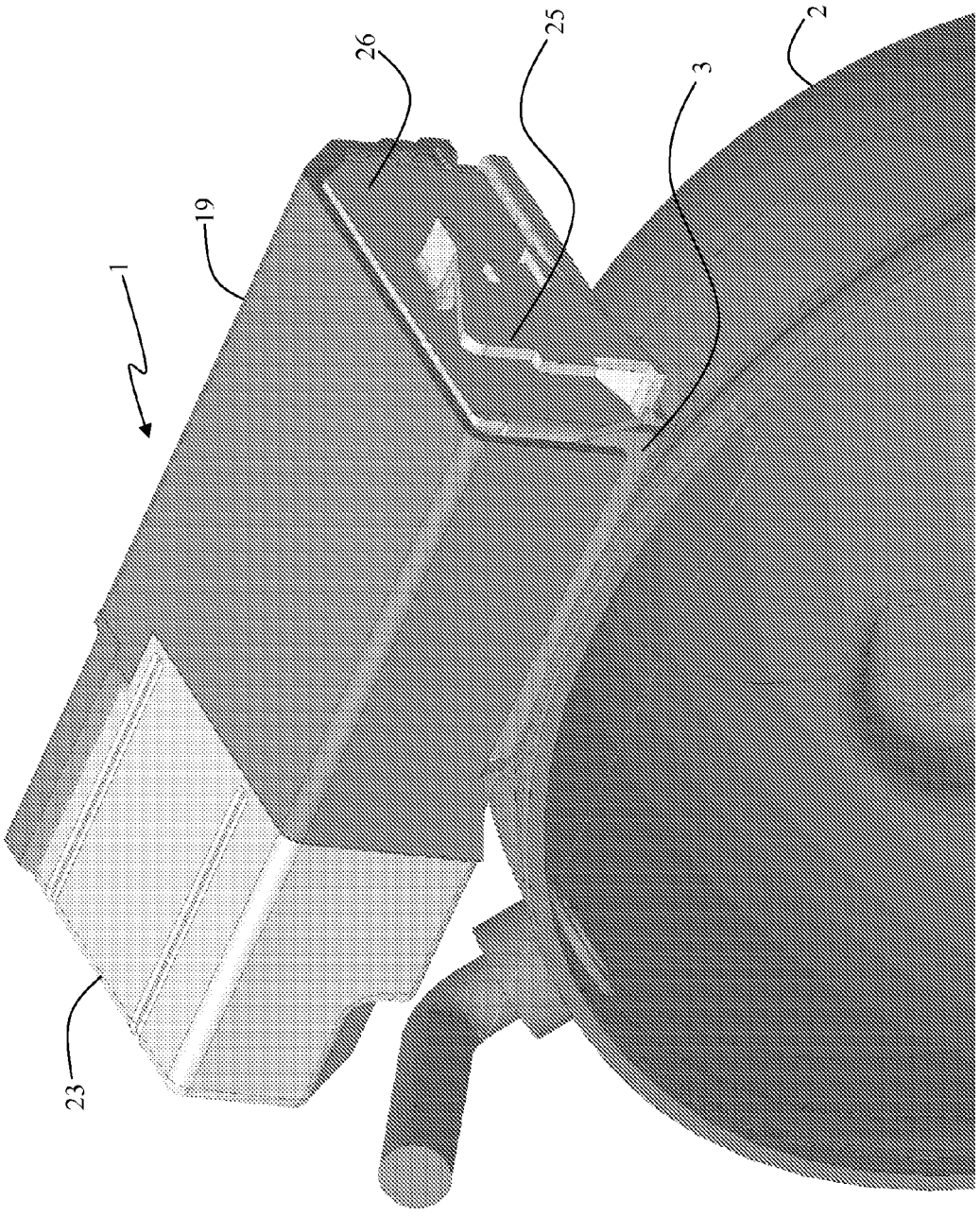

FIG. 6

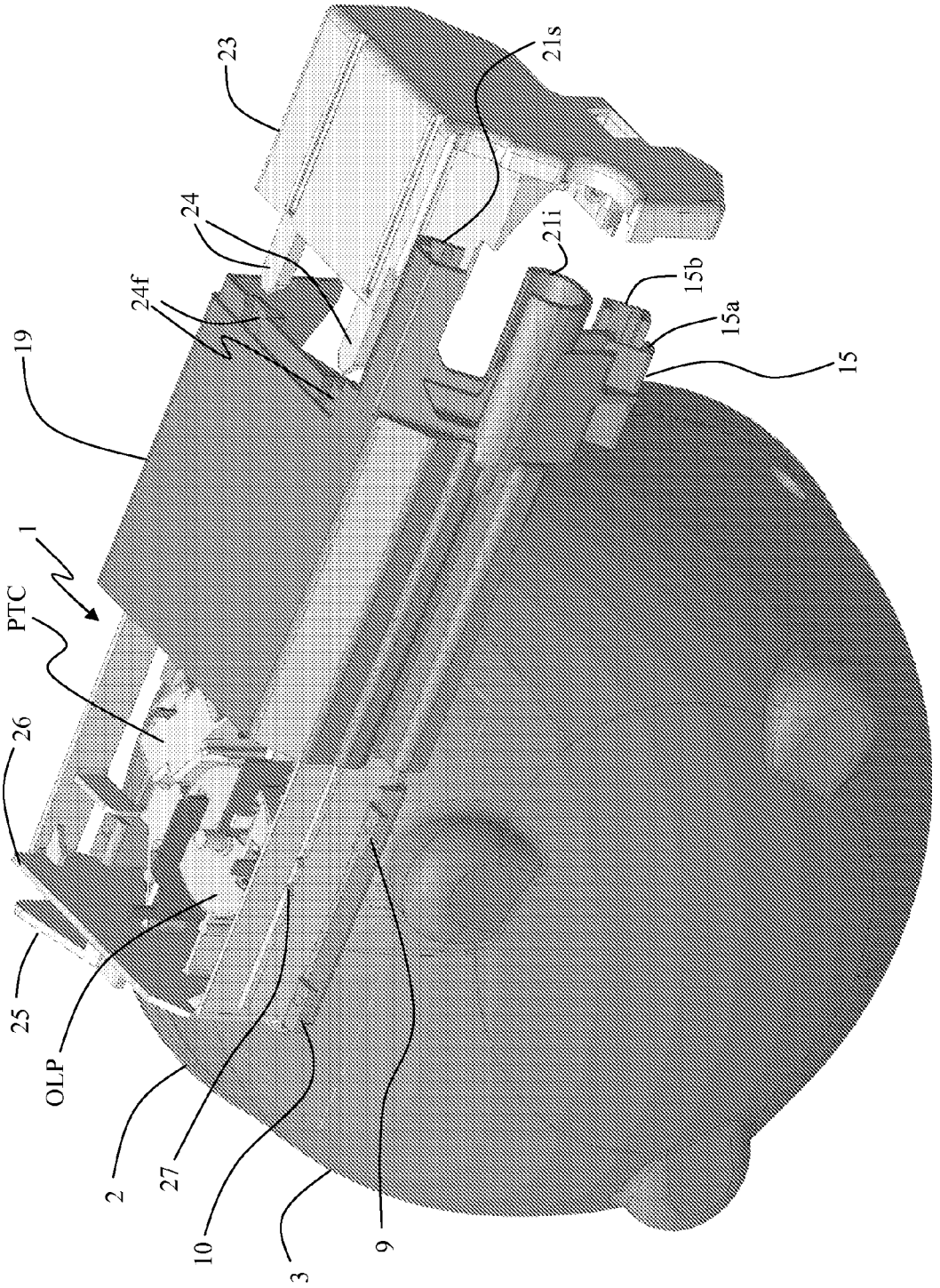

FIG. 7

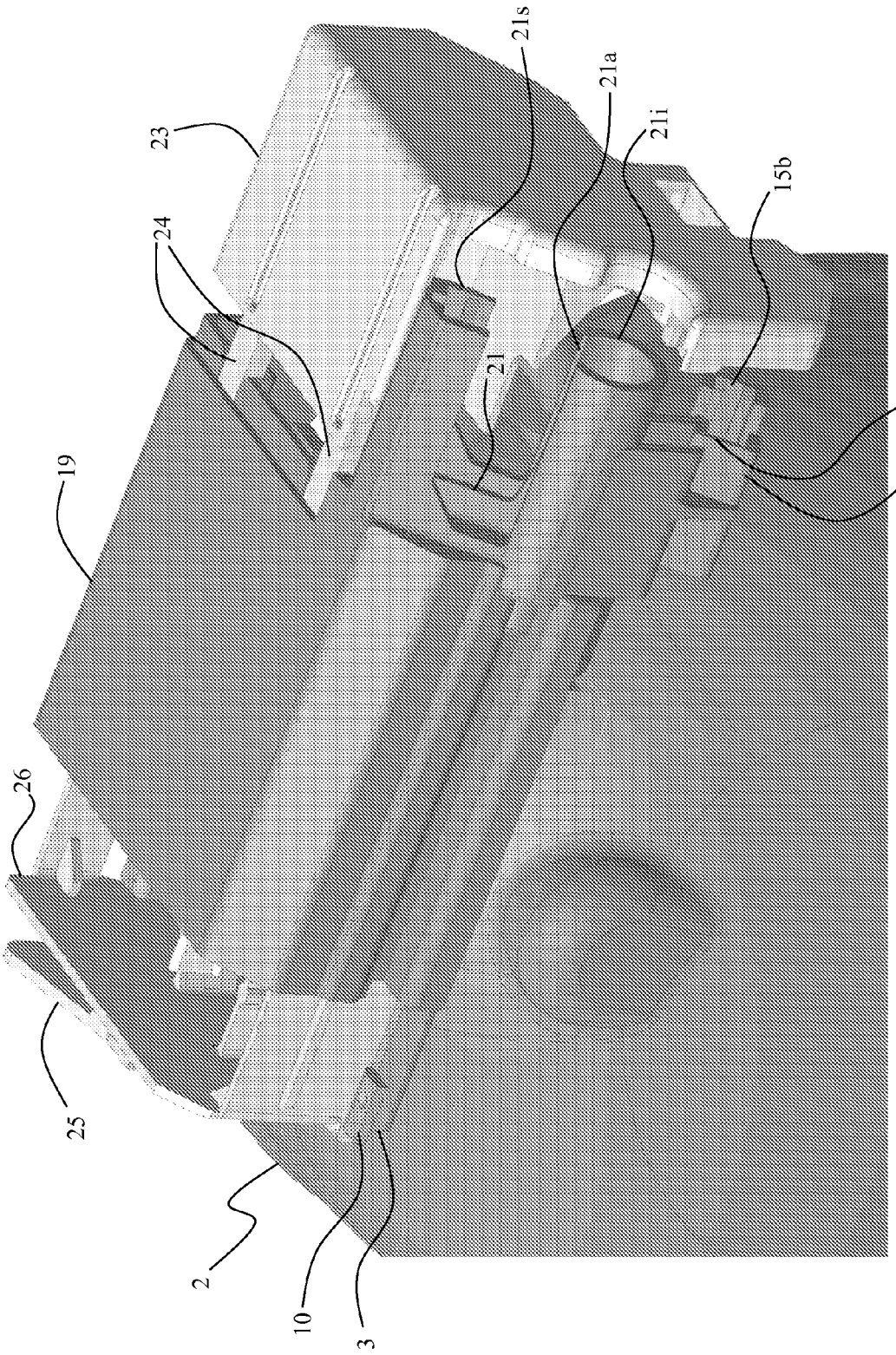

FIG. 8

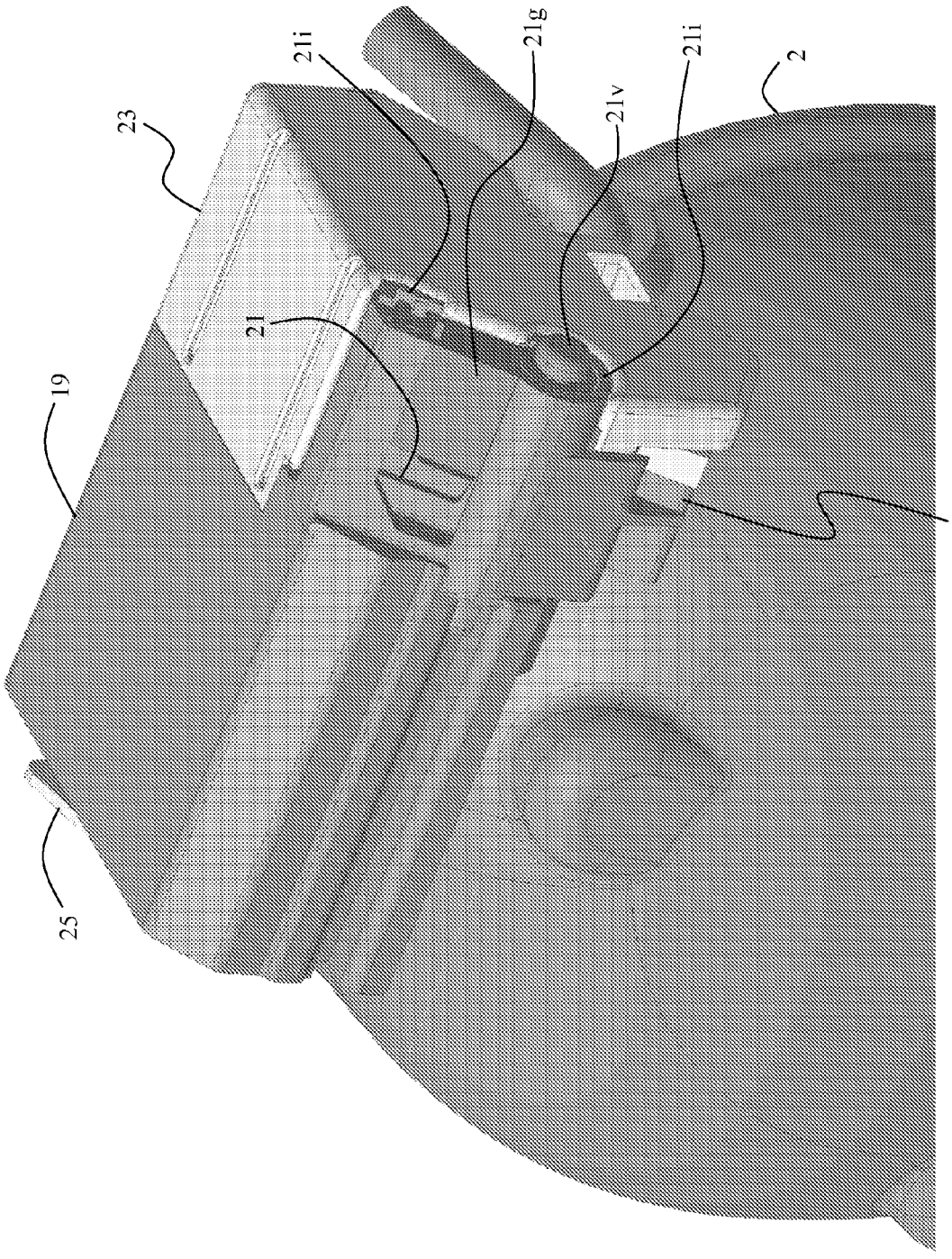

FIG. 9

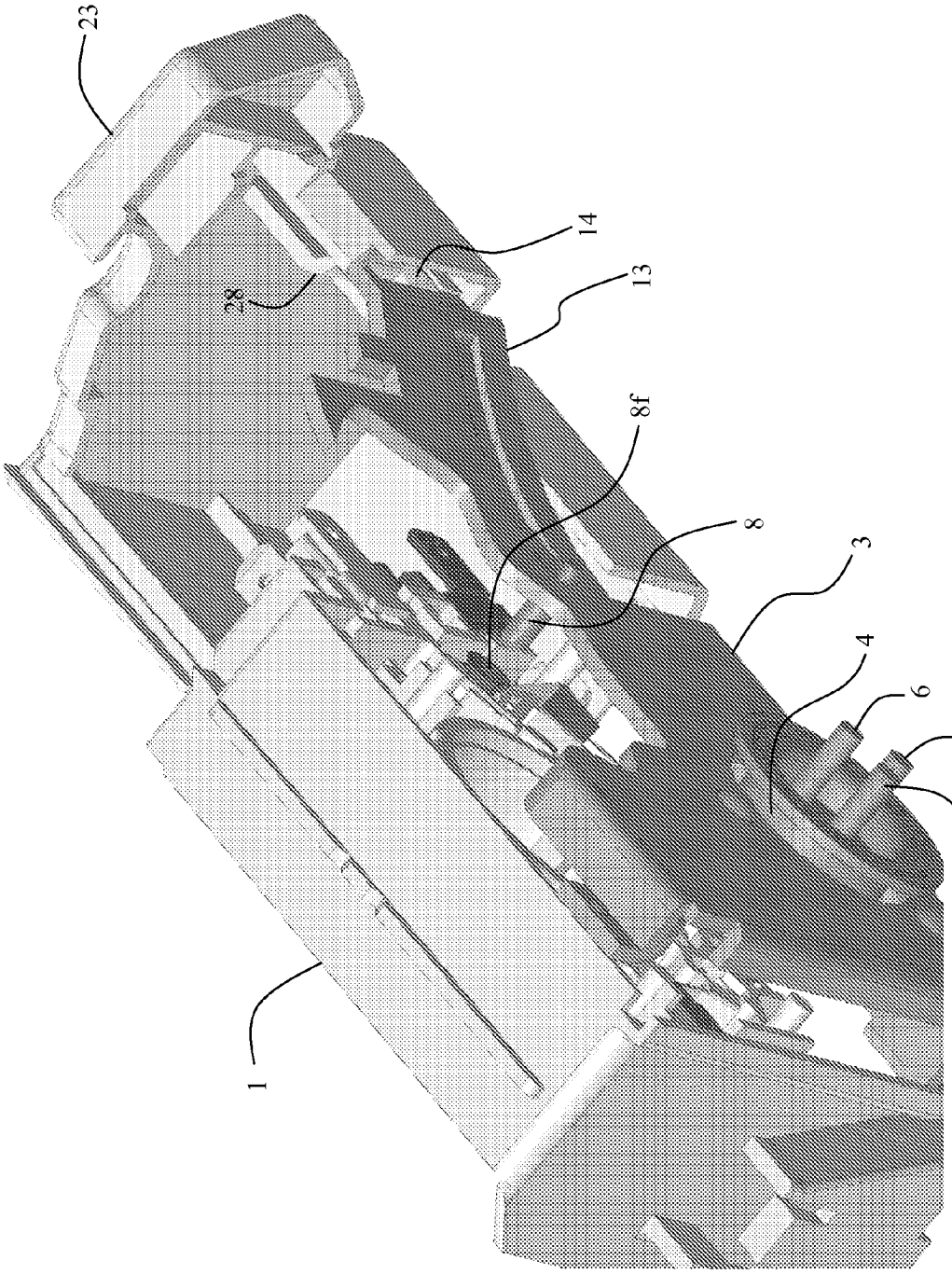

FIG. 10

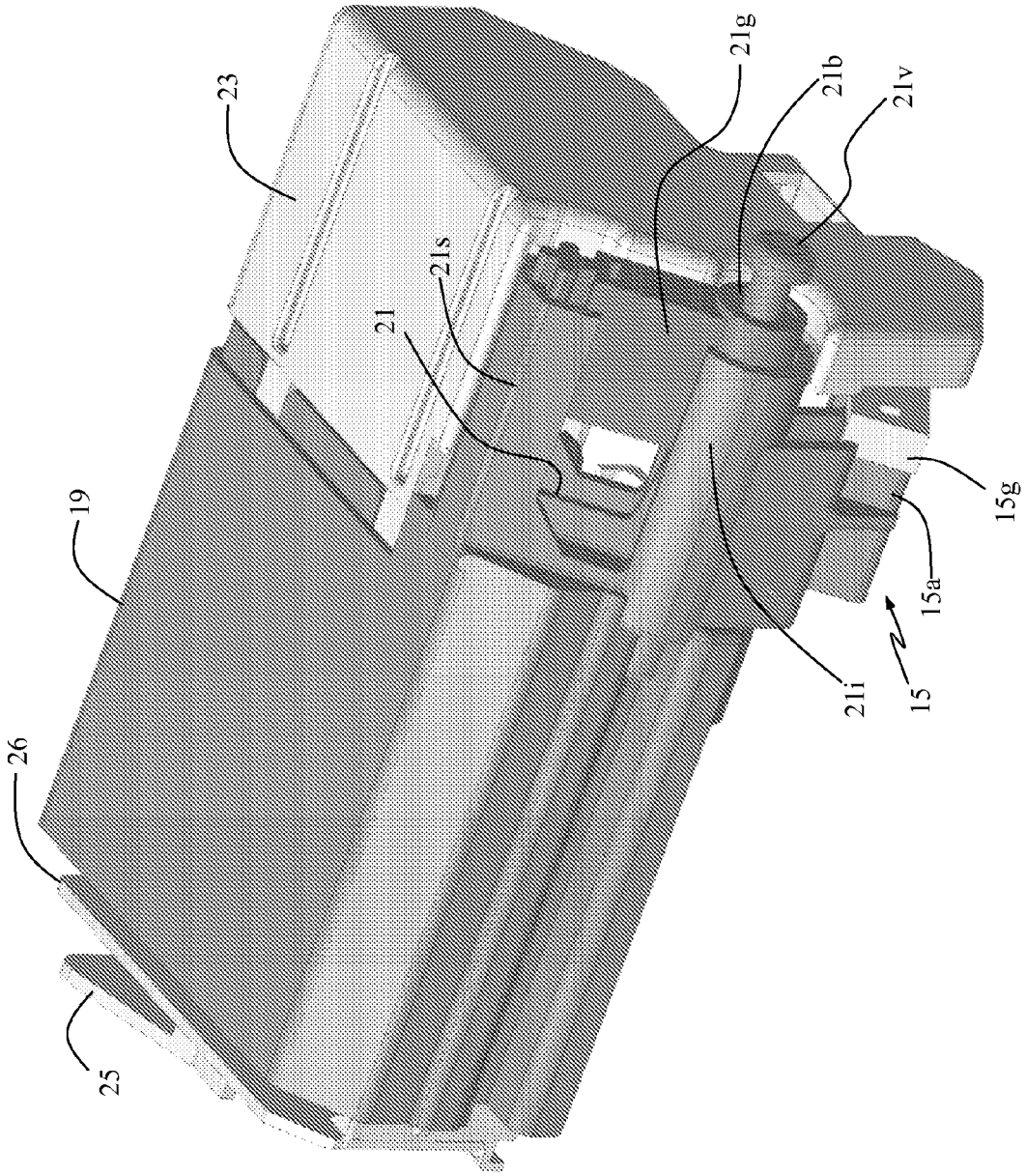

FIG. 11

REFERENCES CITED IN THE DESCRIPTION

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- IT 1268138 **[0005]**
- EP 1111316 A1 **[0006]**