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KH MA MD TN(71) Applicant: **Microelettrica Scientifica S.p.A.****20090 Buccinasco (Milano) (IT)**

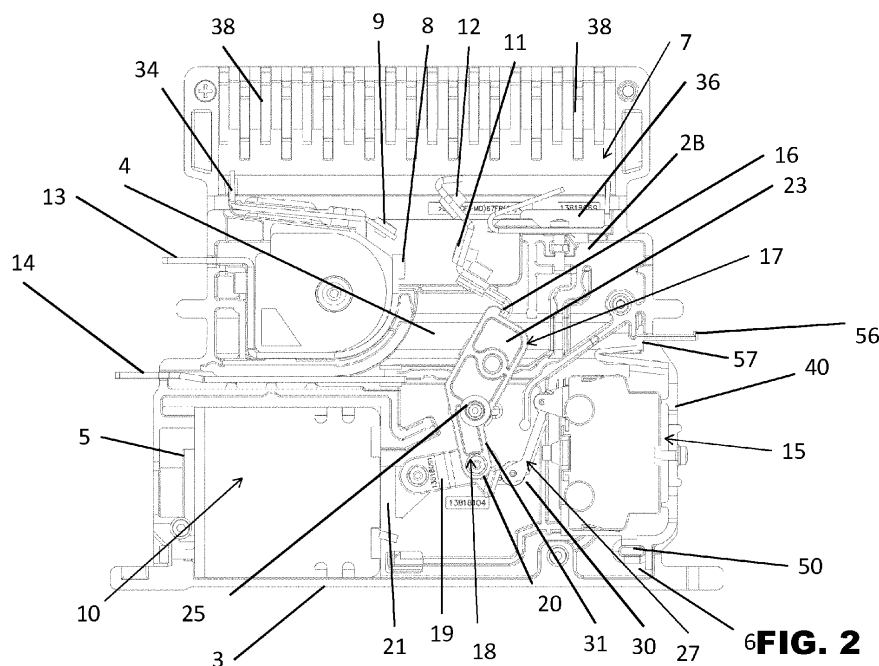
(72) Inventors:

• **BOSSONI, Carlo****20147 Milano (IT)**• **PELLIZZINI, Albino****20156 Milano (IT)**(74) Representative: **Prüfer & Partner mbB****Patentanwälte · Rechtsanwälte****Sohnckestraße 12****81479 München (DE)**(54) **IMPROVED CONTACTOR DEVICE STRUCTURE WITH IMPROVED AUXILIARY SWITCH**

(57) The present invention relates to an improved contactor device (1) structure for industrial or railways applications and comprising at least:

- an envelope or housing (2) made by a synthetic plastic material having a predetermined isolation coefficient;
- fixed (8, 9) and movable contacts (11, 12) supported and protected by a central internal portion (4) or vane of the envelope or housing (2);
- said movable contacts (11, 12) being supported on a moving mechanism (18) activated by a coil slider (21);

- an auxiliary switch (15) included in a lateral vane (6) of said envelope or housing (2); and
- a top arc chute extinguishing portion (7) covering said fixed (8, 9) and movable contacts (11, 12); wherein
- said auxiliary switch (15) is structurally independent and removably inserted in a plug-in manner in said lateral vane (6) of said envelope or housing (2); means (55, 56, 57) being provided to keep said switch (15) in stable position into a corresponding seat (50) of said vane (6).

**FIG. 2****EP 3 624 156 A1**

Description

[0001] The present invention relates to an improved contactor device structure comprising at least:

- an envelope or housing made by a synthetic plastic material having a predetermined isolation coefficient;
- fixed and movable contacts supported and protected by the central internal portion or vane of the envelope or housing;
- said movable contacts being supported on a moving mechanism activated by a coil slider;
- an auxiliary switch included in a lateral vane of said envelope; and
- a top arc chute extinguishing portion covering said fixed and movable contacts.

Technical field

[0002] As it is well known in this specific technical field, a contactor device is an electrically controlled switch used for switching an electrical power circuit.

[0003] A contactor may be considered similar to a relay except with higher current and voltage ratings and a few other differences. Unlike general-purpose relays, contactors are designed to be directly connected to high-current load devices. Relays tend to be of low power capacity. Moreover, unlike relays, contactors are designed with features to control and suppress the arc produced when interrupting currents in high power circuits.

[0004] Generally speaking, devices switching more than 15 amperes or in circuits rated more than a few kilowatts are usually called contactors. A contactor is controlled by a circuit which has a much lower power level than the main switched circuit. Contactors come in many forms with varying capacities and features.

[0005] Unlike a circuit breaker, a contactor device is not intended to interrupt a short circuit current. Contactors range from those having a breaking current of several amperes to thousands of amperes and voltage rating up to many kilovolts.

[0006] The physical size of contactors ranges from a device small enough to pick up with one hand, to large devices approximately a meter on a side.

[0007] Contactors are used to feed electric motors, power converters heating, capacitor banks, thermal evaporators, and other electrical loads; in the frame of the present invention we will focus the attention on contactors used in railways applications.

Prior art

[0008] A contactor has substantially three main com-

ponents:

At least two contacts which are the current carrying part of the contactor. This may include power contacts, auxiliary contacts, and contact springs.

[0009] An electromagnet, or "coil" provides the driving force to close the contacts.

[0010] An envelope or enclosure which is a frame housing the contacts and the electromagnet. Enclosures are made of insulating materials, and thermosetting plastics to protect and insulate the contacts and internal parts.

[0011] A basic contactor will have a coil input, which may be driven by either an AC or DC supply depending on the contactor design. The coil is usually controlled with a voltage level far lower than the main circuit voltage.

[0012] Apart from optional auxiliary low current contacts, contactors are almost exclusively fitted with normally open ("form A") contacts.

[0013] When current passes through the electromagnet, a magnetic field is produced, which attracts the moving core of the contactor. The electromagnet coil draws more current initially, until its inductance increases when the metal core enters the coil. The moving contact is driven by the moving core; the force developed by the electromagnet holds the moving and fixed contacts together.

Generally, when the contactor coil is de-energized, a spring returns the electromagnet core to its initial position and opens the contacts.

[0014] Many contactors include an auxiliary switch which may be a single-pole or a double-pole switch operated by the moving core of the movable contact arm assembly. This auxiliary switch may be used to remotely indicate the position of the main circuit contacts, whether open or closed. Auxiliary switches can be used to operate indicator lights, relays or just as feedback to the vehicle control system about the contactor's status.

[0015] Quite often, those auxiliary switches are a delicate component of the whole contactor since they may be subject to failures or damages more frequently than the movable contacts of the contactor.

[0016] As a matter of fact, it may happen that the auxiliary switch enters into a failure state that substantially stops the operability of the contactor.

[0017] In order to avoid these situations, it is generally provided a time consuming and expensive maintenance program that requires a periodic functionality check of the auxiliary switch. This activity is performed by specialized maintenance personnel with the help of testing equipment.

[0018] The technical problem at the basis of the present invention is that of providing an improved contactor structure having and improved auxiliary switch structure with such structural and functional features to allow a quicker substitution of the auxiliary switch in case of failures thus reducing the maintenance action to few minutes and improving in this way the Life Cycle Cost of the contactor.

[0019] Another aim of the present invention is that of providing an improved contactor structure having a better

accessibility to the auxiliary switch portion.

[0020] Another object of the invention is that of providing a new design of contactor device having a particularly compact structure for application wherein space is a critical issue - as more and more often happens on railway vehicles.

[0021] A further object of the present invention is that of reducing the overall size of the contactor structure providing an alternative structure for the main coil and the corresponding moving mechanism acting on the electric contacts.

Summary of the invention

[0022] The solution idea at the basis of the present invention is that of providing an auxiliary switch structure that is structurally independent from the contactor structure while being easily integrated into the envelope of the contactor.

[0023] On the basis of this solution idea, the technical problem is solved by an improved contactor structure for industrial or railways applications and comprising at least:

- an envelope or housing made by a synthetic plastic material having a predetermined isolation coefficient;
- fixed and movable contacts supported and protected by a central internal portion or vane of the envelope or housing;
- said movable contacts being supported on a moving mechanism activated by a coil slider;
- an auxiliary switch included in a lateral vane of said envelope or housing; and
- a top arc chute extinguishing portion covering said fixed and movable contacts;

characterized in that:

- said auxiliary switch is structurally independent and removably inserted in a plug-in manner in said lateral vane of said envelope or housing; means being provided to keep said switch in stable position into a corresponding seat of said vane.

[0024] Advantageously, said auxiliary switch has an envelope including a flexible flap having an end portion projecting outside the housing and including a step portion mating with an internal surface of said seat; an action on the end portion of said flap allowing to disengage the step portion from its mating surface.

[0025] Moreover, further means are provided to keep said switch in a stable and safe position; such means include at least a screw accessible from one side of the

housing and positioned between the removeable switch and the portion of the housing at a side of the switch.

[0026] It should be noted that, optionally, an electronic board is associated to one main side of the contactor outside the housing; said electronic board being provided to regulate the electric supply to the control coil supplying the correct voltage and current values for predetermined scheduled times.

[0027] This correct voltage and current values are supplied independently from the possible excursions of the auxiliary (battery) voltage supply and in a range of operating temperatures variable between -40°C and + 75°C.

[0028] Moreover, high reliability operating conditions of the electronic board are guaranteed by the presence of proper thermal design of components and protection devices mounted on the electronic board.

[0029] Electronic components are provided on said electronic board having immunity against radiating and driven disturbances and a specific insulation of at least 1500 V (at 50 Hz and for 60s) toward ground is provided for said board.

[0030] Said electronic board is mounted at a predetermined small distance from a main lateral wall of the contactor envelope on a couple of supporting columns formed on a half shell.

[0031] A protection coverage is provided over the electronic board with holes for the passage of the fixing screw inserted in corresponding seats at the free end of said supporting columns.

[0032] It should be further noted that the electronic board partially covers a command connector that is hosted in a corresponding rebated seat formed laterally and outside the housing close to the removeable switch.

[0033] This command connector is mounted on its seat before the mounting of the electronic board and is plugged to the board with at least a couple of fast-on connectors.

[0034] Furthermore, as an alternative embodiment, the improved contactor structure is provided with a manual switch instead of an electronic board. Said manual switch can directly be operated by a user. Thus, in comparison with the embodiment provided with an electronic board, the construction provided with a manual switch is simplified and cheaper.

[0035] The manual switch is provided for being operated by a user, to regulate the electric supply to the control coil manually, that is, without an electronic board.

[0036] Further features and advantages of the contactor device of the present invention will appear from the following description given by way of nonlimiting example with reference to the enclosed drawings figures.

Brief description of the drawings

[0037]

- Figure 1 shows a schematic and perspective view of a contactor device realized according to the

present invention;

- Figure 2 shows a front and internal view of the contactor device of Figure 1;
- Figure 3 shows a schematic and perspective view of the internal components of the contactor device of Figure 2;
- Figure 4 shows a schematic and perspective view of a particular of some internal components of the contactor device of the invention;
- Figures 5 shows schematic views of the particular of Figure 4 seen from a backside point of view;
- Figure 6 shows a schematic and perspective view of an upper portion of the contactor device of Figure 1;
- Figure 7 shows another schematic and perspective view of a contactor device realized according to the present invention;
- Figure 8 shows a schematic and perspective view of a particular of the contactor device realized according to one embodiment of the present invention;
- Figure 9 shows another schematic and perspective view of the particular of figure 8 seen from a different perspective point.

Detailed description

[0038] With reference to the drawings figures, with 1 is globally and schematically shown a contactor device realized according to the present invention.

[0039] The contactor 1 is a switching device specifically provided for industrial or railways applications wherein a A.C. or D.C. current can be switched on and off for a safe switching actions.

[0040] More specifically, the contactor 1 is intended for high voltage ratings applications in the electric traction and in particular for railways and underground systems.

[0041] Just to give an idea of the working conditions and the range of current values involved for these kind of contactors, it should be noted that these devices must be able to efficiently switch currents of at least 50 A under operating voltage ranges between 900 V and 1800 V.

[0042] Those operating ranges may even be referred to a single pole of the contactor.

[0043] In this respect, the contactor 1 of the present invention is disclosed hereinafter with a single pole configuration with a single interruption in air, an electromagnetic control by full power coil and single state functioning.

[0044] The contactor device 1 presents an envelope or housing 2 covering and including all the components

of the device as will be disclosed hereinafter. More particularly, the fixed 8, 9 and movable contacts 11, 12 are the core of the contactor device 1 and are supported and protected by the central internal portion 4 or vane of the envelope or housing 2.

[0045] The envelope 2 is made by a synthetic plastic material having a predetermined isolation coefficient.

[0046] Such an envelope 2 is formed by a couple of moulded shells 2A and 2B that are connected together to define hosting vanes for the various components of the contactor device 1.

[0047] Looking at figure 2, wherein the shell 2B is shown as a half portion of the envelope 2, it may be appreciated the presence of a main central vane 4 for hosting the electric contacts 8, 9 and 11, 12 of the device 1 and a couple of more lateral vanes 4, 5 and 6 for hosting a control coil 10 and a couple of auxiliary switches 15 respectively.

[0048] A top arc chute extinguishing portion 7 covering said fixed 8, 9 and movable contacts 11, 12 is provided on the top of the contactor device 1.

[0049] Advantageously, according to the invention, the auxiliary switches 15 are structurally independent with respect to the structure of the envelope 2. Moreover, the switch group 15 is removable and inserted in a plug-in manner in a corresponding seat 50 that is accessible in a lateral vane 6 of the envelope 2 from the opposite side with respect to the control coil 10.

[0050] The switch 15 has its own envelope 45 that includes a flexible flap 56 that may be bent during the insertion of the switch 15 into the corresponding seat 50.

[0051] The flap 56 has a more internal step portion 57 mating with a coupled shaped portion (shown in figure 2) inside the seat 50. A finger action on the end portion of the flexible flap 56 projecting outside the housing 2 allows to bend the flap 56 and to disengage the step portion 57 from its mating and coupling internal surface thus allowing to remove the switch 15 from its seat 50 for inspection of for a substitution due to a failure.

[0052] In other words, the flap 56 with the step portion 57 may be considered fast plug-in and fast release means provided to mount and to keep said switch in position into the corresponding seat 50.

[0053] More particularly, further means are provided to keep said switch in a stable position; such means include at least a screw 55 accessible from one side of the housing 2 and positioned between the removeable switch 15 and the portion of the housing 2 at a side of the switch.

[0054] Under the main vane 4 and between the control coil 10 and the auxiliary switch 15 there is a moving mechanism 18 for actuating the moving contacts 11, 12 of the contactor 1. The auxiliary switch 15 may be a single pole or a dual pole switch.

[0055] Differently from the prior art solutions, the envelope 2 has a half base flange formed integrally with each shell 2A or 2B so that the base flange 3 is obtained once the shells are coupled together.

[0056] The base flange 3 serves for installing the con-

factor 1 on a supporting wall that may be vertical or horizontal according the application needs.

[0057] It should be noted that fixed terminal power contacts 13 and 14 are provided and project from a same lateral side of the envelope 2. For instance, the terminal 13 is the positive pole while the terminal 14 is the negative pole, provided that no preferential direction is given.

[0058] Those fixed terminal power contacts 13, 14 are associated to the corresponding internal fixed contacts 8, 9 and to the internal moving contact 11, 12, respectively.

[0059] The fixed contact 8 is realized by a Silver alloy while the upper fixed contact 9 is realized by a Tungsten alloy with higher resistive characteristics.

[0060] The upper fixed contact 9 is supported by a proper arc ramp 34 that is extended toward the arc chute 7. Similarly, a second arc ramp 36 is provided over the upper moving contact 12 and toward the arc chute 7.

[0061] A conventional blowing coil 32 is provided between the upper terminal power contact 13 and the polar expansion 34 of the fixed contact. This blowing coil is used at the opening phase of the contactor to generate the force that help to extinguish the electric arc pushing it toward the arc chute 7.

[0062] A conventional braid (not shown in the figures) connects the internal end of the power contact 14 to one bottom end of the moving contacts.

[0063] Advantageously, according to the invention, a squared magnetic core 22 is provided to host the coil of the electromagnet 10.

[0064] The electromagnet 10 may be realized with a variable number of turns according to the voltage value under which the coil shall operate. The coil is formed around a cylindrical insulating support like a conventional sprocket.

[0065] Independently from the number of wire turns, the ferromagnetic housing 22 is provided always with the same dimensions and a squared section wherein the coil is hosted. So, the squared volume available may host any kind of electromagnet 10 needed for the specific application of the contactor device 1.

[0066] The sliding shaft 21 projects outside the electromagnet 10 to act on the moving contacts. This coil slider is pushed by electromagnetic force generated by the coil in contrast to a spring 24 that is mounted on an opposite end of the coil slider 21 projecting from the opposite side of the coil.

[0067] The coil slider 21 is intended for activating the moving mechanism 18 supporting the moving contacts 11, 12 of the contactor device 1, as will be explained hereinafter.

[0068] The moving contacts 11 and 12 are supported on the upper end of a plate 16 linked to one end or arm 23 of a lever 17 of the moving mechanism 18.

[0069] The lever 17 is hingedly supported on a pin 25 transversally fixed on the housing 2 in the vane 4. The lever 17 has one larger arm 23 supporting the plate 16 of the moving contacts 11, 12 and a longer arm 20 ex-

tended downwardly in a direction substantially opposite to the other arm 23.

[0070] A connecting element 19 is hinged to the end of the coil slider 21 at one side and to the longer arm 20 at the other side.

[0071] This connecting element 19 is hinged to the longer arm 20 in a position that is in the proximity of the supporting pin 25.

[0072] Advantageously, according to the invention, an intermediate tilting actuator 27 is provided for acting on the auxiliary switch 15 when the moving mechanism 18 is activated by the coil slider 21.

[0073] Such a tilting actuator 27 comprises at least a lever 26 having one end hinged to a fixed point 40 of the vane 6 wherein the auxiliary switch 15 is hosted.

[0074] The lever 26 of said tilting actuator 27 is extended downwardly in a cantilever manner and kept at a predetermined distance from the auxiliary switch 15 by the biasing force of a spring 29.

[0075] More specifically, the lever 26 is intended to activate a command 28 of the auxiliary switch 15 against the biasing force of said spring 29 and after the lever 26 is pushed toward the auxiliary switch 15 by the combined action of the coil slider 21 and the longer arm 20 of the moving mechanism 18.

[0076] Each of the 2 switches 15 has its own lever 26 (part of the switch) so that a parallel acting is realized.

[0077] As available on the market, the switch 15 is chosen with a small resilient wheel 30 at the lower end of the lever 26, whose purpose is just that of reducing the impact of the arm 20 of the moving mechanism 18 when it is pushed toward the free end of the lever 26.

[0078] In this respect a side portion of the arm 20 is shaped with a circular recess 31 mating with the resilient wheel 30 for rendering even smoother the impact between the side portion of the arm 20 and resilient wheel 30 of the lever 26 in consideration of the high number of switching actions performed by the contactor device 1.

[0079] Another important feature of the contactor 1 according to one embodiment of the present invention is the presence of an electronic board 60 associated to one main side of the contactor 1 outside the housing 2.

[0080] This electronic board 60 is provided to regulate the electric supply to the electromagnet 10. More specifically the electronic board 60 is structured to supply the correct voltage and current values to the control coil 10 and for predetermined scheduled times.

[0081] These correct voltage and current values are supplied independently from the possible excursions of the main voltage supply and in a range of operating temperatures variable between -40°C and + 75°C.

[0082] The high reliability operating conditions of the electronic board 60 are guaranteed by the presence of heat dissipating elements and circuit recovery means mounted on the electronic board 60.

[0083] Moreover, the control board 60 is provided with a proper level of immunity against radiated and conducted disturbances according to the more severe railways

requirements.

[0084] A further specific insulation of at least 1500 V (at 50 Hz and for 60s) toward ground is provided.

[0085] The electronic board 60 is mounted at a predetermined small distance from a main lateral wall of the contactor envelope 2. In this respect, a couple of supporting columns 46 and 48 are provided on the half shell 2B close to the base flange 3.

[0086] These supporting columns 46, 48 are integrally formed in the structure of the half shell 2B with a cylindrical shape with open end for hosting the insertion of a fixing screw 49.

[0087] A protection coverage 47 is provided over the electronic board 60 with holes 54 for the passage of the fixing screw 49. This cover 47 is squared and the holes 54 are preferably formed at two corners of the squared shape being diagonally opposite.

[0088] Between the electronic board 60 and the columns 46, 48 there are dumping O-rings 53. The same O-rings 53 are provided between the free end of the supporting columns 46, 48 and between the fixing screw 49 and the holes 54 of the protection coverage 47.

[0089] All this dumping O-rings 53 allow a shock and vibration protection for the electronic board 60 mounted at one contactor side.

[0090] It should be further noted that the electronic board 60 partially covers a command connector 65 that is hosted in a corresponding rebated seat 64 formed laterally and outside the housing 2 close to the removeable switches 15.

[0091] This command connector 65 is mounted before the mounting of the electronic board 60, as clearly shown in figure 9, and is plugged to the board 60 with at least a couple of fast-on connectors 67 and 68.

[0092] Having provided the command connector 65 outside the contactor envelope has a great advantage to avoid any interference with the movable parts of the contactor and for rendering extremely easy the connection to the electronic board 60.

[0093] As a matter of fact, a failure of the board 60 may be easily checked from the outside of the contactor thanks to the connectors 67 and 68 that may be used to transfer electric maintenance signals to the board 60 and for checking its functionality.

[0094] In case of a failure, the board may be easily substituted removing the coverage 47 without affecting the structure of the contactor. The performances of the contactor device 1 according to the present invention are also due to the specific structure of the arc chute 7 component.

[0095] As a matter of fact, without adequate contact protection, the occurrence of electric current arcing causes significant degradation of the contacts, which suffer significant damage. An electrical arc occurs between the two contact points (electrodes) when they have a transition from a closed to an open configuration (break arc), or from the open to the closed configuration (make arc). The break arc is typically more energetic and thus more

destructive. The break arc energy is strongly affected by the time constant (L/R) of the external power circuit.

[0096] The heat developed by the resulting electrical arc is very high, ultimately causing the metal on the contact to migrate with the current. The extremely high temperature of the arc slowly destroys the contact metal, causing some material to escape into the air as fine particulate matter.

[0097] The arc extinguishing portion 7 provided in the contactor device of the present invention is structured with a plurality of parallel plates supported in a half cover formed in each shell 2A and 2B of the envelope 2.

[0098] Differently from the prior art solutions, wherein a single ceramic element is inserted in the cover of the arc chute, in the present invention a plurality of slots is formed in the lower portion 41 of each half shell 2A and 2B of the envelope 2.

[0099] A dissipation plate 38 or 38' is hosted in each facing slot 39. The plates are preferably formed by ceramic, but even other material may be used.

[0100] The plates are supported in a staggered manner so that each plate 38 has an adjacent plate 38' that is shifted along the vertical direction and 180° rotated on the vertical axis.

[0101] In other words, the odd plates 38 are supported in a same position in the lower portion 41 of the arc chute, as well as the even plates 38' are supported there between.

[0102] The arc chute 7 is structurally provided with a proper number of plates 38 or 38' according to the voltage range that must be treated and the corresponding arc chute energy capacity that shall be extinguished in total security.

[0103] The contactor device 1 of the present invention solves the technical problem and achieves a number of advantages the main of which is given by his improved reliability and longer working life.

[0104] The moving mechanism 18 provided for acting on the auxiliary switch has a stronger and more reliable structure if compared with the known solutions.

[0105] The distances between the plates 38, 38' of the arc chute 7 are widely dimensioned for safe application in polluted environments.

[0106] The indirect blow out circuit and the presence of the additional arc contacts 9 and 12 makes the LTHH50 contactors suitable to work both with high and low currents.

Claims

1. An Improved contactor device (1) structure for industrial or railways applications and comprising at least:

- an envelope or housing (2) made by a synthetic plastic material having a predetermined isolation coefficient;
- fixed (8, 9) and movable contacts (11, 12) sup-

ported and protected by a central internal portion (4) or vane of the envelope or housing (2);
 - said movable contacts (11, 12) being supported on a moving mechanism (18) activated by a coil slider (21);
 - an auxiliary switch (15) included in a lateral vane (6) of said envelope or housing (2); and
 - a top arc chute extinguishing portion (7) covering said fixed (8, 9) and movable contacts (11, 12);

characterized in that:

- said auxiliary switch (15) is structurally independent and removably inserted in a plug-in manner in said lateral vane (6) of said envelope or housing (2); means (55, 56, 57) being provided to keep said switch (15) in stable position into a corresponding seat (50) of said vane (6).
2. Improved contactor device (1) structure according to claim 1, wherein said auxiliary switch (15) has an envelope (45) including a flexible flap (56) having an end portion projecting outside the housing (2) and including a step portion (57) mating with an internal surface of said seat (50); an action on the end portion of said flap (56) allowing to disengage the step portion (57) from its mating surface.
 3. Improved contactor device (1) structure according to claim 1, including further means to keep said switch (15) in a stable position; such means including a safety screw (55) accessible from one side of the housing (2) and positioned between the removeable switch (15) and the portion of the housing (2) at a side of the switch (15).
 4. Improved contactor device (1) structure according to claim 1, including an electronic board (60) associated to one main side of the contactor (1) outside the housing (2); said electronic board (60) being provided to regulate the electric supply to the control coil (10) supplying the correct voltage and current values for predetermined scheduled times.
 5. Improved contactor device (1) structure according to claim 4, wherein this correct voltage and current values are supplied independently from the possible excursions of the main voltage supply and in a range of operating temperatures variable between -40°C and + 75°C.
 6. Improved contactor device (1) structure according to claim 4, wherein high reliability operating conditions of the electronic board (60) are guaranteed by specific design and validation process.
 7. Improved contactor device (1) structure according

to claim 4, wherein electronic components are provided on said electronic board (60) having immunity against radiating and conducted disturbances.

8. Improved contactor device (1) structure according to claim 7, wherein a specific insulation of at least 1500 V (at 50 Hz and for 60s) toward ground is provided for said board (60).
9. Improved contactor device (1) structure according to claim 4, wherein said electronic board (60) is mounted at a predetermined small distance from a main lateral wall of the contactor envelope (2) on a couple of supporting columns (46, 48) formed on a half shell (2B).
10. Improved contactor device (1) structure according to claim 9, wherein protection coverage (47) is provided over the electronic board (60) with holes (54) for the passage of the fixing screw (49) inserted in corresponding seats at the free end of said supporting columns (46, 48).
11. Improved contactor device (1) structure according to claim 10, wherein dumping O-rings (53) are provided between the free end of the supporting columns (46, 48) and between the fixing screw (49) and the holes (54) of the protection coverage (47).
12. Improved contactor device (1) structure according to claim 4, wherein said electronic board (60) partially covers a command connector (65) that is hosted in a corresponding rebated seat (64) formed laterally and outside the housing (2) close to the removeable switch 15.
13. Improved contactor device (1) structure according to claim 12, wherein this command connector (65) is mounted on its seat (64) before the mounting of the electronic board (60) and is plugged to the board (60) with at least a couple of fast-on connectors (67, 68).
14. Improved contactor device (1) structure according to claim 1, including a manual switch being provided to regulate the electric supply to the control coil (10).

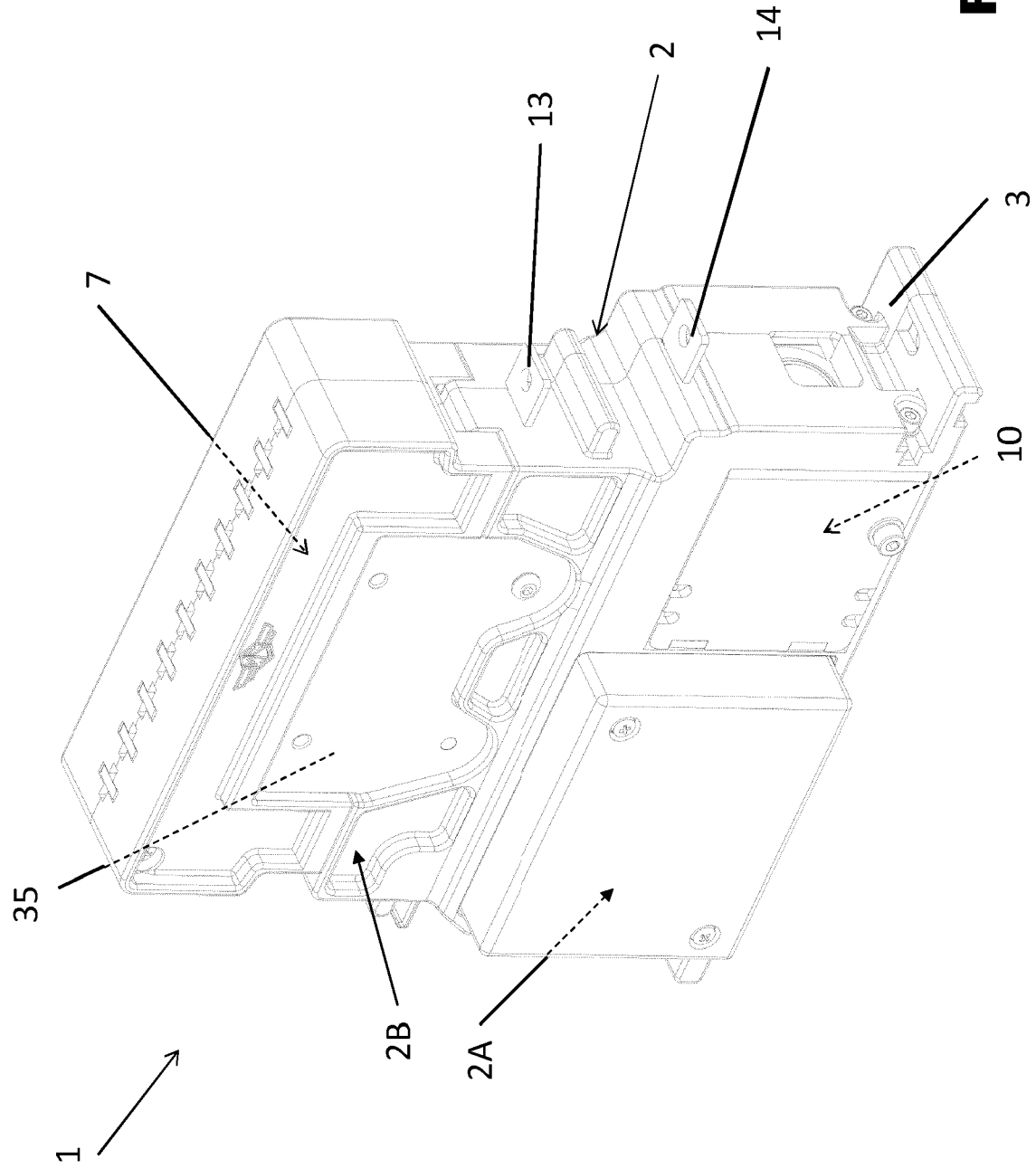


FIG. 1

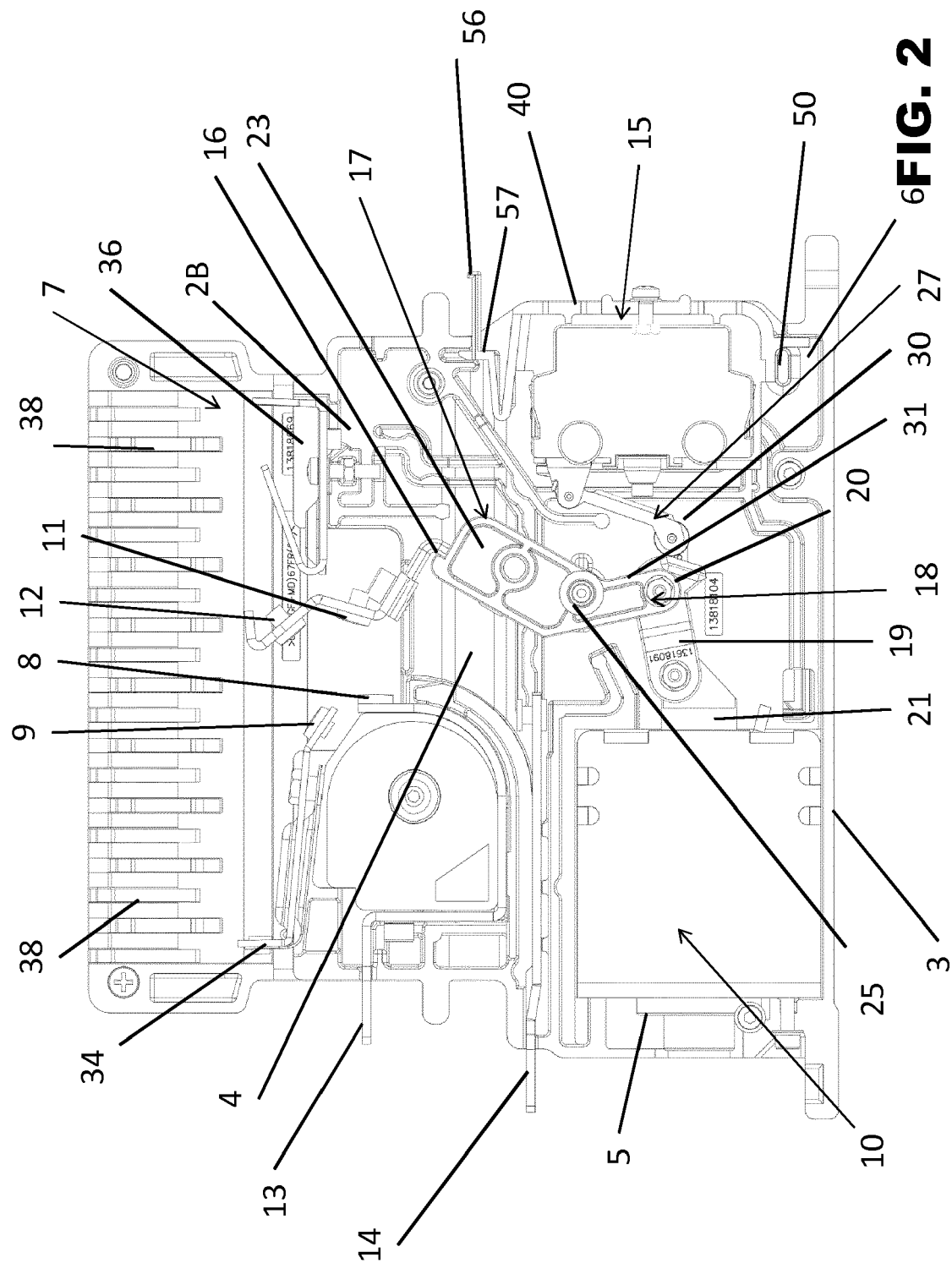


FIG. 2

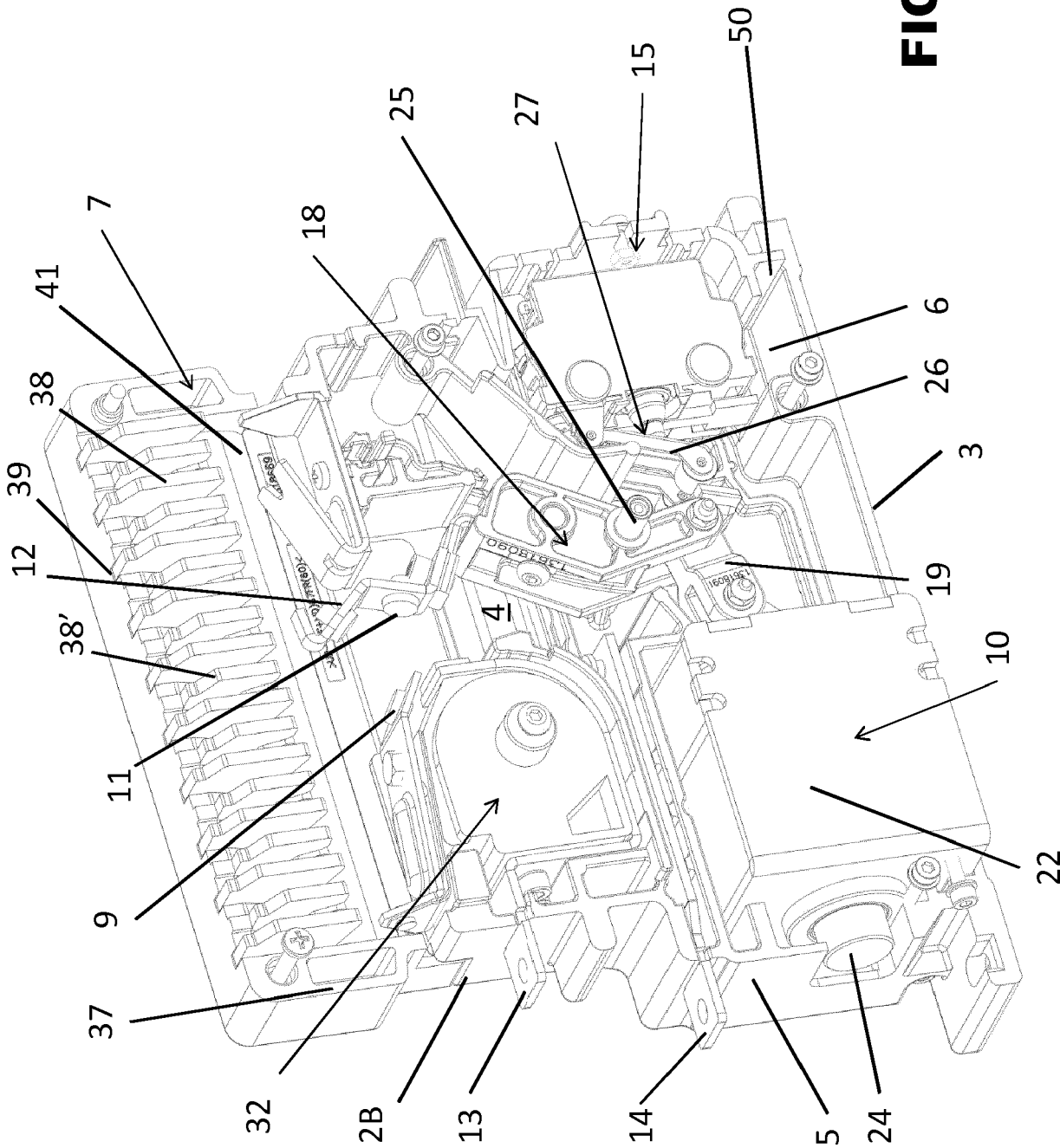


FIG. 3

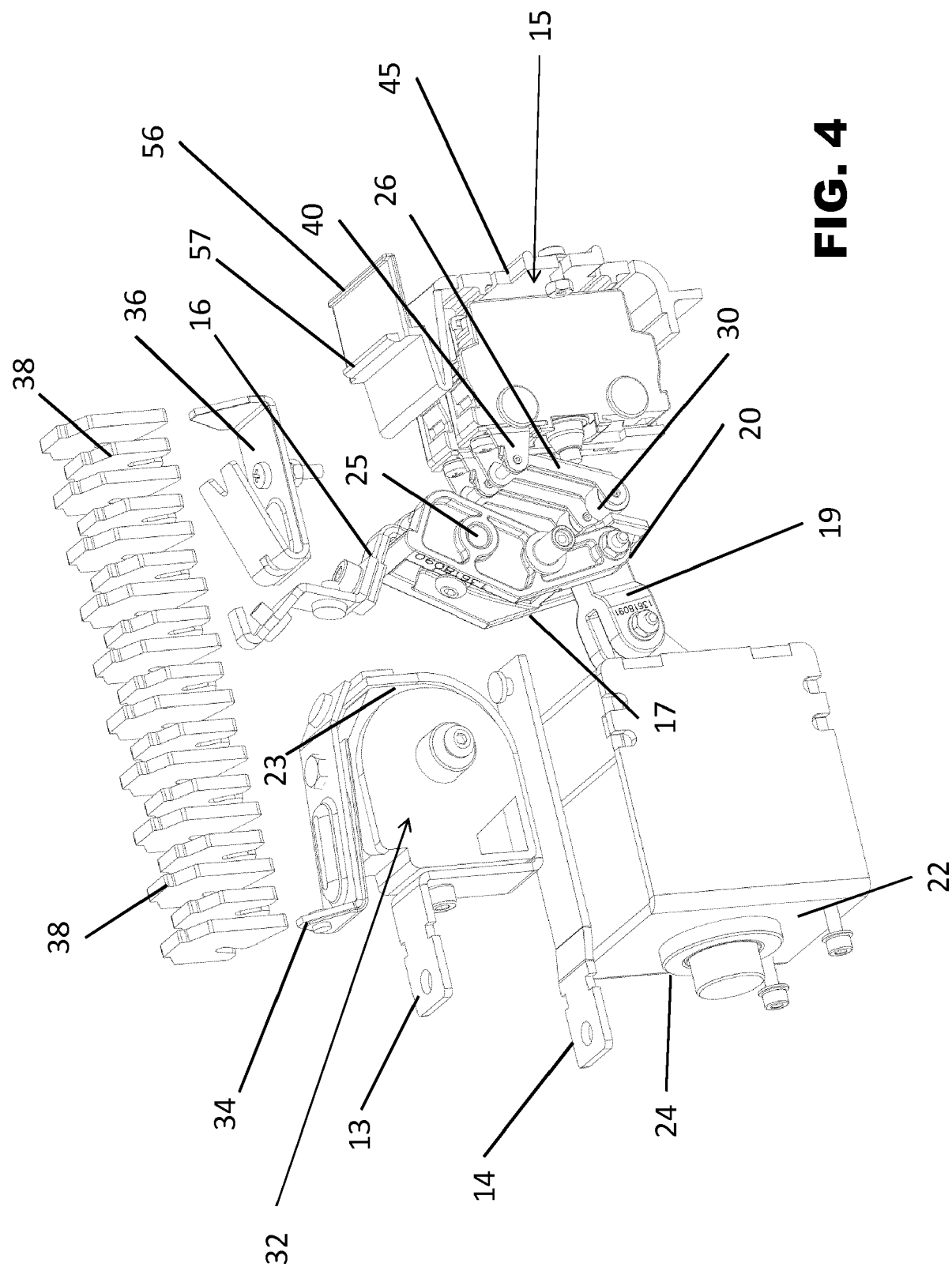


FIG. 4

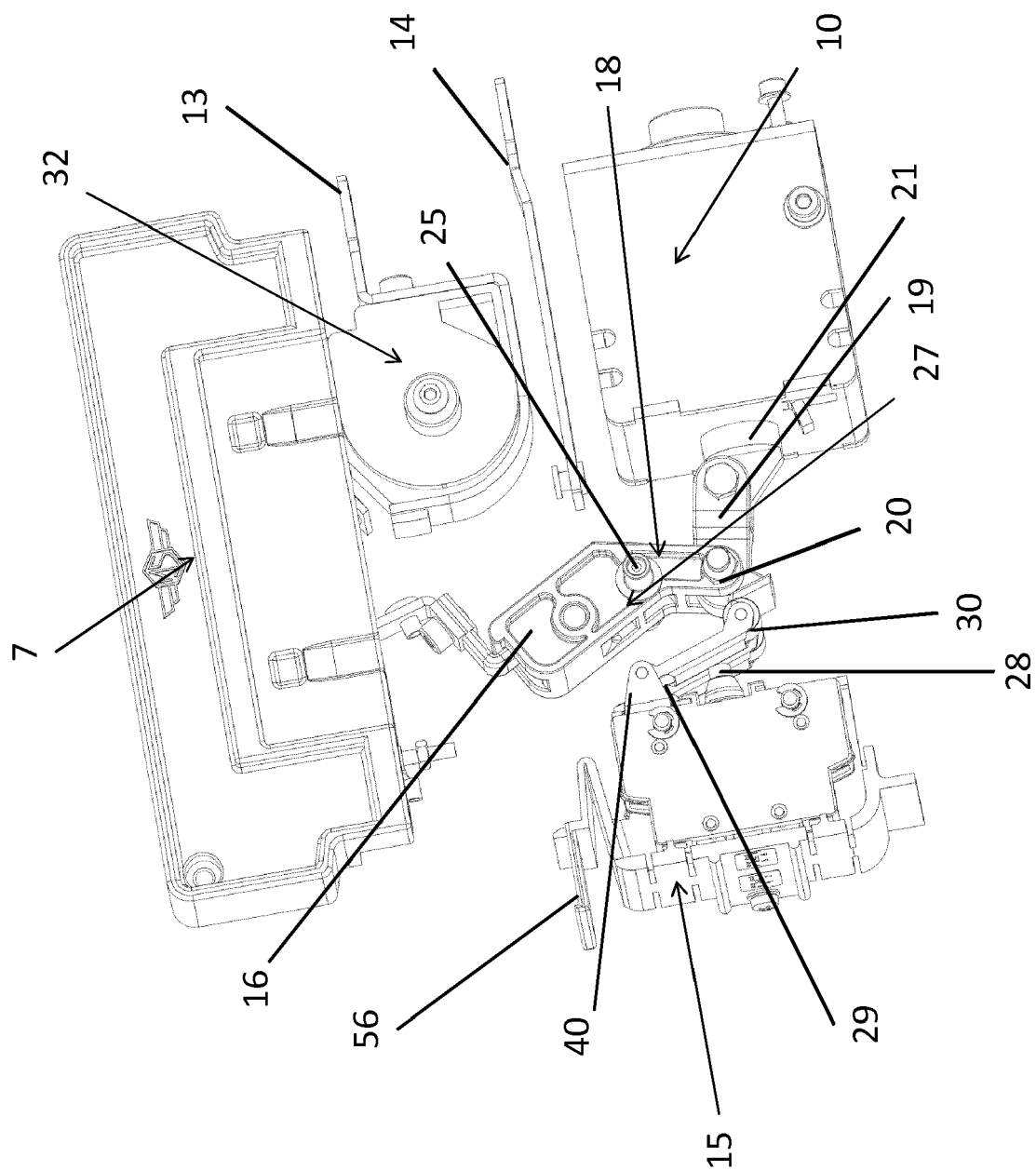


FIG. 5

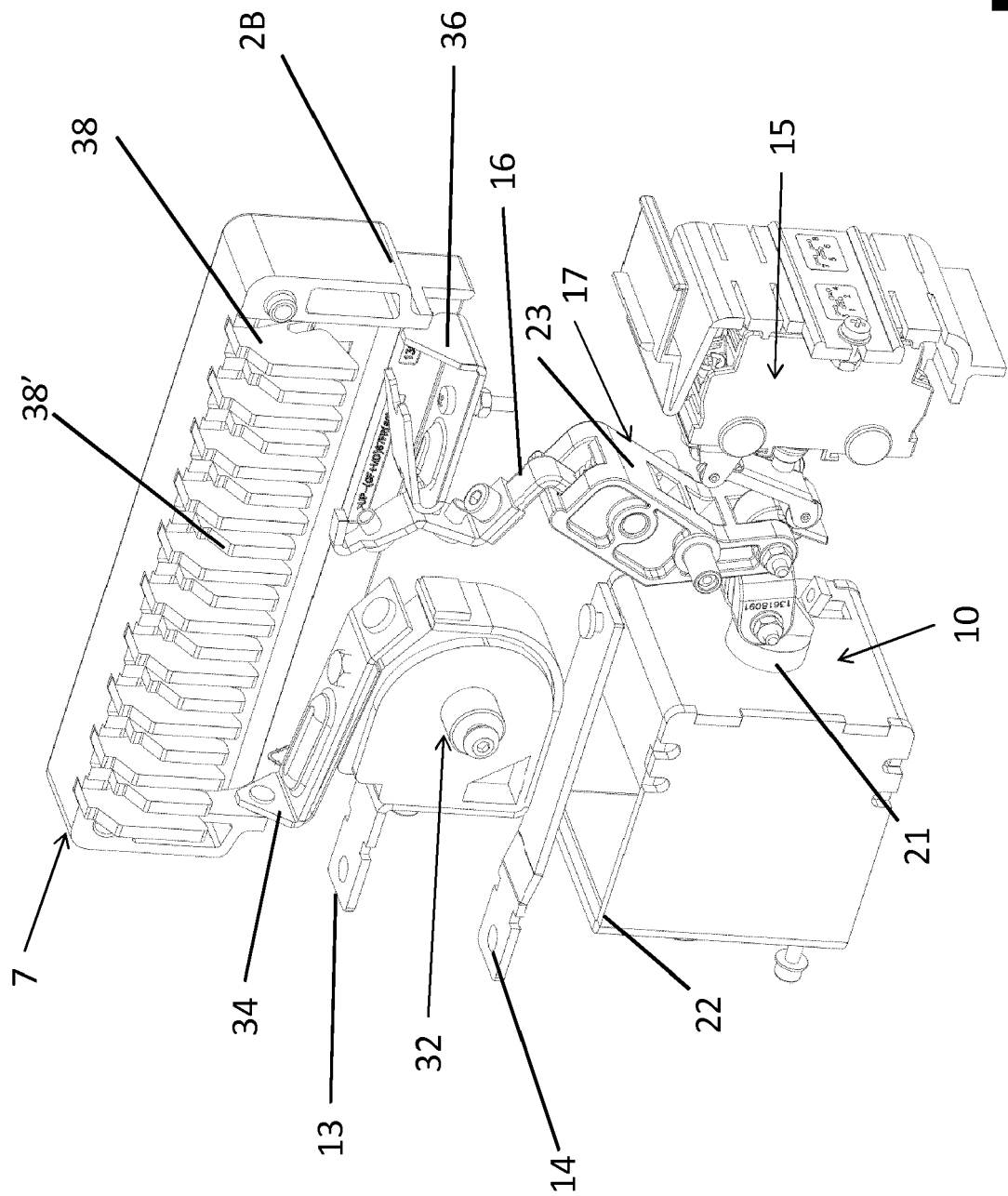


FIG. 6

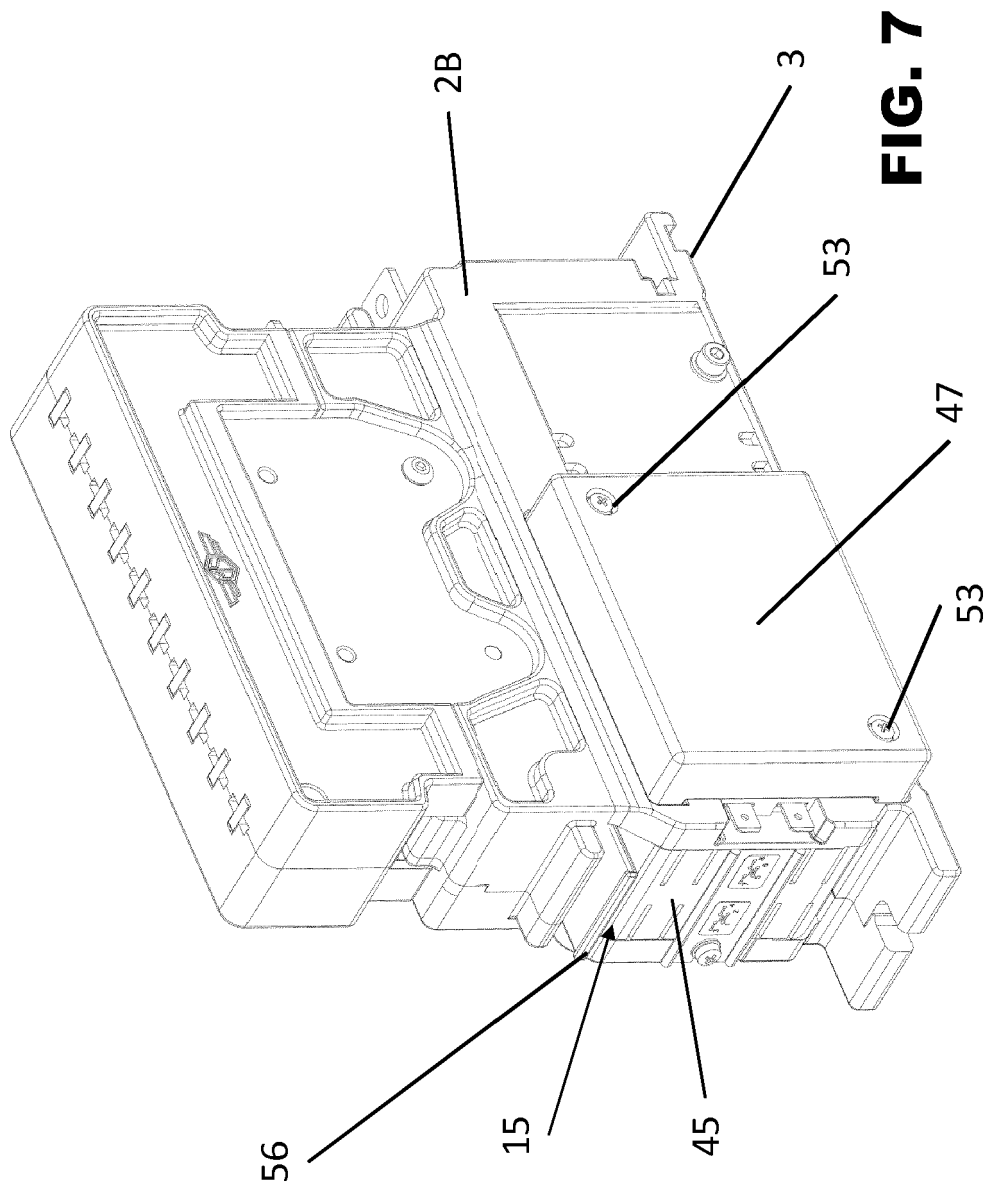
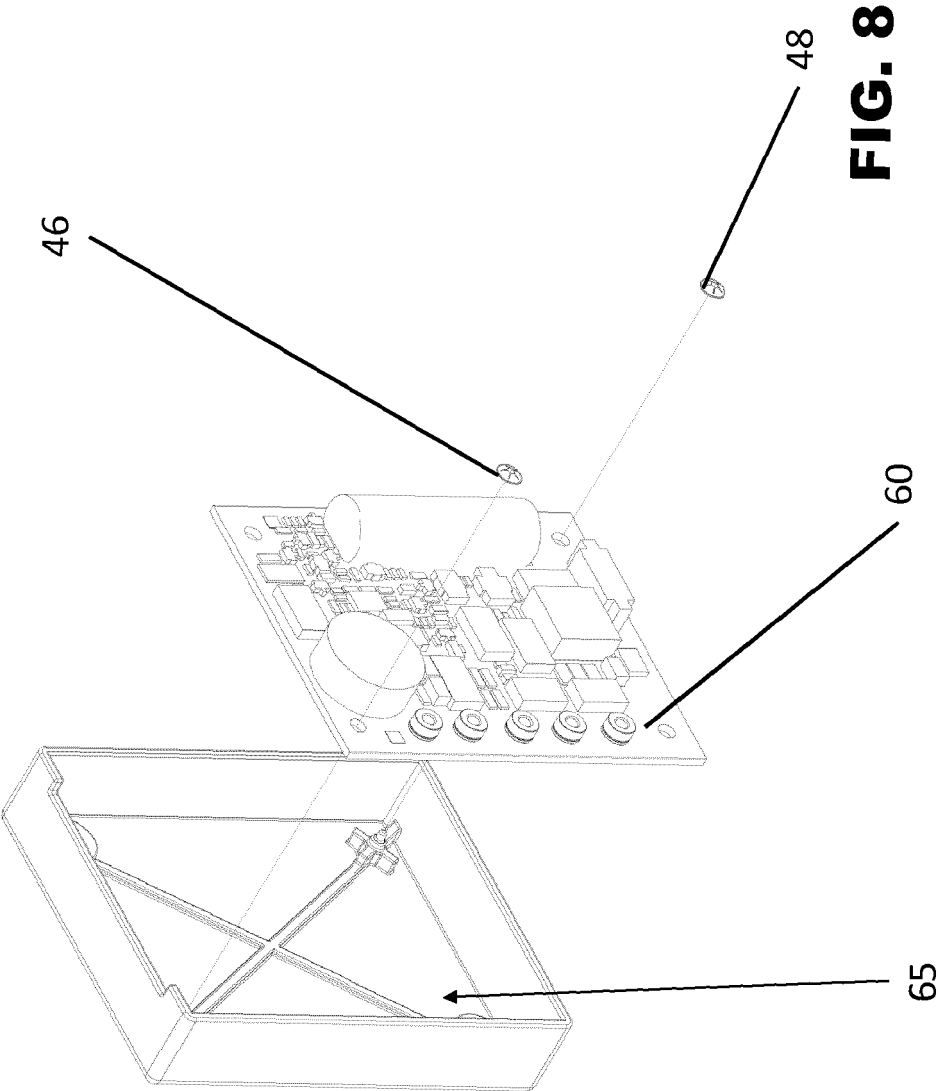
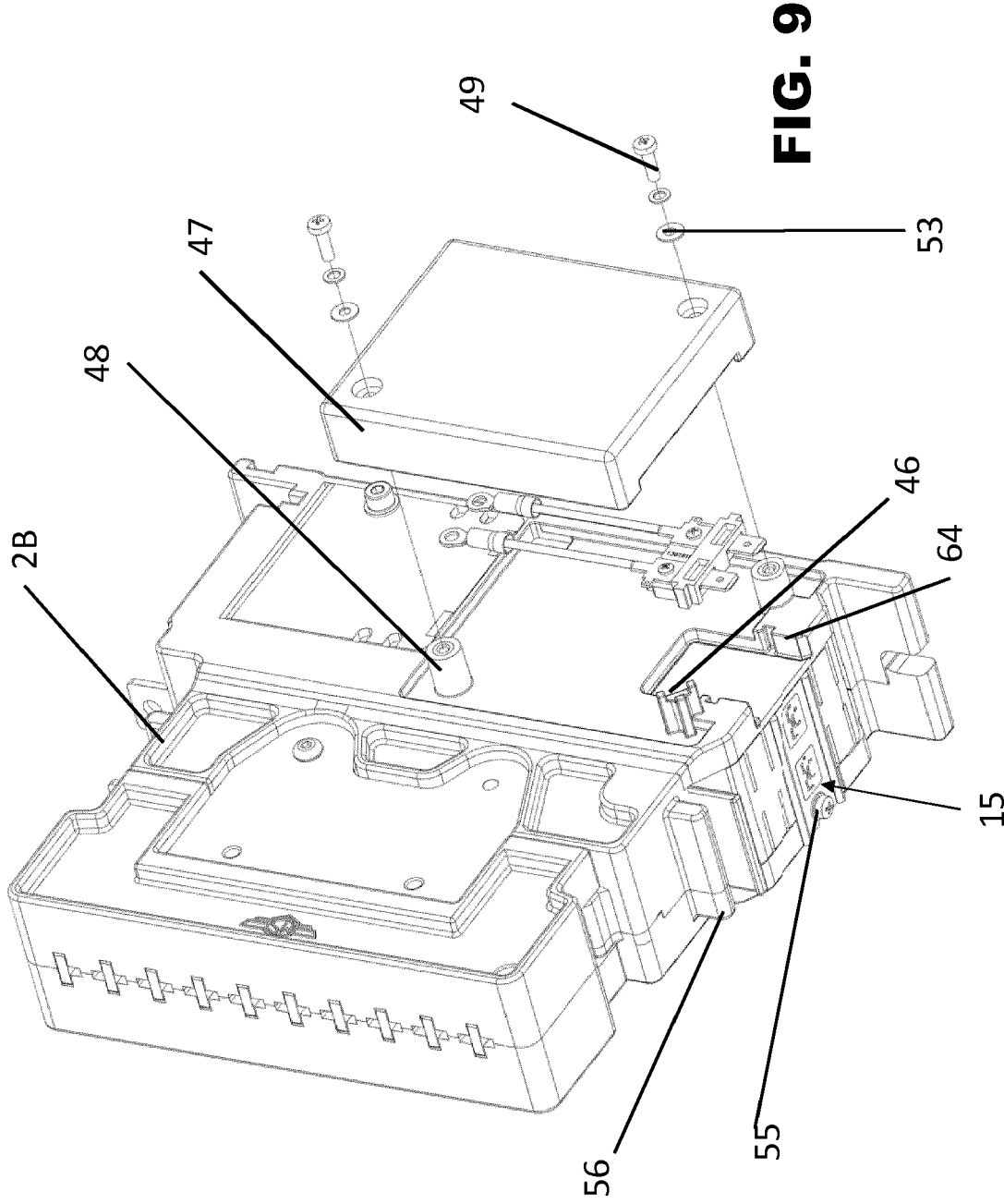


FIG. 7







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