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(54) A PLUGGABLE COIL TERMINAL FOR USE WITH A CONTACTOR AND ITS INSTALLATION METHOD

(57) This invention provides a type of pluggable contactor use coil terminal, whereby said coil terminal can be interchangeably inserted into the contactor or detached therefrom, said contactor being comprised of a coil framework, whereby the contactor also comprises: a plurality of first coupler sections disposed in positions at the plurality of end sections of the coil framework respectively, the plurality of first coupler sections being conductively connected with the coils disposed on the coil framework; second coupler sections of the coil terminal protruding in the direction of one side from the coil terminal, such that when the coil terminal is inserted into the contactor, the second coupler sections are capable of forming a conductive connection with any first coupler section within the coil framework due to their profiles interlocking. Based on the coil terminal for contactor use of this invention, it is possible to achieve flexible coil terminal installation, which furthermore leads to the tight installation of the contactor and provides convenient installation ports for expanded installation of other intelligent components. Furthermore, this invention also provides an installation method for the installation of the contactor use coil terminal.

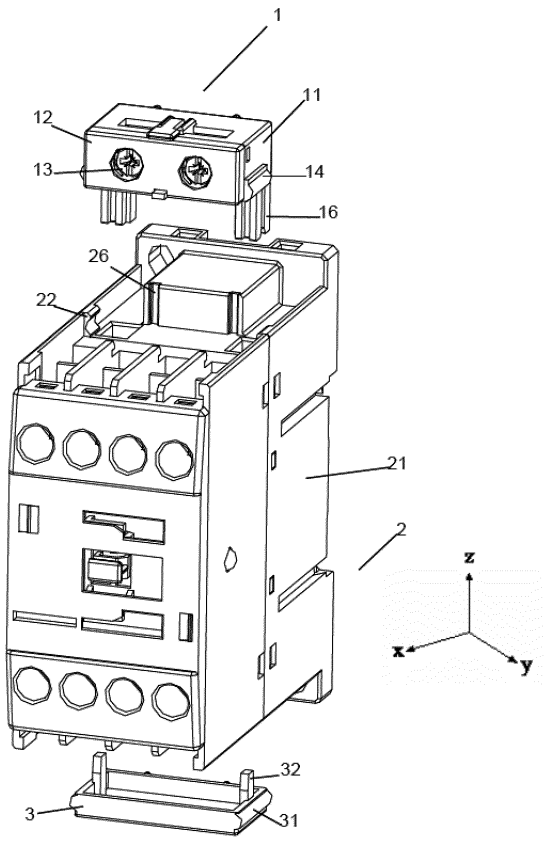

Fig. 1

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Description

Technical field

[0001] This invention relates to the field of contactors, in particular a type of pluggable coil terminal for contactor use and its installation method.

Background technology

[0002] AC contactors are widely used in the power equipment field, for instance in connecting and disconnecting electric motors. Contactors can comprise of a contactor housing, and electromagnetic structures comprised of static iron cores, moving iron cores (the armature) and contact elements, the working principles of which are that by passing electricity through the coil, an electromagnetic attraction is created between the static iron core and the moving iron core, causing the armature to overcome the spring force of a reaction spring and to be attracted towards and finally come into contact with the static iron core, and thus the engaging of the contact elements of the contactor, or the reverse.

[0003] Coil terminals are relied upon to cause electrical power from an external origin to be connected to the contactor in the traditional manner. Fixed connection of a coil terminal to the body of the contactor is already common knowledge. As is commonly the case, there are 2 or 3 coil terminals provided on the body of the contactor which allow the connection and disconnection of the contactor. In use, the user operates the coil terminal located on the top end of the contactor in the normal manner. This presents the following issues, when the contactor is used in a tight installation space (or the potential situation of addition of intelligent expansion components exists), the coil terminal sticking out on the exterior of the body of the contactor can interfere with other functional components, or obstruction by other functional components may result in difficulties in connecting cables or a need to reconnect cables. To summarize, the inability to conveniently install the coil terminal of a contactor can result in a wide variety of inconveniences.

[0004] In view of this, there is a need for an improved coil terminal which satisfies the need within the industry for a flexible coil terminal installation method with respect to the above drawbacks.

Invention Content

[0005] The aim of this invention is to provide a pluggable coil terminal for contactor use and its installation method capable of satisfying the needs for flexible installation.

[0006] According to one aspect of this invention, a type of pluggable coil terminal for contactor use is provided, whereby said coil terminal can be interchangeably inserted into the contactor or detached therefrom, said contactor being comprised of a coil framework and a plurality of first coupler sections disposed in positions at the plurality of end sections of said coil framework respectively, the plurality of first coupler sections being conductively connected with the coil disposed on the coil framework, wherein, the coil terminal is comprised of: second coupler sections of the coil terminal protruding in the direction of one side from said coil terminal, such that when the coil terminal is inserted into the contactor, said second coupler sections are capable of forming a conductive connection with any first coupler section within the coil framework due to their profiles interlocking.

[0007] Compared to the traditional arrangement of the coil terminal being permanently installed on the contactor, it is possible with the contactor according to this invention to unplug the coil terminals directly from the contactor according to one's needs, it being possible furthermore to arbitrarily install them on the top end or bottom end of the contactor, which is very useful in terms of contactor installations in tight spaces. What is more, as the contactor is provided with ports on both the top and bottom ends, it is possible to consider installing intelligent expansion modules on the side on which the coil terminal is not installed, which has major significance in terms of expanding contactor functionality.

[0008] In one preferred embodiment, said first coupler section is a pair of terminal lugs extending outwards from the end section of the coil framework, said second coupler section being a pair of connecting legs of the coil terminal, whereby the paired connecting legs are both comprised of clip slots formed integrally in the connecting legs and are such that when the coil terminal is inserted into the contactor, the terminal lugs corresponding to them form an interference fit with them thus achieving conductive connection with the electrical connecting strips.

[0009] In this manner, and via a simple, low cost method allowing easy mass production, conductive connection due to the interlocking profiles of the coil terminal and contactor is achieved.

[0010] In one preferred embodiment, said contactor also comprises a contactor housing on which a socket is disposed for the insertion of said coil terminal, the coil terminal being comprised of a coil terminal cover and a coil terminal base, there also being a clamping structure between the contactor housing and the coil terminal whereby when the coil terminal is inserted into the contactor, it prevents movement of said contactor housing relative to said coil terminal.

[0011] In this manner, and via a simple, low cost method allowing easy mass production, prevention of relative movement between the coil terminal and the contactor is achieved, simultaneously preventing accidental unplugging of the

coil terminal in its plugged-in state, ensuring long-term, stable functioning of the contactor.

[0012] In one preferred embodiment, said clamping structure comprises: two first clamping sections which are disposed symmetrically on the two opposing end sections of said contactor housing; and second clamping sections disposed on the two sides of the base of said coil terminal, whereby when the coil terminal is inserted into the contactor, the profiles of the second clamping sections and the first clamping sections interlock.

[0013] In this manner, and via a simple, low cost method allowing easy mass production, prevention of relative movement between the coil terminal and the contactor is achieved.

[0014] In one preferred embodiment, said first clamping sections are disposed on two opposing side walls of said contact housing, being a pair of recessed side slots formed integrally with the contactor housing, the second clamping sections being a pair of raised side sections formed integrally on the coil terminal base.

[0015] In one preferred embodiment, said clamping structure comprises: two position limiting clip slots which are disposed symmetrically on the two opposing end section side walls of the contactor housing; and a push rod disposed in a manner allowing its relative movement between the coil terminal cover and the coil terminal base, the push rod being capable of movement between the bias voltage position and its retracted position; when the coil terminal is inserted into said contactor, when the push rod is located in its bias voltage position, its profile interlocks with the position limiting clip slot.

[0016] In this manner, a type of clamping structure between the coil terminal and the contactor is provided that can be easily operated by the user and which is low in cost, which is also capable of preventing accidental unplugging of the coil terminal in its plugged-in state, ensuring long-term stable functioning of the contactor.

[0017] In one preferred embodiment, it also comprises: a pair of guiding grooves disposed on the housing of said contactor; and a pair of guide ribs on the side surfaces of said coil terminal forming an integral part of the base of the coil terminal, whereby the guide ribs and the guiding grooves interact to guide the insertion of said coil terminal into the socket of the contactor housing.

[0018] In this manner, providing a type of simple, low cost structure allowing accurate guiding when being inserted into the coil terminal.

[0019] In one preferred embodiment, said contactor also comprises a seal cover for sealing and covering said contact housing socket in a clipped connection with said contactor housing, whereby the seal cover possesses a pair of seal cover feet extending outwards from one side of the seal cover, the cross-sectional size of the seal cover feet being basically identical to the cross-sectional size of the corresponding socket, there is also clamping structure disposed between the contactor housing and the seal cover, which prevents movement of the contactor housing relative to the seal cover when the seal cover is inserted into the contactor.

[0020] In this manner, the detrimental effects of contact between the external environment and the electrical components within the contactor housing are avoided, and what is more, it prevents erroneous connection of cables to the contactor by the user as well as increasing electrical clearance.

[0021] In one preferred embodiment, it also comprises: a pair of guiding grooves disposed on the housing of said contactor; and a pair of guide ribs, on the side surfaces of the seal cover forming an integral part of the seal cover, whereby the guide ribs and the corresponding guiding grooves interact to guide the insertion of the seal cover feet into the socket of the contactor housing.

[0022] In this manner, providing a type of simple, low cost structure allowing accurate guiding when inserting the seal cover.

[0023] In one preferred embodiment, there are connecting cable screws in the position of said coil terminal cover for the purpose of causing electricity to flow through the coil terminal.

[0024] According to another aspect of this invention, a type of coil terminal installation method is provided, whereby said coil terminal is the pluggable coil terminal for contactor use according to this invention, wherein, the coil terminal is inserted into the contactor, a conductive connection being formed due to the profiles of the first coupler sections of the coil framework and of the second coupler sections interlocking.

[0025] Other characteristics and advantages of this invention will in part become obvious to a technician skilled in the art after reading this publication, other sections being described in the following specific embodiments in conjunction with the appended drawings.

Appended Drawings Description

[0026] The following taken in conjunction with the appended drawings is a detailed description of embodiments of this invention, whereby

Figure 1 is a 3-dimensional depiction of the contactor with a coil terminal according to this invention in a non-inserted state;

Figure 2 is a 3-dimensional depiction of the housing of the contactor with a coil terminal in a non-inserted state;

Figure 3 is a 3-dimensional depiction of the coil terminal for contactor use according to this invention;
Figure 3A is a 3-dimensional depiction of the coil terminal for contactor use according to this invention, whereby part of the coil terminal has been removed from the center of the coil terminal;
Figure 3B is a cross-sectional depiction of the coil terminal for contactor use maintained within the contactor housing according to this invention;
Figure 4 is a 3-dimensional depiction of the seal cover of the contactor according to this invention;
Figure 5 is a cross-sectional depiction of the contactor the state of which is such that the coil terminal has already been inserted;
Figure 6 is a 3-dimensional depiction of the contactor the state of which is such that the coil terminal has already been inserted, whereby the contactor housing and seal cover sections have been removed;
Figure 7 is a side view of the coil terminal and coil framework according to this invention the state of which is that they are already inserted, whereby the contactor housing and seal cover sections have been removed;
Figure 8 is a 3-dimensional depiction of the contactor of the coil terminal in the inserted state;
Figure 9 is a 3-dimensional depiction of the contactor of the coil terminal according to this invention depicted in the non-inserted state, the difference from figure 1 being that the coil terminal is installed in the opposite direction;
Figure 10 is a 3-dimensional depiction of the contactor according to claim 9 within which the coil terminal is already in the inserted state.

List of Labeling in the Appended Drawings

1. Coil terminal	11. Coil terminal cover
12. Coil terminal base	13. Connecting cable screw
14. Raised side section	15. Push rod
16. Connecting leg	161. Electrical connecting strip
162. Clip slot	17. Guide rib
2. Contactor	21. Contactor housing
22. Recessed side slot	23. Socket
24. Coil framework	25. Terminal lug
26. Guiding groove	27. Coil
28. Position limiting clip slot	3. Seal cover
31. Raised side section	32. Seal cover foot
33. Guide ribs	

Detailed Embodiments

[0027] With reference to the appended drawings, the following is a detailed description of a representative scheme of the contactor provided with a coil terminal and its installation method according to the disclosures of this invention. The purposes of providing the appended drawings are purely to portray certain embodiments of this invention, but the appended drawings are not drawn to scale according to any specific embodiment, and certain features may have been magnified, removed or dissected in order to allow better display and interpretation of the revealed content of this invention. Certain components within the appended drawings may be modified according to actual requirements on the premise that the technical effects are not affected. In the description, when the phrase "in the appended drawings" appears or some such term, it is not necessary to refer to all the appended drawings or examples.

[0028] Certain directional expressions used descriptively with respect to the appended drawings in the following text, such as "front", "back", "internal", "external", "top", "bottom" or other such directional expressions should be assumed to have the normal meaning and refer to the directions in question when viewing the appended drawings normally. Unless otherwise stated, directional expressions stated in this description are the normal directions as may be understood by a technician skilled in the art.

[0029] Where the expressions "first" and "second" and other such-like expressions within this invention are concerned, these do not represent any order, quantity or importance within this invention, only being used to distinguish between one component and another component.

[0030] The 3 dimensional drawings in figure 1 depict the pluggable coil terminal contactor according to this invention in the non-inserted state, whereby the spatial direction of the contactor and coil terminal are expressed in terms of the x, y and z spatial coordinates system, and specifically, the x axis represents the front and back directions of the contactor, the direction indicated by the arrow being the front, the y axis represents the left and right directions of the contactor, the direction indicated by the arrow being the right direction, the z axis represents the top and bottom directions of the

contact, the direction indicated by the arrow being the top.

[0031] As shown in figure 1, whereby this comprises a contactor 2, and a coil terminal 1 located above the contactor 2 and a seal cover 3 located beneath the contactor 2. Of course, a technician skilled in the art would appreciate that, installation of the coil terminal 1 from the top of the contactor 2 is only given as an example, and it would be possible to insert the coil terminal 1 in any direction relative to the contactor 2, for instance, but not being limited to in the left and right directions or the front and back directions etc.

[0032] In this invention, the contactor 2 comprises a contactor housing 21 and a coil, coil framework, static iron core and moving iron core electromagnetic structures and contact elements (as shown in the drawing). A technician skilled in the art would appreciate that, the electrical structures within the contactor housing are common knowledge in this field, and for the sake of brevity details of these are not discussed further.

[0033] Furthermore, as shown in figure 1, the overall shape of the contactor housing 21 according to this invention is rectangular, the example being one whereby installation is achieved via assembly in the front to back direction of two housing components which fit together. To be more specific, figure 2 depicts one housing component of the contactor housing 21. As can be seen from the drawing, there is a cavity within the housing component of the contactor housing 21 for the purposes of containing such components as the coil, the coil framework 24, the static iron core and the moving iron core electromagnetic structures and the contact elements. The following taken in conjunction with figure 2 is a detailed description of the contactor housing 21.

[0034] As is shown in figure 2, and based on the x, y and z spatial coordinates system shown (the same in figure 1, whereby the x axis represents the front and back directions of the contactor, the y axis represents the left and right directions of the contactor and the z axis represents the top and bottom directions of the contactor), the contactor housing 21 is for instance a single molded component which is rectangular in form overall, whereby there is a cavity in the central section of the rectangular form for the purposes of containing the coil framework 24, whereby said coil framework 24 is exemplified as extending in the direction of the z axis therein, it being possible to provide a coil (not shown in the drawing) on said coil framework 24. Under the circumstances that the coil on the coil framework 24 has been conductively connected, it is possible to cause electromagnetic attraction to arise between the static iron core and armature within the conductive contactor, this causes the armature to overcome the spring force of the reaction spring, it being attracted to approach and finally contact the static iron core, the result of which is that the contact elements of the contactor engage; the components and their interactive relationships capable of achieving the above mentioned processes are of a type that a technician skilled in the art would be well acquainted with, and for the purpose of brevity details of these are not discussed further.

[0035] As shown in figure 2, a pair of terminal lugs 25 of the first coupler section are provided at the two end sections of said coil framework 24 respectively, as shown in the drawing, there are a pair of terminal lugs 25 provided at the top and bottom of said contactor housing 21 respectively, whereby the paired terminal lugs 25 extend outwards from the cavity within the contactor housing in the top and bottom directions of the contactor housing 21 respectively. In this manner, said pair of terminal lugs 25 can form a conductive connection with the coil (not shown) provided and electrically connected with the coil framework 24, and this, for example, may be achieved via electrical contacts or electrically conductive wires molded into the coil framework 24. Of course, a technician skilled in the art could appreciate that, the actual manner of embodiment adopted with respect to the coupler section should not be limited to terminal lugs 25, and appropriate design and modification of the engaging structure on the basis of the desired results is possible.

[0036] Furthermore, in the z direction on the top wall and bottom wall of the contactor housing 21, in a position corresponding to said paired terminal lugs 25 there are paired sockets 23 provided for the purpose of insertion of the coil terminal, as shown in figure 2, the position of the socket 23 and the terminal lug 25 correspond and are likewise in a paired arrangement on the top wall and bottom wall. The shape of said socket 23 shown in figure 2 is square, however it is not limited to only being square, and the only requirement is that it matches the shape of the section of the coil terminal that is inserted.

[0037] What is more, there are paired recessed side slots 22 provided on the left side wall and right side wall in the y direction of the contactor housing 21, it should be pointed out that, said paired recessed side slots 22 are not only formed on the top of the contactor housing 21 as shown in the z direction in figure 2, but are also provided on the bottom of the contractor housing 21 in the z direction, thus ensuring that the coil terminal matches up when inserted from the top or bottom of the contactor housing 21. As shown in figure 2, the structure of said recessed side slots 22 may be such that they are molded in one piece with the contactor housing 21, whereby these may be structures slightly protruding in the opposing direction in the y direction, the extent to which they protrude being an extent that does not result in interference with the insertion of the coil terminal into the socket 23.

[0038] Furthermore, there are raised platforms formed on the top wall and bottom wall of the contactor housing 21 in the z direction, whereby said raised platforms may be components molded in one piece with said contactor housing 21. On the front side of said raised platforms in the x direction, there are a pair of guiding grooves 26 extending downwards in the z direction, and in a preferred arrangement, said guiding grooves 26 extend over the whole of the top to bottom distance of said raised platform and possess such a depth of recess, whereby this is sufficient to ensure that the inserted

coil terminal achieves accurate guiding in the z direction.

[0039] To continue, the coil terminal 1 according to this invention is described in detail in conjunction with figure 3.

[0040] As shown in figure 3, the depiction of which basically adopts the same x, y and z coordinates system as in figure 2 (the only difference relating to the direction the top and bottom of the z axis are pointing in). The coil terminal 1 is for example, a component formed of a coil terminal cover 11 and a coil terminal base 12, being for the purpose of conducting electrical flow from an external power source to within said contactor 2 when inserted into the contactor 2. In order to achieve electrical connection to an external power source, as is shown in figure 3, there are a pair of countersunk holes on the front side surface of said coil terminal cover 11 in the x direction, there being connecting cable screws 13 provided within said countersunk holes respectively that may be electrically connected to an external power source. Due to the design of said countersunk holes, it is possible to avoid accidental damage of the connecting cable screws 13 due to the external environment (for instance due to accidental impact) or externally exposed connecting cable screws 13 causing accidental electrical injuries to operators.

[0041] There is a coil terminal base 12 connected to the bottom of the coil terminal cover 11 in the x direction, the overall shape of said coil terminal base 12 being rectangular, and there are a pair of connecting legs 16 protruding from the bottom of said coil terminal base 12 in the z direction, the connecting legs 16 for example may have a U shaped structure with clip slots 162, the width or spacing of this type of clip slot 162 design ensuring that when the coil terminal is inserted into the contactor, the electrical connecting strips 161 provided on the surface of said clip slots 162 are capable of forming an interference fit with the corresponding terminal lug 25 of the pair of terminal lugs, thus allowing the conductive connection between the two. Whereby, the clip slots 162 form an integral part of the connecting legs 16, the electrical connecting strips may be such that they may be disposed on the surface of the clip slots 162 in a manner such as via bonding, such that said clip slots 162 are capable of preventing accidental distortion of the electrical connecting strips 161. The electrical connecting strip 161 is exemplified by but not limited to being made of metallic foil. Said coil terminal base 12 also possesses an internal cavity not shown in figure 3, there being electrical structures disposed within said internal cavity for the purpose of allowing the conductive connection of the connecting cable screws 13 and the electrical connecting strips 161, said electrical structures being of a type with which a technician skilled in the art would be well acquainted, and which for the purposes of brevity are not described further here.

[0042] Furthermore, there are two raised side sections provided protruding towards the exterior on the left and right side of said coil terminal base 12 along the y direction, said raised side sections 14 being such they are formed in one piece with the coil terminal base 12, of course they may also be individual components connecting to the coil terminal base 12. In this embodiment, said raised side sections 14 are formed in a manner that, when the coil terminal 1 is inserted into the contactor 2, their profiles interlock with the recessed side slots 22 of said contactor housing 21. As a result of this, via said profiles interlocking, it is possible to prevent the contactor housing 21 moving relative to the coil terminal 1 when the coil terminal is inserted into the contactor.

[0043] What is more, in figures 3 and 3A, a push rod 15 is shown provided between the coil terminal cover 11 and the coil terminal base 12, whereby the push rod 15 is capable of moving between the bias voltage position and the retracted position between the coil terminal cover 11 and the coil terminal base 12. As shown in figure 3A, the push rod 15 is a component capable of sliding in the groove provided on the coil terminal base 12 and having an overall U shape. Between the back of said U shaped component on the side facing the coil terminal cover 11 and the coil terminal base 12 there is a spring component (not depicted) for instance a spring for the purpose of bias voltage the push rod 15 in the direction of the coil terminal cover 11. Due to the effect of the spring component, without being affected by any external force, the push rod 15 remains in its bias voltage position shown in figure 3 and figure 3A.

[0044] Figure 3B further depicts the situation when the coil terminal is inserted into the contactor. As shown in figure 3B, there are position limiting clip slots 28 provided on the top wall and bottom wall of the housing of the contactor 2, of course it could be understood that, it would be possible to provide the position limiting clip slots 28 on the wall of the housing in a suitable direction according to the direction of insertion of the coil terminal, and in a preferred arrangement the design of the position limiting clip slots 28 in terms of shape and size is such that they match the size and shape of the push rod 15. In operation, when one wishes to insert the coil terminal into the contactor, as in one example, the user could press down on one end of the push rod 15, thus overcoming the effect of the bias voltage on the spring component causing the push rod 15 to move towards its retracted position, in this manner, when the coil terminal is inserted the push rod 15 is unable to interfere with the position limiting clip slot 28 and allows smooth insertion of the coil terminal 1 into the contactor 2. In the situation where the coil terminal 1 is already inserted within the contactor 2, the user releases the force acting on one end of the push rod 15, and due to the effect of the spring component bias voltage, in its bias voltage position the push rod 15 and the position limiting clip slot 28 profiles interlock. As a result of this, via the profiles interlocking, it is possible to prevent the contactor housing 21 moving relative to the coil terminal 1 when the coil terminal is inserted into the contactor.

[0045] In particular, the hope is to indicate that, regardless of two types of clamping structure, the push rod 15 and the raised side sections 14, being depicted in figure 3 and preventing movement of the contactor housing 21 relative to the coil terminal 1 when the coil terminal is inserted into the contactor, as could be understood by a technician skilled

in the art, these two types of clamping structure achieve clamping operations independently and their provision is in no way interconnected. In view of this, it cannot be surmised from the structures depicted in figure 3 that the two types of clamping structure comprised respectively of a push rod 15 and raised side sections 15 must both be provided at the same time within the coil terminal 1, but that either of these two clamping structures may be selected according to requirements.

[0046] What is more, as depicted in figures 3 and 3A, where there are a pair of guide ribs 17 provided on the back surface of the coil terminal base 12 facing in the direction of the back of the coil terminal cover 11, in a preferred arrangement the guide ribs 17 are parallel to each other and are formed integrally with the coil terminal 12. In an even more preferable arrangement, the guide ribs 17 extend upwards the full height of the coil terminal cover 11. As shown in figure 1, when the coil terminal 1 is inserted into the contactor 2, the pair of guide ribs 17 are capable of moving within the guiding grooves 26 extending upwards and downwards along the raised platform on the top wall and bottom wall of the contactor housing 21, thus achieving accurate guiding of the coil terminal when being inserted.

[0047] To continue, a detailed description of the seal cover 3 according to this invention is provided in conjunction with figure 4.

[0048] In order to avoid the detrimental effects of contact between the external environment and the electrical components within the contactor housing 21, and what is more, prevent erroneous connection of cables to the contactor 2 by the user and to increase electrical clearance, this invention furthermore provides a contactor housing 21 socket seal cover 3 capable of clip-on connection with the contactor housing 21. As depicted in the drawings, the seal cover 3 has an overall thin plate shape and in a preferred arrangement is molded in one piece from corrosion resistant, electrically insulating, ageing-resistant engineering plastic. There are a pair of seal cover feet 32 that extend out upwards along the z direction on one side of the surface of the seal cover 3 facing upwards in the z direction. The seal cover feet in a preferred arrangement being formed in one-piece with the seal cover 3, of course it is also possible that they are individual components connected to the seal cover 3. In order to achieve a tight fit between them and the socket 23 of the contactor housing 21, the cross-sectional size of the seal cover feet 32 is basically the same as the cross-sectional size of the corresponding socket 23.

[0049] Furthermore, as shown in figure 4, there are two raised side sections 31 provided protruding towards the exterior on the left and right side of the seal cover 3 along the y direction, and the raised side sections 31 may be components formed in one piece with the seal cover 3, although of course they can be individual components connected to the seal cover 3. In this embodiment, the raised side sections 31 are formed in a manner that, when the seal cover 3 is inserted into the contactor, their profiles interlock with the recessed side slots 22 of the contactor housing 21. In this manner, as a result of the profiles interlocking, it is possible to prevent movement of the contactor housing 21 relative to the seal cover 3 when the seal cover 3 is inserted into the contactor.

[0050] What is more, as shown in figure 4, there is a pair of guide ribs 33 provided on the side surfaces of the seal cover 3 on the back side along the x direction, and in a preferred arrangement said guide ribs 33 are formed in one piece with the seal cover 3 and are parallel to each other. In an even more preferable arrangement, the guide ribs 33 extend for the full thickness of the seal cover 3. As shown in figure 1, when the seal cover 3 is inserted into the contactor 2, the pair of guide ribs 33 are capable of moving within the guiding grooves 26 extending upwards and downwards along the raised platform on the top wall and bottom wall of the contactor housing 21, thus accurately guiding the seal cover when inserted aiding in guiding the seal cover feet 32 of the seal cover when inserted into the socket 23 of the contactor housing 21.

[0051] The following is a detailed description of the installation for installing the pluggable coil terminal according to this invention on the contactor in conjunction with figures 5 to 8.

[0052] Firstly, figure 8 is a depiction of the state when the coil terminal 1 and the seal cover 3 are inserted into the contactor 2.

[0053] As shown in figure 8, the connecting cable screws 13 of the coil terminal 1 for the purpose of achieving its electrical connection to an external power supply face the front side, the result of this being that they are convenient for the purpose of the user carrying out cable connection operations, at the same time, due to the disposition of the connecting cable screws 13 being on the front side, it is possible to design the height of the coil terminal 1 in a manner whereby it is no taller than the overall height of the contactor housing 21, which is of particular significance in terms of close fitting installation of the contactor 2. Furthermore, although not depicted in figure 8, the fact that it is possible to carry out sealing and covering by inserting a seal cover 3 in the bottom of the contactor 2, it is possible to reduce the detrimental effects of the external environment (dampness, dust etc.) on the interior of the contactor 2, while also reducing the likelihood of incorrect operation occurring when operators carry out connection of cables.

[0054] When carrying out installation, as is shown in figures 1 and 8, first the coil terminal 1 and the seal cover 3 are installed on the top and the bottom of the contactor 2 and the connecting legs of the coil terminal 1 and the seal cover feet of the seal cover 3 are lined up with the corresponding sockets, and in a preferred arrangement, this is achieved by relying on the guide ribs of the coil terminal 1 and the seal cover 3. When it is necessary to carry out installation, due to the operator exerting pressure downwards on the coil terminal 1, the raised side sections 14 on the two sides of the

coil terminal 1 press on the recessed side slots 22 on the corresponding side walls of the contactor housing 21. The nature of the material of the side walls of the contactor housing 21 is such that, due to the effects of the raised side sections 14, and the side walls being capable of expansion in an outward manner towards the two sides, in this manner, as the raised side sections 14 are subjected to pressure, they push open the recessed side slots 22, thus engaging within the recessed side slots 22. Once the raised side sections 14 are completely located within the recessed side slots 22, the operator releases the pressure on the coil terminal 1, the result of which is that due to the natural rebound effect of the material of the side walls of the contactor housing 21, these return to their initial position causing the raised side sections 14 to lock into the recessed side slots 22, thus preventing movement of the contactor housing 21 relative to the coil terminal 1. Based on more or less the same structures, it is possible for operators to achieve insertion of the seal cover 3 into the contactor housing 21 via more or less the same operations, locking together preventing movement of the contactor housing 21 relative to the seal cover 3.

[0055] As shown in figure 5, once installed by insertion, the connecting legs 16 of the coil terminal 1 are inserted within the socket 23 of the contactor housing 21.

[0056] Preferably, by designing the cross-sectional size of the connecting legs 16 and the corresponding socket 23 to be more or less the same, the effect of the socket 23 walls pressing and connecting in the x coordinates axis and the y coordinates axis as shown in figure 5 achieves restriction of relative movement, which furthermore ensures the secure and stable placement of the coil terminal 1 within the contactor 2. What is more, as shown in figure 5, said connecting legs 16 can form a conductive connection interference fit via electrical connecting strips 161 provided on the clip slots 162 provided thereon with the terminal lugs 25 on the end sections located on the top of the coil framework 24, which is furthermore beneficial in terms of preventing accidental pulling out of the coil terminal 1 in an upward or downward direction. Due to there being electrical connecting strips on the surfaces of the clip slots 162 for the purpose of achieving a conductive connection with the corresponding terminal lugs, a conductive connection due to their profiles interlocking is created between the coil terminal 1 and the coil framework 24. Once a state of conductive connection exists, by introducing current to the coil 27 provided on the coil framework 24, the expected control of operation of the contactor 2 is achieved. Furthermore, at the bottom of figure 5 the seal cover in installed state is shown.

[0057] In order to better describe the conductive connection interlocking between the profiles of the coil terminal 1 and the coil framework 24, figures 6 to 7 depict views where the contactor housing 21 and other such components have been removed. As shown in figures 6 to 7, the coil framework 24 is provided with a pair of terminal lugs 25 at its top end and its bottom end respectively, this being beneficial in terms of insertion of the coil terminal 1 from the bottom or from the top, thus allowing flexible allocation of coil terminals 1 and forming the conductive connection of the interlocking profiles. What is more, in figure 7 the interference fit between the clip slots 162 of the connecting legs 16 of the coil terminal and the terminal lugs 25 on one side of the coil framework 24 is shown clearly, and furthermore it is possible to achieve the conductive connection between the interlocking profiles of the coil terminal and coil framework 24 via the electrical connecting strips which are not shown.

[0058] Figures 9 to 10 respectively are a 3-dimensional depiction of the coil terminal 1 installed from the bottom of the contactor 2 and a 3-dimensional depiction of the coil terminal 1 already installed on the contactor 2 from the bottom. Whereby, figure 9 depicts the connecting legs 16 of the coil terminal 1, the connecting legs 16 being for the purpose of insertion into the contactor 2 from the bottom finally achieving a conductive connection between the interlocking profiles of the coil terminal 1 and the contactor 2. Furthermore, figures 9 to 10 depict the seal cover 3 installed from the top of the contactor 2 and its raised side sections 31. Due to the locking together between the raised side sections 31 and the recessed side slots 22 of the seal cover 3, installation of the seal cover 3 on the contactor housing 21 is achieved and relative movement between the two prevented, and this process of insertion can be carried out more effectively via the guiding grooves 26 shown in figure 9.

[0059] In figure 10, as shown, the seal cover 3 has already been installed on the top of the contactor 2, and in a corresponding fashion, the coil terminal 1 has already been installed on the bottom of the contactor 2. The coil terminal 1 can lock into the recessed side slots on the side wall of the contactor housing 21 due to its own raised side sections 14, it can also lock into the position limiting clip slots on the housing wall of the contactor 2 via the push rod 15 or may have both.

[0060] From the above description, it may be appreciated that, compared to the traditional arrangement of the coil terminal being permanently installed on the contactor, it is possible with the contactor according to this invention to unplug the coil terminals directly from the contactor according to one's needs, it being possible furthermore to arbitrarily install them on the top end or bottom end of the contactor, which is very useful in terms of contactor installations in tight spaces. What is more, as the contactor is provided with ports on both the top and bottom ends, it is possible to consider installing intelligent expansion modules on the side on which the coil terminal isn't installed, which has major significance in terms of expanding contactor functionality.

[0061] It should be understood that, while this description is based on descriptions of all embodiments, not all embodiments consist of only a single independent technical scheme; the adoption of this descriptive approach in the description is only for the sake of clarity, and a technician skilled in the art should treat the description as an integral whole, it being

possible to combine the technical schemes of the various embodiments, in which manner other embodiments which could be understood by a technician skilled in the art would be possible.

[0062] The above descriptions are only a method of describing the specific embodiments of this invention, and in no way represent a restriction on the scope of this invention. Without departing from the conceptual framework and principles of this invention, a technician skilled in the art would be able to make like-for-like changes, modifications and combinations, and all shall fall within the scope of protection afforded this invention.

Claims

1. A type of pluggable contactor use coil terminal, it being possible to interchangeably insert said coil terminal into the contactor or unplug it from the contactor, whereby the contactor comprises a coil framework and a plurality of first coupler sections disposed in positions at the plurality of end sections of said coil framework respectively, the plurality of first coupler sections being conductively connected with the coil disposed on the coil framework;
   wherein, said coil terminal comprises: a second coupler section protruding in the direction of one side from the coil terminal, such that when the coil terminal is inserted into the contactor, the second coupler section is capable of forming a conductive connection with any first coupler section within the coil framework due to their profiles interlocking.

2. The coil terminal according to claim 1, wherein said first coupler section is a pair of terminal lugs extending outwards from the end section of said coil framework, the second coupler section being a pair of connecting legs of the coil terminal, the paired connecting legs both being comprised of clip slots forming an integral part of the connecting legs and which are such that when the coil terminal is inserted into the contactor, the corresponding terminal lugs form an interference fit thus achieving conductive connection with the electrical connecting strips.

3. The coil terminal according to claim 1, wherein said contactor also comprises a contactor housing on which a socket is disposed for the insertion of said coil terminal, the coil terminal being comprised of a coil terminal cover and a coil terminal base, there also being a clamping structure between the contactor housing and the coil terminal whereby when the coil terminal is inserted into the contactor, movement of the contactor housing relative to the coil terminal is prevented.

4. The coil terminal according to claim 3, wherein said clamping structure comprises:

   two first clamping sections which are disposed symmetrically on the two opposing end sections of said contactor housing; and,
   second clamping sections disposed on the two sides of the base of said coil terminal, whereby when the coil terminal is inserted into the contactor, the profiles of the second clamping sections and the first clamping sections interlock.

5. The coil terminal according to claim 4, wherein said first clamping sections are disposed on two opposing side walls of said contactor housing, being a pair of recessed side slots forming an integral part of the contactor housing, the second clamping sections being a pair of raised side sections formed integrally on the coil terminal base.

6. The coil terminal according to claim 3, wherein
   there are two position limiting clip slots which are disposed symmetrically on the two opposing end section side walls of said contactor housing; and
   there is a push rod disposed in a manner allowing its relative movement between said coil terminal cover and said coil terminal base, the push rod being capable of movement between the bias voltage position and its retracted position; when the coil terminal is inserted into the contactor, when the push rod is in its bias voltage position its profile interlocks with the position limiting clip slot.

7. The coil terminal according to any aspect of claims 3 to 6, wherein it also comprises:

   a pair of guiding grooves disposed on the housing of said contactor; and,
   a pair of guide ribs, on the side surfaces of said coil terminal forming an integral part of the base of the coil terminal, whereby the guide ribs and the guiding grooves interact to guide the insertion of the coil terminal into the socket of the contactor housing.

8. The coil terminal according to any aspect of claims 3 to 6, wherein said contactor also comprises a seal cover which connects by clipping onto said contactor housing for the purpose of sealing the contactor housing, whereby the seal cover possesses a pair of seal cover feet extending outwards from one side of the seal cover, the cross-sectional size of the seal cover feet being basically identical to the cross-sectional size of the corresponding socket; there is also a clamping structure disposed between the contactor housing and the seal cover, which prevents movement of the contactor housing relative to the seal cover when the seal cover is inserted into the contactor.

9. The coil terminal according to claim 8, wherein, this also comprises:

a pair of guiding grooves disposed on the housing of said contactor; and,
a pair of guide ribs, on the side surfaces of said seal cover, whereby the guide ribs and the corresponding guiding grooves interact to guide the insertion of the seal cover into the socket of the contactor housing.

10. The coil terminal according to any aspect of claims 3 to 6, wherein there are connecting cable screws in the position of said coil terminal cover for the purpose of causing electricity to flow through the coil terminal.

11. A type of coil terminal installation method, whereby said coil terminal is the pluggable coil terminal for contactor use according to any aspect of claims 1 to 10, wherein the coil terminal is inserted into the contactor, a conductive connection being established due to the profiles of the second coupler sections and any first coupler section within the coil framework interlocking.

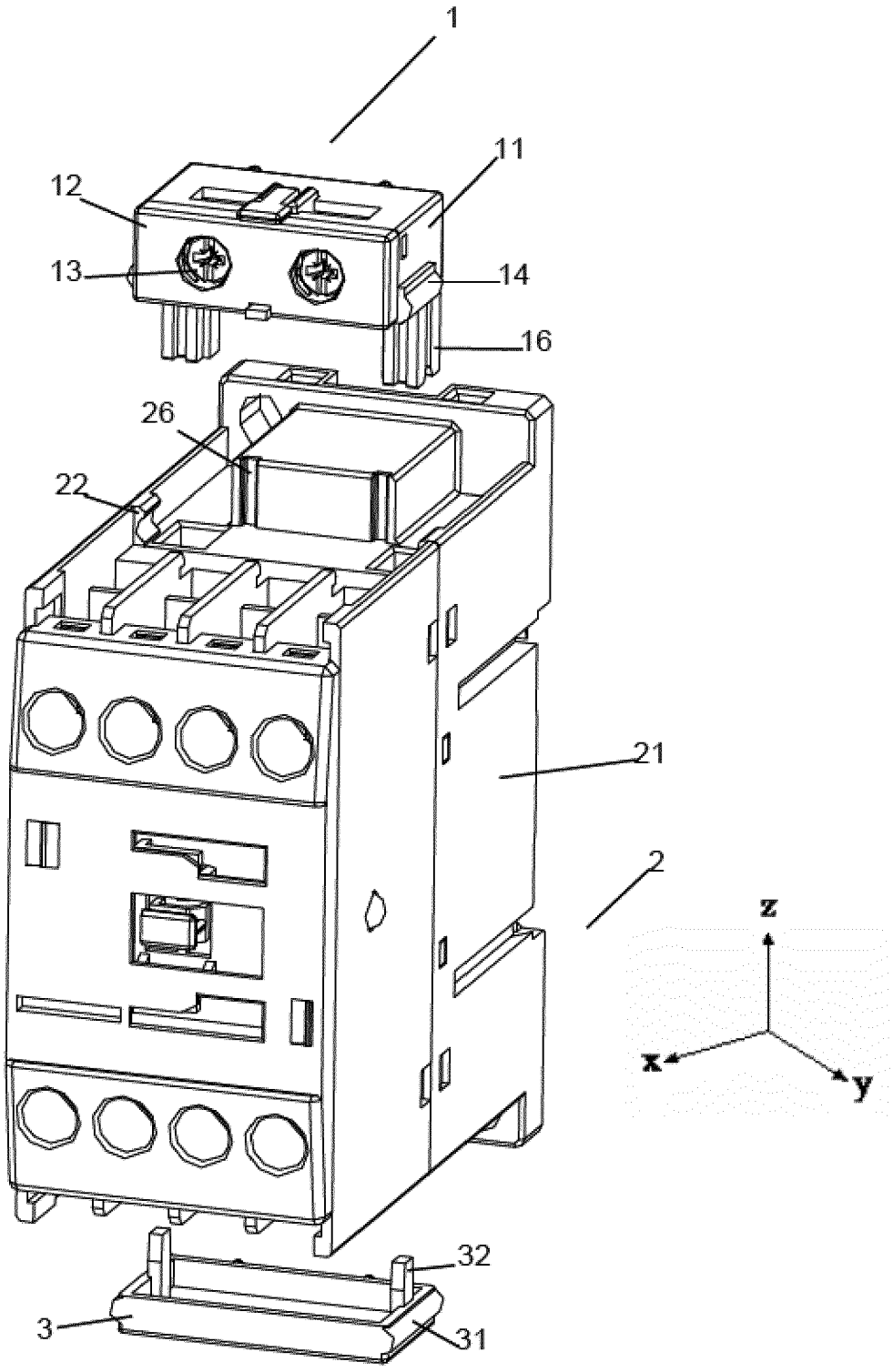

Fig. 1

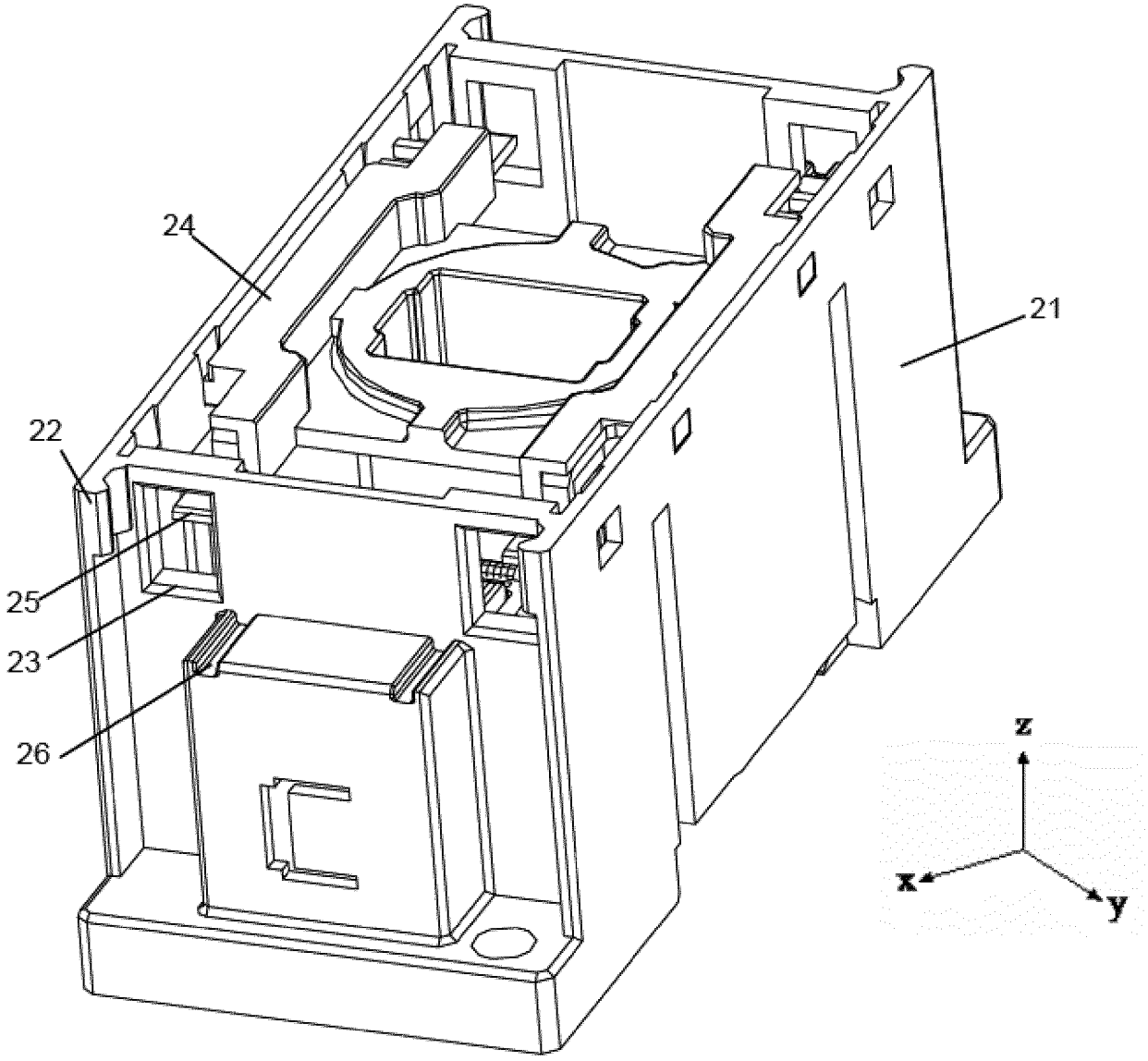

Fig. 2

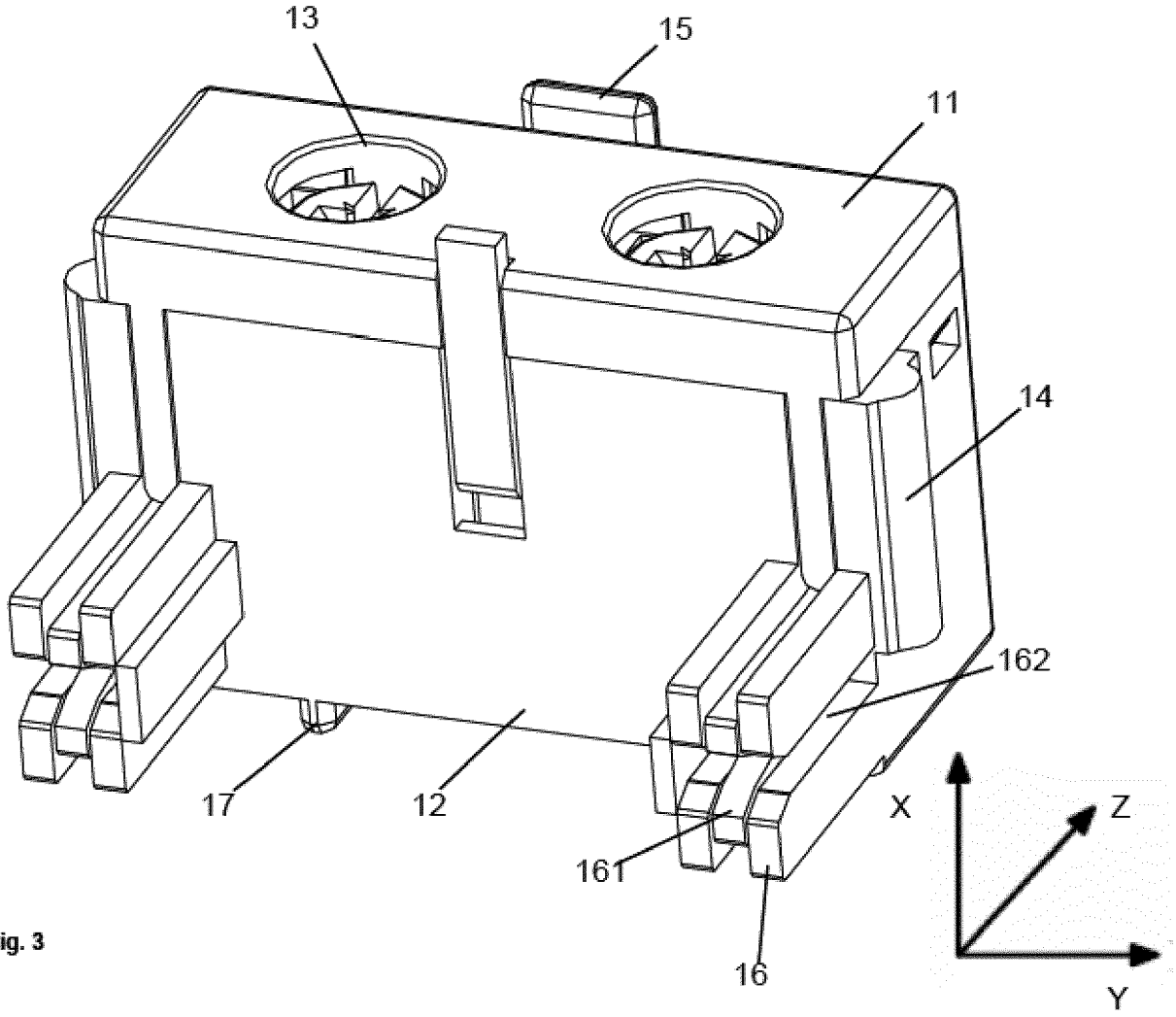

Fig. 3

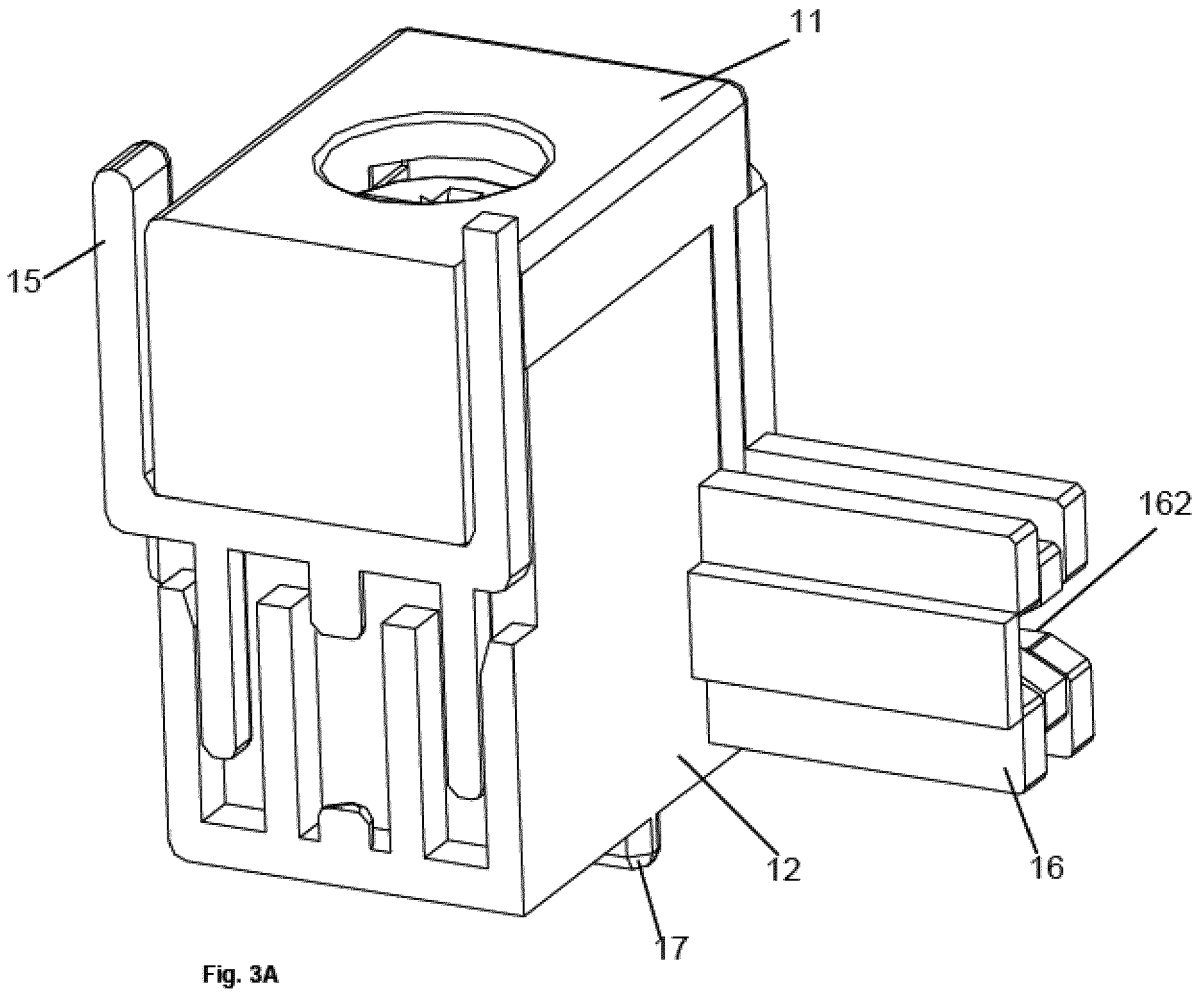

Fig. 3A

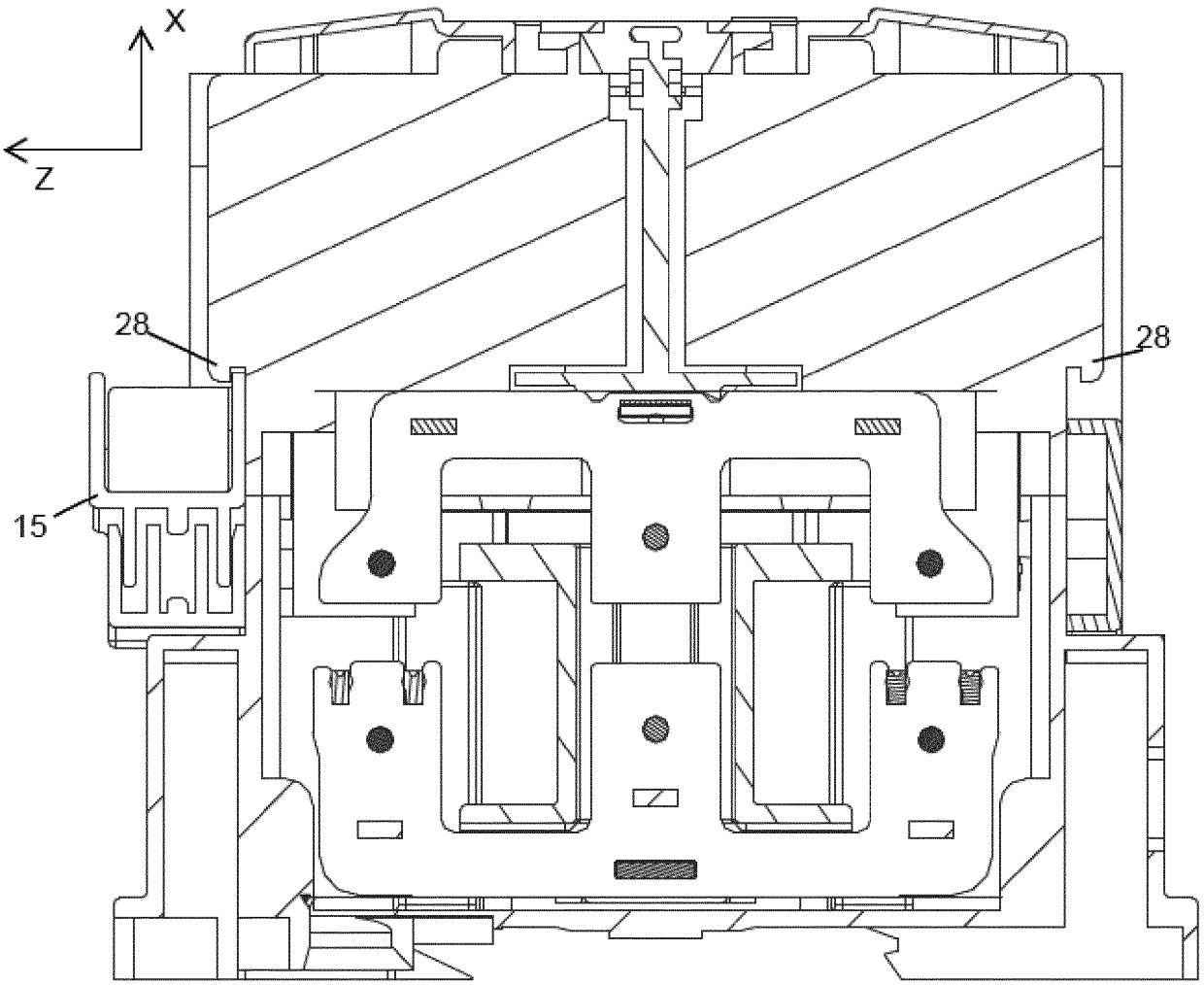

Fig. 3B

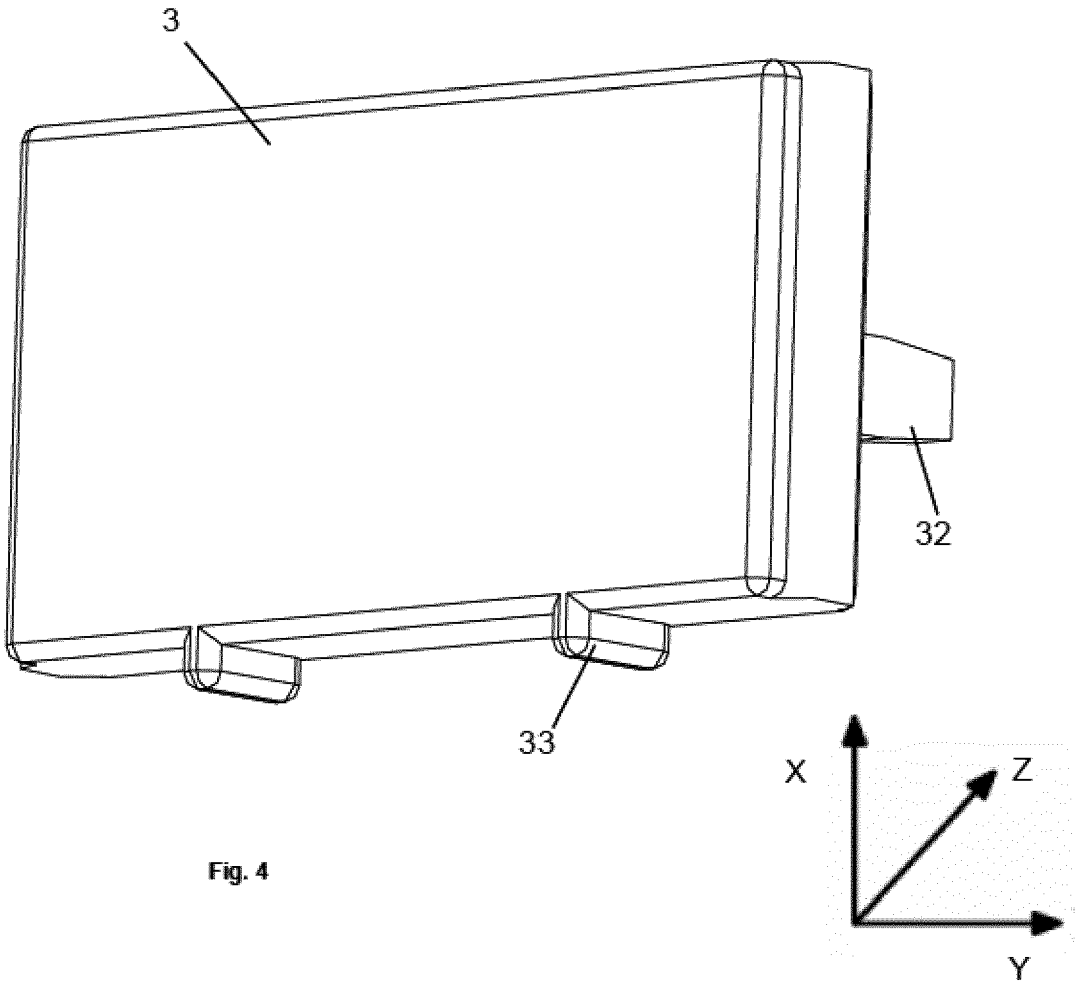

Fig. 4

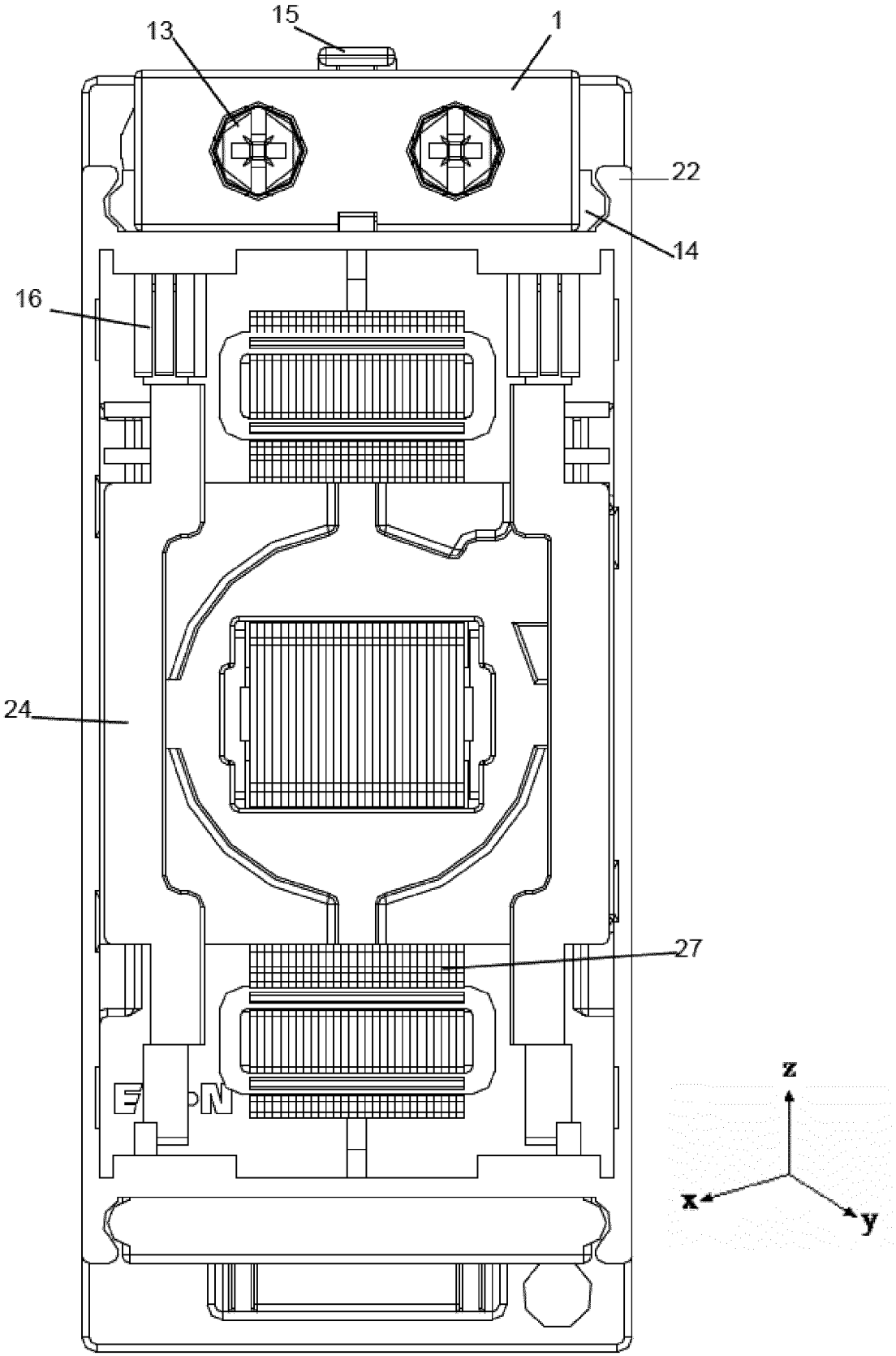

Fig. 5

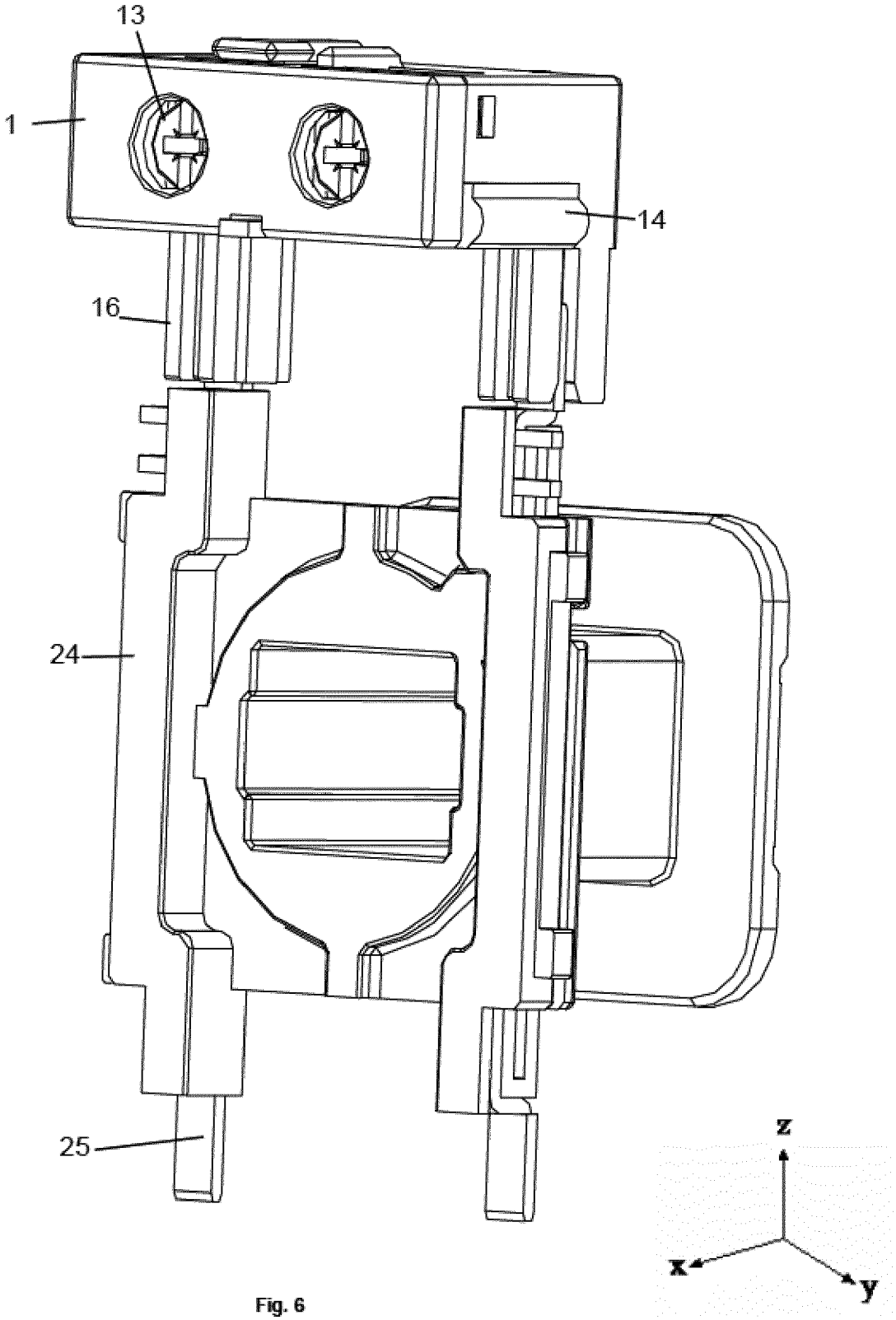

Fig. 6

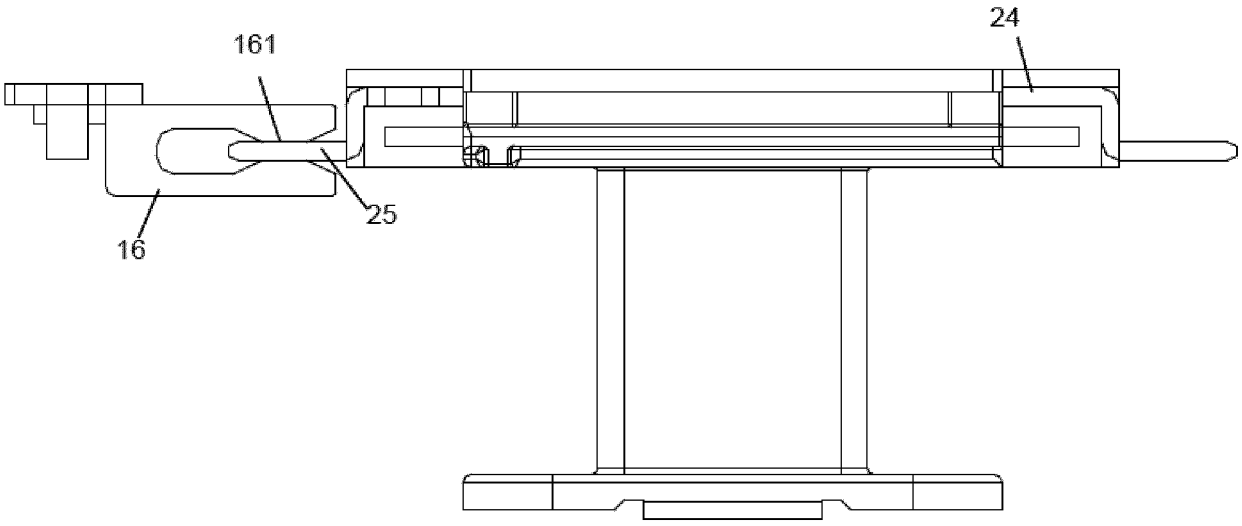

Fig. 7

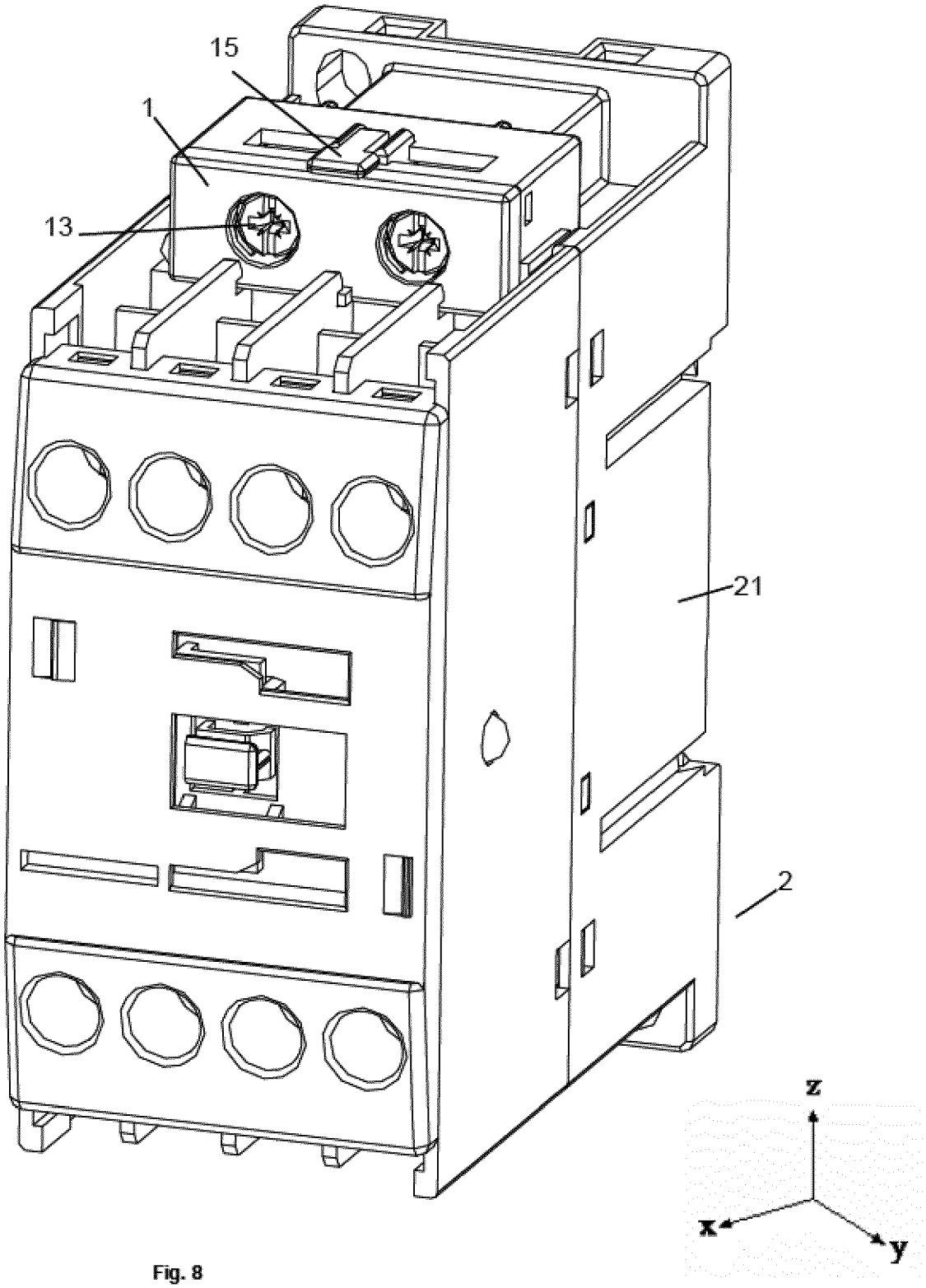

Fig. 8

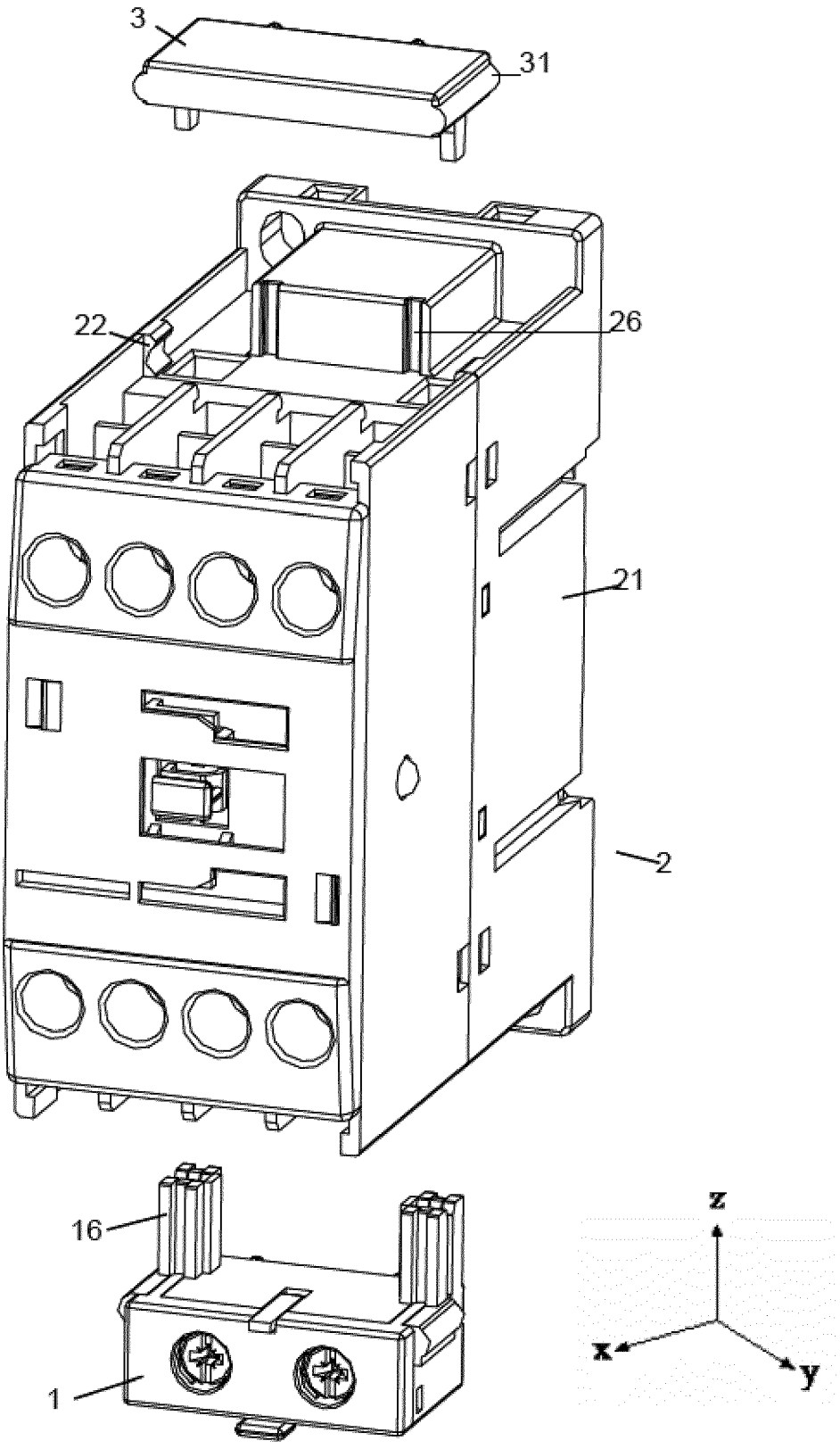

Fig. 9

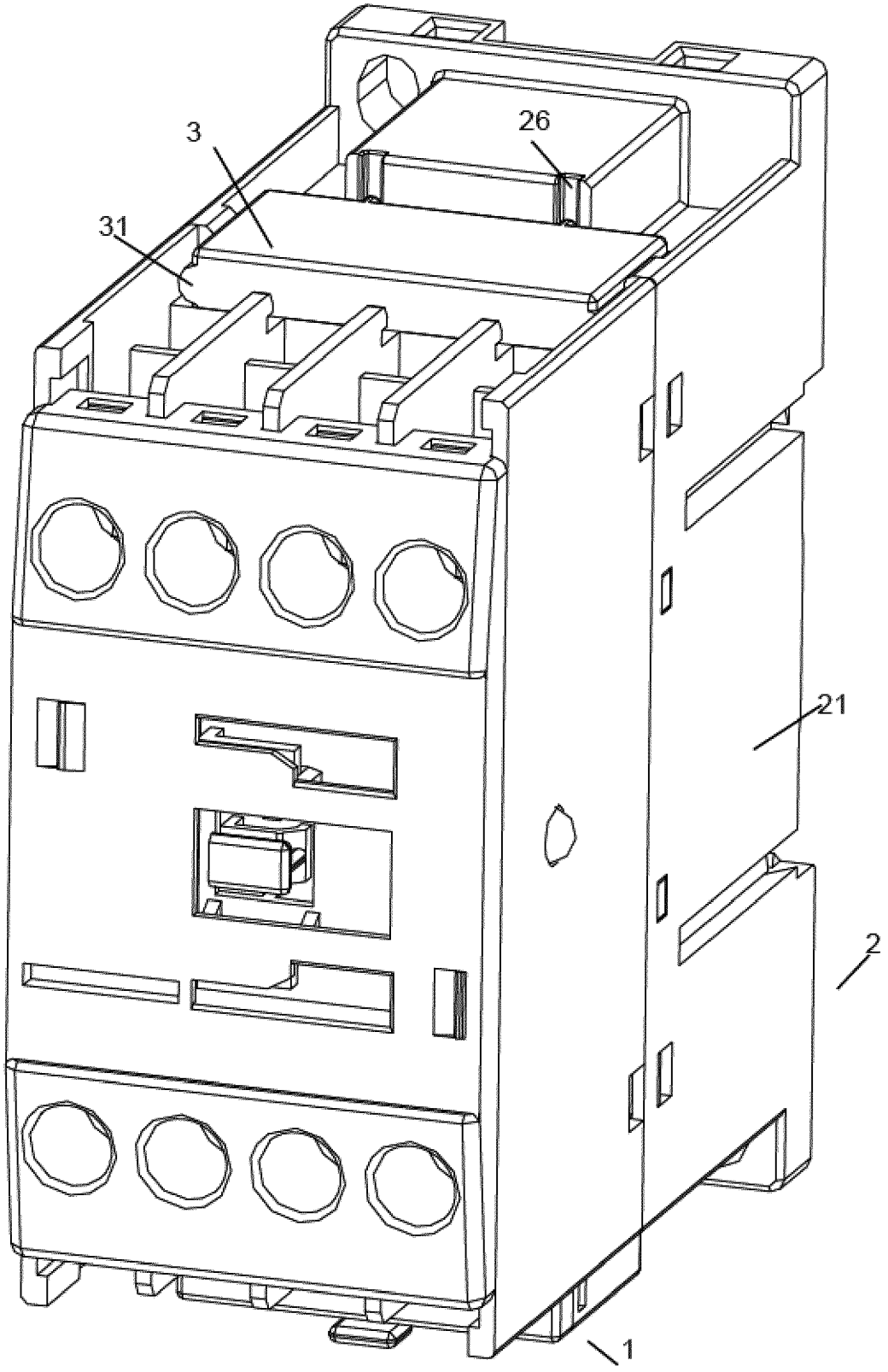

Fig. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 18 21 2819

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2008/106362 A1 (PORTIER ALAIN [FR]) 8 May 2008 (2008-05-08) * paragraphs [0043] - [0051], [0057] - [0059]; figures 1-7 *	1-11	INV. H01H50/44 H01H50/14 ADD. H01R9/24 H01R4/30 H01R13/44 H01R13/627

TECHNICAL FIELDS SEARCHED (IPC)
H01H
H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 May 2019	Meyer, Jan

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08-05-2019

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