



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

0 447 417 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **13.07.94** (51) Int. Cl.⁵: **H01H 71/00**

(21) Application number: **89913070.2**

(22) Date of filing: **27.10.89**

(86) International application number:
PCT/DK89/00253

(87) International publication number:
WO 90/05375 (17.05.90 90/11)

(54) **A MULTI-POLE SWITCH COMPRISING A TRIPPING MODULE.**

(30) Priority: **10.11.88 DK 6285/88**

(43) Date of publication of application:
25.09.91 Bulletin 91/39

(45) Publication of the grant of the patent:
13.07.94 Bulletin 94/28

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

(56) References cited:
EP-A- 0 179 482
FR-A- 2 516 699
SE-B- 448 412
US-A- 4 481 492

(73) Proprietor: **HOLEC SYSTEMEN EN COMPONENTEN B.V.**
Tuindorpstraat 61
NL-7555 CS Hengelo(NL)

(72) Inventor: **MAROT, Lajos K.D.**
Cedervaenget 13
DK-2830 Virum(DK)
Inventor: **BORGESSEN, Egon Engelbrecht**
Højlandsvangen 30
DK-2700 Bronshøj(DK)

(74) Representative: **Larsen, Anna et al**
c/o Chas. Hude,
H.C. Andersens Boulevard 33
DK-1553 Copenhagen V (DK)

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid (Art. 99(1) European patent convention).

Description

Technical Field

The invention relates to a multi-pole, power switch comprising a plurality of switch sections, i.e. one switch section per pole, wherein each switch section comprises a set of fixed and a set of movable contacts, and a section for mechanical operation which causes a longitudinal displacement of a bar member along its own longitudinal axis, said bar member extending through all the sections, the movable contacts in each section being secured to said bar member, said bar arranged so that the movable contacts are displaced towards and away from surfaces of the fixed contacts for the IN and OUT movement respectively, and wherein the section for mechanical operation comprises a toggle mechanism with a toggle spring ensuring both a quick make and a quick break of the circuit irrespective of the manual operation when the dead point of said toggle mechanism has been passed, wherein the toggle mechanism engages a shaft tube which is rotatable by means of a square shaft with a handle, and wherein a toggle joint pivot of said toggle mechanism engages said bar member, and wherein means are provided for tripping the switch, said tripping means comprising a trip mechanism for the disconnection of the contacts in each switch section under excess current conditions, including spring means for storing energy to be released during the tripping action, and further said tripping means being arranged to be activated by a signal through a gate.

Background Art

Heavy current switches of the above type are inter alia known from the applicant's EP-A-0.188.258 and 0.179.482, the latter of which forms the basis for the preamble of claim 1, disclosing a heavy current, low voltage switch constructed to quick make and quick break of currents in the order of 125-1600 Amps, and from FR-A-2,516,699 showing a heavy current switch of similar kind.

Further electric switches having trip devices are known from the US-PS Nos. 4,631,507, 4,481,492, 4,213,109, DE-PS No. 2,717,444, Swedish printed accepted application No. 448,412, EP-A2-0,156,184 and EP-A1-0,185,107.

Disclosure of Invention

According to the invention a switch of the type mentioned in the preamble is provided, said switch being characterised in that the section for mechanical operation comprises an opening or recess able to receive a tripping module, and that a tripping

module is provided, being receivable in said opening and comprising the entire trip mechanism, and in that the shaft tube extends through the tripping module and is adapted to engage said tripping module.

Thereby the tripping module can be inserted over the shaft tube, said shaft tube extending from the mechanical section and protruding through an opening provided for this purpose in the tripping module. In this manner it is easy to insert a tripping module into a switch without such a tripping module.

As a result, a particularly compact switch is obtained, whereby the switch may or may not include the tripping function. The modular structure allows a delivery of switches with or without the tripping module according to the need of the customers. In addition, the modular structure presents great advantages with respect to storage and production because the same switch type can be used irrespective of whether the switch is to be delivered with or without the tripping module.

The switch is preferably characterised in that the spring means for the storage of mechanical energy for effectuation the tripping process can be compressed by a manual rotation of the handle shaft (46). In this manner the tripping module can be actuated during the "switching on" or closing of the switch in such a manner that the energy storing spring of the tripping module is compressed and consequently ensures a storing of energy which is sufficient for forcibly turn the switch off or "open" the switch, if necessary.

The switch is preferably of the type wherein the toggle joint is displaced along a circular arc during the switching-on or -off movement of the switch, and where a toggle joint pivot is extended into engagement with the bar member. According to the invention means are provided for disengaging the toggle joint pivot and the bar member during a disconnection (switching off) of the switch caused by the tripping module. As a result, the energy stored in the energy storing spring of the tripping module is only used for displacing the bar member and the contacts mounted on said bar member, whereas the toggle joint pivot, the toggle mechanism, the shaft tube, and the handle are not actuated (affected) or only actuated (affected) to a minor degree.

In a preferred embodiment according to the invention, the tripping module is included in a switch housing composed of two substantially identical halves, which presents great advantages with respect to production and storage. The actuation (operation) section of the switch housing is according to the invention preferably such that the mechanical actuation (operation) mechanism is included in an actuating (operation) module, which apart

from the protruding shaft tube is of substantially the same dimensions as the tripping module and is mounted by inserting said actuating (operation) module into the bottom portion of the switch housing through the opening. Such a modular structure provides flexibility, i.e. the switch housing can be turned and always mounted in the best possible manner according to the local circumstances.

According to the invention the tripping module is preferably situated between two switch sections, which implies that the bar displacing force is applied close to the centre of the bar member, said centre being the most rational point of application because the ideal point of application of a translatory force actuation on a body is the centre of gravity of said body.

Brief Description of Drawings

The invention is described in greater detail below with reference to the accompanying drawings, in which

Fig. 1 illustrates a switch mounted with an actuating mechanism, a tripping mechanism, and an excess current relay,

Fig. 2 is an exploded view of the switch of Fig. 1,

Fig. 3 illustrates the bottom portion of the switch, said portion including the actuating mechanism,

Fig. 4 illustrates the portion of Fig. 3 provided with bar member and movable contacts, and

Fig. 5 illustrates the top portion of the switch, said portion including the tripping module.

Best Mode for Carrying Out the Invention

The switch of Figs. 1 to 5 comprises a switch housing with a bottom portion 10 and a top portion 20, said portions preferably being identical. The switch further comprises a bar member 30 which in the embodiment shown is formed as an almost rectangular plate with openings receiving the movable contacts 36, which only appear from Fig. 4, as well as a shaft tube 42, a square shaft 46 displaceable inside the shaft tube 42 into a suitable position in which it is locked, and a handle 48.

With respect to its operational function the switch housing is divided into a switch section 21, an actuation (operation) section 22, a switch section 23, and the switch section 24 when seen from the left to the right of the drawing.

Fig. 3 illustrates the switch chambers 31, 33, and 34 with their respective set of fixed contacts 41, 43, 44 and extinguishing metal plates 51, 53, 54. An actuating mechanism 40 with a shaft tube 42 constitutes the mechanical actuation (operation) 22 allowing by means of the square shaft 46 (Fig 2)

with the handle 48 a control of the position of the bar plate 30 and consequently of the movable contacts 36 in such a manner that the switch can be connected and disconnected (switched on and off) according to desire. The shaft tube is preferably a hollow, square tube and/or of a U-shaped profile of a cross section forming three of the sides of a square. The actuating mechanism 40 is built in a manner known per se as a toggle mechanism with a spring-loaded toggle joint. Fig. 3 only illustrates the extended toggle joint pivot 52 adapted to engage the bar plate 30 mounted thereabove.

Fig. 4 illustrates the same bottom portion 10 with the bar plate 30 and roller contacts 36. An oblong hole 32 is provided for the shaft tube 42 in such a manner that the bar plate 30 with the roller contacts 36 can reciprocate during the disconnection (switching off) and the connection (switching on). A stop 37 projects from the bar plate 30 and into the tripping module 50 so as thereby to be actuated by the disconnecting means of the tripping module. These disconnecting means can be shaped in many ways.

Fig. 5 illustrates the tripping module 50 included in the actuation (operation) section 22 of the top portion 20. Fig. 5 shows in addition that in principle all the switch chambers 31, 33, 34 can be identical both in the top portion and in the bottom portion.

The device 60 shown in Figs. 1 and 2 may be an excess current relay transmitting a signal current to the tripping module 50 in case of an excess current.

The switch operates in the following manner. Usual connection is established by turning the handle 48 and consequently the shaft tube 42, whereby the toggle mechanism is compressed. The rotation of the shaft tube is transferred through the toggle joint pivot 52 of the toggle mechanism to a translatory displacement of the bar plate 30 and the roller contacts 36 mounted thereon. During the connecting movement and preferably during the last portion of said movement the rotation of the shaft tube is utilized for compressing the energy storing spring of the tripping module. The latter procedure is possible because the shaft tube extends through the tripping module so as therein to engage means compressing the spring. As a result, the tripping module is always compressed and consequently capable of disconnecting the switch as soon as said switch is connected.

A manual disconnection is carried out by turning the handle 48 and consequently the shaft tube 42 in the opposite direction compared to previously, whereby the toggle mechanism is compressed like previously and forces - when a dead point of the toggle mechanism has been passed - the bar plate back into the disconnected position.

A disconnection caused by an excess current is actuated by the tripping module according to the following procedure. In response to an excess current a relay 60 transmits a signal to the tripping module 50. The signal actuates activating means in the tripping module so as to activate release means, which in turn release the energy storing spring. When released the energy storing spring pushes the bar plate 30 away from the connecting position and into the disconnected position. The toggle joint pivot engages the bar plate in such a manner that by means of a spring-loaded ratchet or inclined chamfered surface the bar plate can pass freely back to its disconnected position, i.e. not engaging the toggle joint pivot 52.

Claims

1. A multi-pole power switch comprising a plurality of switch sections (21, 23, 24), i.e. one switch section per pole, wherein each switch section comprises a set of fixed (41,43,44) and a set of movable contacts (36), and a section (22) for mechanical operation which causes a longitudinal displacement of a bar member (30) along its own longitudinal axis, said bar member (30) extending through all the sections (21, 23, 24), the movable contacts (36) in each section being secured to said bar member (30), said bar member arranged so that the movable contacts (36) are displaced towards and away from surfaces of the fixed contacts (41,43,44) for the IN and OUT movement respectively, and wherein the section (22) for mechanical operation comprises a toggle mechanism with a toggle spring ensuring both a quick make and a quick break of a current irrespective of the manual operation when the dead point of said toggle mechanism has been passed, wherein the toggle mechanism engages a shaft tube (42) which is rotatable by means of a square shaft (46) with a handle (48), and wherein a toggle joint pivot (52) of said toggle mechanism engages said bar member (30), and wherein means are provided for tripping the switch, said tripping means comprising a trip mechanism for the disconnection of the contacts (41, 43, 44 36) in each switch section under conditions of excess current, including spring means for storing energy to be released during the tripping action, and further said tripping means being arranged to be activated by a signal through a gate, **characterised** in that the section (22) for mechanical operation comprises an opening (12) able to receive a tripping module (50), that a tripping module (50) is provided, being receivable in said opening (12) and comprising the

entire trip mechanism, and in that the shaft tube (42) extends through the tripping module (50) and is adapted to engage said tripping module (50).

2. A multi-pole switch as claimed in claim 1, **characterised** in that the spring means for the storage of mechanical energy for effectuation the tripping process can be compressed by a manual rotation of the handle shaft (46).
3. A multi-pole switch as claimed in claim 1 or 2, wherein the toggle joint is displaced along a circular arc during the switching-over movement of the switch, **characterised** in that means are provided for disengaging the toggle joint pivot (52) and the bar member (30) during a disconnection of the switch caused by the tripping module (50).
4. A multi-pole switch as claimed in claim 1, 2 and/or 3, **characterised** in that the switch comprising the tripping module (50) is composed of two substantially identical halves (10,20).
5. A multi-pole switch as claimed in claim 4, **characterised** in that the operation section (22) of the switch is such that the mechanical operation mechanism is included in an operation module (40) which apart from the protruding shaft tube (42) is of substantially the same dimensions as the tripping module (50) and is mounted by inserting said operating module (40) into the bottom portion of the switch through the opening (12).
6. A multi-pole switch as claimed in any of the claims 1 to 5, **characterised** in that the section (22) for mechanical operation including the tripping module (50) is situated between two switch sections (21,23).

Patentansprüche

1. Mehrpoliger Leistungsschalter mit mehreren Schaltersektionen (21, 23, 24), d. h. mit einer Schaltersektion pro Pol, wobei jede Schaltersektion einen Satz feste (41, 43, 44) und einen Satz bewegliche Kontakte (36) aufweist, und mit einer Sektion für mechanische Betätigung, die eine Längsverschiebung eines Stabelements (30) entlang seiner eigenen Längsachse bewirkt, wobei das Stabelement (30) sich durch alle Sektionen (21, 23, 24) erstreckt, wobei die beweglichen Kontakte (36) in jeder Sektion an dem Stabelement (30) befestigt sind, wobei das Stabelement so angeordnet

ist, daß die beweglichen Kontakte (36) für die EIN- bzw. AUS-Bewegung zu den Oberflächen der festen Kontakte (41, 43, 44) hin bzw. von diesen weg verschoben werden, und wobei die Sektion (22) für die mechanische Betätigung einen Kipphebelmechanismus mit einer Kipphebelfeder aufweist, die nach Passieren des Totpunktes des Kipphebelmechanismus ein schnelles Einschalten und ein schnelles Ausschalten eines Stroms unabhängig von der manuellen Betätigung sicherstellt, wobei der Kipphebelmechanismus mit einem Wellenrohr (42) im Eingriff ist, das mittels einer Vierkantwelle (46) durch einen Handgriff (48) drehbar ist, und wobei ein Kipphebelgelenkzapfen (52) des Kipphebelmechanismus mit dem Stabelement (30) im Eingriff ist, und wobei Einrichtungen zum Auslösen des Schalters vorgesehen sind, wobei die Auslöseeinrichtungen einen Auslösemechanismus zum Trennen der Kontakte (41, 43, 44, 36) in jeder Schaltersektion bei Überstrom, mit einer Federeinrichtung zum Speichern von Energie, die bei dem Auslösevorgang freigesetzt wird, sowie weitere Auslöseeinrichtungen aufweisen, die so angeordnet sind, daß sie durch ein Signal über ein Gatter aktiviert werden,

dadurch gekennzeichnet, daß die Sektion (22) für mechanische Betätigung eine Öffnung (12) aufweist, die einen Auslösebaustein (50) aufnehmen kann, daß ein Auslösebaustein (50) vorgesehen ist, der in der Öffnung (12) untergebracht werden kann und den gesamten Auslösemechanismus einschließt, und daß das Wellenrohr (42) sich durch den Auslösebaustein (50) erstreckt und so eingerichtet ist, daß es mit dem Auslösebaustein (50) in Eingriff kommt.

2. Mehrpoliger Schalter nach Anspruch 1, dadurch gekennzeichnet, daß die Federeinrichtung zum Speichern von mechanischer Energie für die Ausführung des Auslöseprozesses durch eine manuelle Drehung der Welle (46) mit dem Handgriff zusammengedrückt werden kann.

3. Mehrpoliger Schalter nach Anspruch 1 oder 2, wobei das Kipphebelgelenk während der Umschaltbewegung des Schalters längs eines Kreisbogens verschoben wird, dadurch gekennzeichnet, daß Einrichtungen vorgesehen sind, um den Kipphebelgelenkzapfen (52) und das Stabelement (30) während einer durch den Auslösebaustein (50) bewirkten Öffnung des Schalters voneinander zu lösen.

4. Mehrpoliger Schalter nach Anspruch 1, 2 und/oder 3, dadurch gekennzeichnet, daß sich der Schalter mit dem Auslösebaustein (50) aus zwei im wesentlichen identischen Hälften (10, 20) zusammensetzt.

5. Mehrpoliger Schalter nach Anspruch 4, dadurch gekennzeichnet, daß die Betätigungssktion (22) des Schalters so beschaffen ist, daß die mechanische Betätigungseinrichtung in einem Betätigungsbaustein (40) enthalten ist, der bis auf das vorstehende Wellenrohr (42) im wesentlichen die gleichen Abmessungen aufweist wie der Auslösebaustein (50) und durch Einsetzen des Betätigungsbausteins (40) durch die Öffnung (12) in den Bodenabschnitt des Schalters montiert wird.

6. Mehrpoliger Schalter nach irgendeinem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß die Sektion (22) für mechanische Betätigung mit dem Auslösebaustein (50) zwischen zwei Schaltersektionen (21, 23) angeordnet ist.

Revendications

1. Un commutateur de courant à pôles multiples comprenant une pluralité de parties de commutateur (21,23,24) c'est-à-dire une partie de commutateur par pôle dans lequel chaque partie de commutateur comprend un groupe de contacts fixes (41, 43, 44) et un groupe de contacts mobiles (36) et une section (22) pour l'actionnement mécanique qui provoque un déplacement longitudinal d'un élément barre (30) le long de son propre axe longitudinal, ledit élément barre (30) s'étendant à travers toutes les parties (21, 23, 24), les contacts mobiles (36) dans chaque partie étant fixés audit élément barre (30), ledit élément barre étant agencé de sorte que les contacts mobiles (36) soient déplacés vers et à distance des surfaces des contacts fixes (41, 43, 44) pour le mouvement respectif vers l'intérieur et vers l'extérieur et dans lequel la partie (22) pour chaque actionnement mécanique comprend un mécanisme à rotule avec un ressort de rotule assurant à la fois un établissement rapide et une rupture rapide d'un courant indépendamment de l'actionnement manuel après le dépassement du point mort dudit mécanisme à rotule, dans lequel le mécanisme à rotule vient au contact d'un tube d'axe (42) qui est susceptible de tourner au moyen d'un arbre carré (46) avec une poignée (48) et dans lequel un pivot d'articulation à rotule (52) dudit mécanisme à rotule vient au contact dudit élément barre (30) et dans lequel des moyens sont prévus pour

- déclencher le commutateur, lesdits moyens de déclenchement comprenant un mécanisme de déclenchement pour la déconnexion des contacts (41, 43, 46, 36) dans chaque partie de commutateur sous des conditions de courant en excès comprenant un mécanisme à ressort pour emmagasiner de l'énergie à libérer pendant l'action de déclenchement et, en outre, lesdits moyens de déclenchement étant agencés pour être actionnés par un signal au travers d'une porte,
- caractérisé en ce que la partie (22) pour l'actionnement mécanique comprend une ouverture (12) apte à recevoir un module de déclenchement (50), en ce qu'un module de déclenchement (50) est prévu en étant susceptible d'être reçu dans ladite ouverture (12) et comprenant tout le mécanisme de déclenchement et en ce que le tube d'axe (42) s'étend au travers du module de déclenchement (50) et est agencé pour venir au contact dudit module de déclenchement (50).
2. Un commutateur à pôles multiples selon la revendication 1, caractérisé en ce que les moyens à ressort pour le stockage de l'énergie mécanique pour effectuer le processus de déclenchement peuvent être comprimés par une rotation manuelle de l'arbre de poignée (46).
3. Un commutateur à pôles multiples selon l'une des revendications 1 ou 2, dans lequel l'articulation à rotule est déplacée le long d'un axe circulaire pendant le mouvement de commutation du commutateur, caractérisé en ce que des dispositifs sont prévus pour désengager le pivot d'articulation à rotule (52) et l'élément barre (30) pendant une déconnexion du commutateur provoquée par le module de déclenchement (50).
4. Un commutateur à pôles multiples selon l'une des revendications 1, 2 ou 3, caractérisé en ce que le commutateur comprenant le module de déclenchement (50) est constitué de deux moitiés essentiellement identiques (10, 20).
5. Un commutateur à pôles multiples selon la revendication 4, caractérisé en ce que la partie d'actionnement (22) du commutateur est telle que le mécanisme d'actionnement mécanique est incorporé dans un module d'actionnement (40), qui à distance du tube d'axe faisant saillie (42) est essentiellement des mêmes dimensions que le module de déclenchement (50) et est monté en insérant ledit module d'actionnement (40) dans la partie inférieure du commutateur au travers de l'ouverture (12).
6. Un commutateur à pôles multiples selon l'une quelconque des revendications 1 à 5, caractérisé en ce que la partie (22) pour l'actionnement mécanique comprenant le module de déclenchement (50) est située entre deux parties de commutateur (21, 23).

Fig. 1

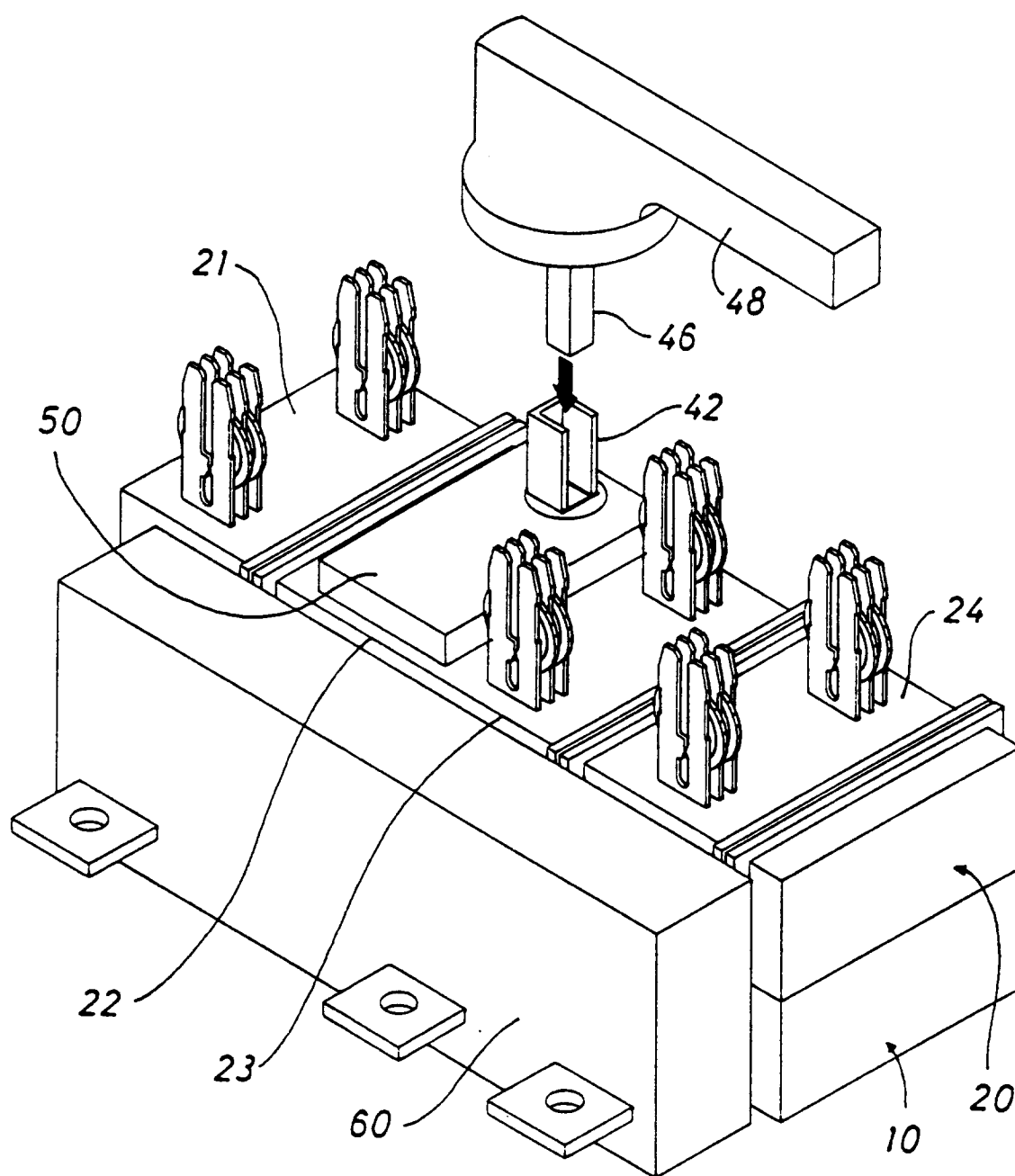
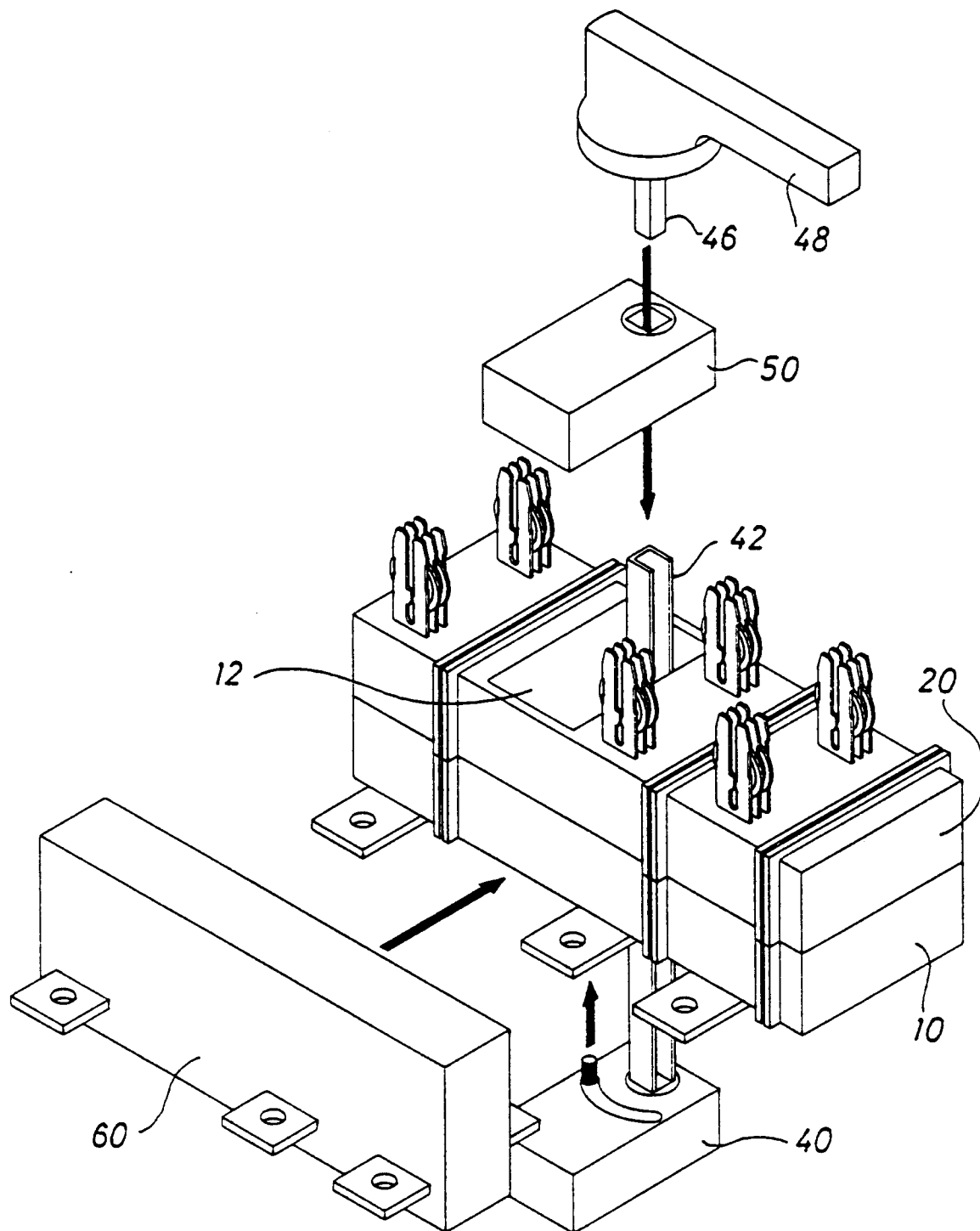


Fig.2



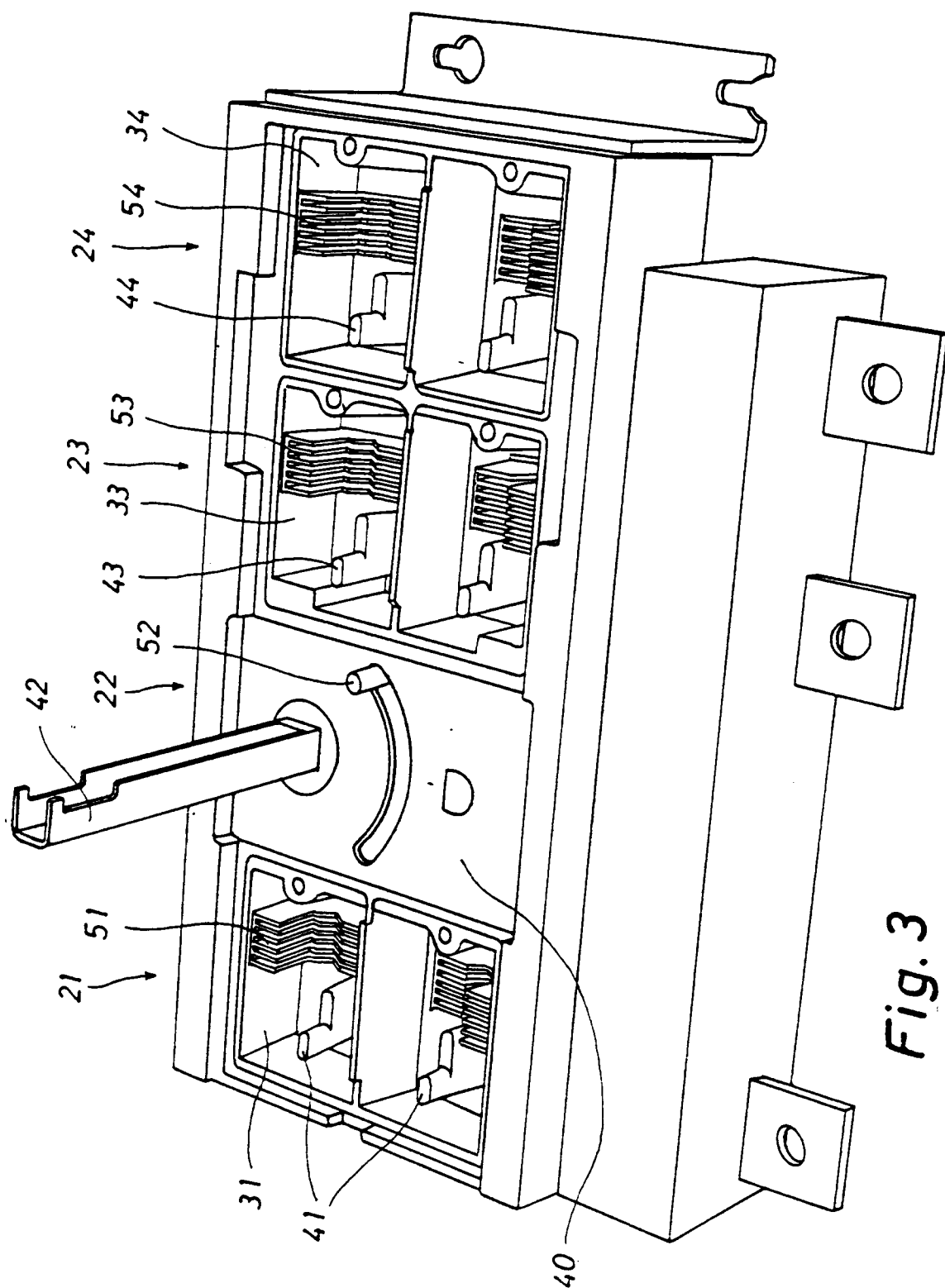


Fig. 3

