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(54) **MODULAR AUTOMATIC ELECTRIC BREAKER WITH OPTIMIZATION OF USED SPACES**

MODULSCHÜTZSCHALTER MIT OPTIMIERUNG DER BENUTZTEN RÄUME

DISJONCTEUR AUTOMATIQUE MODULAIRE AVEC OPTIMISATION DES ESPACES UTILISES

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Description

[0001] The present invention relates to a modular automatic electric breaker with optimization of used spaces.

[0002] It is known that electrical panels currently use automatic breakers and in any case components which have a substantially standardized external casing.

[0003] This module has a substantially flat box-like body which is 18 mm wide and has, to the rear, a means for coupling to an omega-shaped bar which is standardized according to DIN standards.

[0004] In the front part there is a protruding part where the actuation handle or lever is located.

[0005] This box-like casing is currently used to contain an automatic breaker which affects a single pole, so that in case of protection of two or more poles one uses modules, or in any case box-like components, whose width is proportional to the number of modules, starting from the 18-mm size for each pole.

[0006] EP-A-0325071 discloses such a modular electric protection device having one protected pole, and forms the base for the preamble of claim 1 of the present invention.

[0007] If differential breakers are combined, one obtains adjacent arrangements of other devices which can be directly integrated or constituted by separate modules and in any case maintain the characteristic of occupying a width unit for each pole.

[0008] This arrangement causes problems in some cases, both because the resulting electrical panels have considerable dimensions and therefore require significant construction work, and because mutual connection of the components can be complicated.

[0009] The aim of the invention is to eliminate the above described drawbacks. A further aim of the invention is to provide a modular automatic electric breaker with optimization of used spaces, which allows, while maintaining a box-like body which has a standardized external shape, to significantly reduce the spaces used internally, thus allowing to considerably reduce overall dimensions in the case of multi-pole protection devices.

[0010] An object of the invention is to provide an automatic electric breaker in which the dimensions entailed by the coupling of the various protection devices are practically halved, furthermore achieving a functional improvement, since by using kinematic disengagement systems which are smaller than conventional ones it is possible, by having reduced masses involved, to achieve higher movement speeds and therefore faster breaking of the generated electric arc.

[0011] A further object of the invention is to provide an automatic electric breaker which is particularly versatile and allows to introduce, in the standard width of the module, the magnetothermal protection of two poles or the thermal protection; it is also possible to use, for other functional parts, the empty spaces that become available by virtue of the new structural setup of the automatic electric breaker.

[0012] A further object of the invention is to provide an automatic electric breaker which, by virtue of its particular constructive characteristics, is capable of giving the greatest reliability and safety in use.

[0013] These aims, these objects and others which will become apparent hereinafter are achieved by a modular automatic electric breaker with optimization of used spaces, which includes a flat box-like body which has, on its rear face, a means for coupling to an omega-shaped guide and, on its front face, a central protrusion at which it is possible to access an actuation part, characterized in that it includes, inside the box-like body, at least one electrical protection part, at least one kinematic system for actuating the moving electrical contact, and at least one snuffer cell, which are mutually operatively interconnected and occupy no more than half of the internal volume formed by the box-like body.

[0014] Further characteristics and advantages will become apparent from the description of a preferred but not exclusive embodiment of a modular automatic electric breaker with optimization of used spaces, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Fig. 1 is a schematic side view of the electric breaker, showing the volume occupied by the components of the breaker;

Fig. 2 is a schematic view of the mutual arrangement of the components of the breaker;

Fig. 3 is a side view of the breaker, with a wall of the box-like body removed in order to show the components;

Fig. 4 is a front view of the electric breaker;

Fig. 5 is a top plan view of the electric breaker;

Fig. 6 is a schematic perspective view of the electric breaker with a side wall removed;

Fig. 7 is an exploded perspective view of the kinematic system for actuating the moving contact;

Fig. 8 is a view of the kinematic system for actuating the moving contact in the open position;

Fig. 9 is a view of the kinematic system for actuating the moving contact in the closed position;

Fig. 10 is a schematic view of the kinematic system for actuating the moving contact, which has been released because of the intervention of a protection device, with the actuation part still in the closed position.

[0015] With reference to the above figures, the modular automatic electric breaker with optimization of used spaces, according to the invention, includes a box-like body 1 which has the classic standardized shape with 18-mm spacing and forms, at the rear face, a means 2 for coupling to the omega-shaped guide according to DIN standards; the coupling means can be of a per se known kind and therefore they are not described here in detail.

[0016] The box-like body 1 has, at the front face, a protrusion 3 in which the actuation part or handle 4 is arranged; this part or handle also has a conventional configuration.

[0017] The important particularity of the invention is constituted by the fact that a new structural arrangement is provided which allows to accommodate the electric protection device 10, the kinematic system for actuating the moving electric contact 11, and the snuffer cell 12 inside the box-like casing so that no more than half of the internal volume formed by the box-like body is occupied.

[0018] As shown schematically in Fig. 1, the occupied volume is in practice delimited by the median axis, which passes at the actuation part, and by the space toward the upper or lower ends, so that in practice one obtains, inside a same module constituted by the box-like body, spaces which can be used for example to insert an automatic breaker for protecting another pole, to provide a neutral pole, to provide differential protection of the protected poles or to introduce any other devices which might be necessary.

[0019] It should be stressed that in practice an automatic electric breaker is provided which, by occupying only one half of the space typically occupied by conventional-type automatic breakers, allows to significantly reduce total space occupation, allowing to halve the number of modules used to provide conventional protections.

[0020] In order to achieve this advantage, the mutual arrangement of the various parts is important, as shown schematically in Fig. 2.

[0021] In particular, it has been noted that the electrical protection must be located at the central protrusion, in the half provided between the edge of the protrusion and the median horizontal axis that passes through the pivoting point of the actuation part, while the snuffer cell is arranged at the rear face of the box-like body and the kinematic system is interposed between the protection and the snuffer cell.

[0022] From a structural point of view, as shown more clearly in Fig. 3, magnetothermal protection is provided by virtue of the coils 20a and the bimetallic part 20b, while the snuffer cell is constituted by twelve parts 21 with a high breaking capacity which are arranged so that the moving contact 30, during opening, in practice pushes the arc toward the cell, accelerating its elimination.

[0023] The embodiment of the kinematic actuation system is also particularly significant: it is provided by virtue of very compact parts, so that it is possible to use faster disengagement speeds, with the obvious related advantages.

[0024] According to a preferred but non-limitative embodiment, the kinematic system for actuating the moving contact 30, generally designated by the reference numeral 11, is constituted by a bracket 41 which is articulated in a recess 42 formed in the body 43, from which the actuation part or lever 4 extends.

[0025] The bracket 41 engages the arm 44 of a movement lever, generally designated by the reference numeral 45, which is pivoted at 46 to a first pivot connected to the box-like body 1.

[0026] The other arms 47 of the movement lever 45 are articulated to a pair of linkages 50 which are articulated, at their other end, to the end 51 of a cross-member 52.

[0027] The ends 51 can slide in slots 53 formed by an engagement lever 54 which is U-shaped and pivoted to a second pivot 56 which is rigidly coupled to the box-like body.

[0028] The lever for engagement with the locking lug 59 interacts with the locking tab 60 of a control part 61 which oscillates about a third pivot 62 and is provided, in a downward region, with an extension 63 for engagement with the thermal disengagement device, while magnetic intervention is provided at the hook 66.

[0029] To the side of the pivot 62, the control part 61 has the hook 66, which interacts with the moving contact 30.

[0030] An expansion of the moving core of the magnetic breaker engages a fold 17 of the moving contact 30 in order to provide faster opening.

[0031] A connecting portion 70 is arranged opposite the hook 66 and interacts with a driving lever 71 which in practice has the purpose of combining the disengagement of two breakers which are arranged in the same box-like body and are arranged symmetrically to each other with respect to the central axis and optionally also of actuating the components of a laterally adjacent box-like body.

[0032] The other end of the cross-member 52 engages a recess 75 formed in a spring guide 76 which is pivoted to the moving contact 30 by a riveted pivot 78 and is pushed by a contact pressure spring, designated by the reference numeral 77.

[0033] In practical operation, starting from the open position, shown in Fig. 6, and by turning the actuation part 4, the movement lever 45 is made to oscillate clockwise, with a consequent rotation of the linkages 50 which by interacting with the end 51 of the cross-member 52 located on the engagement lever 54 causes the rotational thrust of the moving contact 30, consequently arranging the locking lug 59 of the engagement lever 54 so that it engages the locking tab 60, which maintains the closed position of the contact.

[0034] In case of automatic disengagement, as shown in Fig. 10, the oscillation of the control part 61

causes the rotation of the engagement lever 54, which is no longer retained by the tab 60, with the consequent lifting of the moving contact, which is moved by a driving spring 68.

[0035] It should of course be noted that the actuation part 4 also changes position; in Fig. 10, this part is still shown in the closed position.

[0036] From the above description it is thus evident that the invention achieves the intended aims and objects, and in particular the fact is stressed that the provision of a structure, which allows to arrange the magnetic and thermal protection device, the snuffer cell, and the kinematic system for actuating disengagement in a single half of the standardized box-like body normally used to produce electrical panels, allows to introduce a highly practical and versatile system, with the advantage of being able to provide the most disparate solutions.

[0037] It is in fact possible to provide, in the half of the box-like body which is substantially not used, a neutral pole, a second protected pole, the differential protection of the protected poles, thus allowing in practice to halve the spaces used in the direction of width, since a single module allows to double functionality with respect to the modules that are conventionally commercially available.

[0038] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept, as defined by the claims.

Claims

1. Modular automatic electric breaker with optimization of used spaces, comprising a flat boxlike body (1) which has, on its rear face, a means (2) for coupling to an omega-shaped guide and, on its front face, a central protrusion (3) at which it is possible to access an actuation part (4), said boxlike body comprising at least one electrical component, said at least one electrical component comprising an electrical protection part (10), at least one kinematic system for actuating the moving electrical contact (11), and at least one snuffer cell (12), said electrical protection part (10), said kinematic system (11) and said snuffer cell (12) being mutually operatively interconnected; characterized in that it comprises, in the same box-like body, two different electrical components, each of which occupies the respective half of the space formed by said box-like body; said electrical protection part (10), said kinematic system (11) and said snuffer cell (12) of said at least one electrical component occupying no more than half of the internal volume formed by said boxlike body (1), said electrical protection part (10) being arranged right above said snuffer cell (12), said snuffer cell (12) having its parts or elements arranged vertically with respect to said rear face of said body, the other half of said internal volume of said body being occupied a separate electrical component; said electrical protection part (10) being arranged above said snuffer cell (12) and said kinematic system (11) for actuating the moving electrical contact being arranged between said electrical protection part (10) and said snuffer cell 12.

2. Automatic electric breaker according to claim 1, characterized in that said half of the internal volume is delimited by the median plane that passes through said actuation part.

3. Automatic electric breaker according to claim 1, characterized in that said electrical protection part (10) is arranged at said central protrusion (3), in the half provided between the walls of said protrusion and said median plane that passes through the pivoting point of said actuation part (4), said snuffer cell (12) being arranged at the rear face of said box-like body (1) and said kinematic actuation system (11) being interposed between said electrical protection part (10) and said snuffer cell (12).

4. Automatic electric breaker according to claim 1, characterized in that said snuffer cell (12) is constituted by components which have a high breaking capacity and have a moving contact located so as to push the arc toward said cell when said contact opens.

5. Automatic electric breaker according to claim 1, characterized in that said kinematic system (11) for actuating said moving contact comprises a bracket (41) which is articulated in a slot (42) formed on the body (43) from which the actuation part extends, said bracket engaging the arm (44) of a movement lever (45) pivoted to said box-like body (1) and being articulated to the other arm of said lever by means of a pair of linkages (50) which are in turn articulated to the ends (51) of a cross-member (52) and can slide in a slot (53) formed by an engagement lever (54) which is pivoted to a second pivot (56) rigidly coupled to said box-like body, said engagement lever (54) interacting with a control part (61) which oscillates about a third pivot (62) and has an extension (63) for engagement with the thermal and magnetic disengagement device, said control part having a locking tab with which a locking lug, which protrudes from said engagement lever, interacts.

6. Automatic electric breaker according to claim 5, characterized in that the devices for magnetic and thermal intervention interact at a hook (66) of said control part (61), which is arranged to the side of said third pivot (62).

7. Automatic electric breaker according to claim 1, characterized in that it comprises an interconnecting portion which interacts with a driving lever (71) for coupling, in terms of disengagement, two breakers located in the same box-like body and arranged symmetrically with respect to the median axis, as well as for the optional actuation of the electrical components of a laterally adjacent box-like body.

8. Automatic electric breaker according to claim 1, characterized in that said snuffer cell (12) is constituted by parts arranged at right angles with respect of said rear face of said box-like body.

Patentansprüche

1. Modularer automatischer Schutzschalter mit optimierter Raumausnutzung mit einem flachen, kastenartigen Körper (1), welcher auf seiner rückwärtigen Fläche ein Mittel (2) zum Verbinden mit einer omega-förmigen Führung und auf seiner Vorderfläche einen zentralen Vorsprung (3) aufweist, an dem ein Schaltglied (4) zugänglich ist, wobei der kastenartige Körper mindestens eine elektrische Komponente enthält, die ein elektrisches Schutzelement (10), mindestens eine kinematische Einheit (11) zum Bewegen eines bewegbaren elektrischen Kontaktes und mindestens eine Ableitzelle (snuffer cell) (12) enthält, wobei das elektrische Schutzelement (10) die kinematische Einheit (11) und die Ableitzelle (snuffer cell) (12) wechselseitig wirkend miteinander verbunden sind,
dadurch gekennzeichnet,
daß er in demselben kastenartigen Körper zwei verschiedene elektrische Komponenten aufweist, von denen jede für sich jeweils die Hälfte des durch den kastenartigen Körper gebildeten Raumes einnimmt, daß das elektrische Schutzelement (10), die kinematische Einheit (11) und die Ableitzelle (snuffer cell) (12) der mindestens einen elektrischen Komponente nicht mehr als die Hälfte des durch den kastenartigen Körper (1) gebildeten Innenvolumens einnehmen, das elektrische Schutzelement (10) rechts oberhalb der Ableitzelle (snuffer cell) (12) angeordnet ist, die Einzelteile oder Elemente der Ableitzelle (snuffer cell) (12) vertikal in bezug auf die rückwärtige Fläche des Körpers angeordnet sind und die andere Hälfte des Innenvolumens von einer separaten elektrischen Komponente eingenommen wird und daß das elektrische Schutzelement (10) oberhalb der Ableitzelle (snuffer cell) (12) und die kinematische Einheit (11) zum Bewegen des bewegbaren elektrischen Kontaktes zwischen dem elektrischen Schutzelement (10) und der Ableitzelle (snuffer cell) (12) angeordnet ist.

2. Automatischer Schutzschalter nach Anspruch 1, dadurch gekennzeichnet, daß die Hälfte des Innenvolumens durch eine Mittelebene, die durch das Schaltglied verläuft, abgegrenzt ist.

3. Automatischer Schutzschalter nach Anspruch 1, dadurch gekennzeichnet, daß das elektrische Schutzelement (10) an dem zentralen Vorsprung (3) innerhalb der zwischen den Wänden des Vorsprunges und der Mittelebene, die durch den Angelpunkt des Schaltgliedes (4) verläuft, gebildeten Hälfte angeordnet ist, wobei die Ableitzelle (snuffer cell) (12) an der rückwärtigen Fläche des kastenartigen Körpers (1) und die kinematische Schalteinheit (11) zwischen dem elektrischen Schutzelement (10) und der Ableitzelle (snuffer cell) (12) angeordnet ist.

4. Automatischer Schutzschalter nach Anspruch 1, dadurch gekennzeichnet, daß die Ableitzelle (snuffer cell) (12) aus Komponenten gebildet wird, die eine hohe Durchbruchkapazität aufweisen und einen bewegbaren Kontakt beinhalten, der so angeordnet ist, daß er einen Lichtbogen in Richtung der Zelle verschiebt, wenn dieser Kontakt öffnet.

5. Automatischer Schutzschalter nach Anspruch 1, dadurch gekennzeichnet, daß die kinematische Einheit (11) zum Bewegen des bewegbaren Kontaktes einen Gelenkarm (41) aufweist, der in eine Ausnehmung (42) in dem Körper (43), von dem aus sich das Schaltglied erstreckt, gelenkig gelagert ist, wobei der Gelenkarm an einem Arm (44) eines Bewegungshebels (45) angreift, der an dem kastenartigen Körper (1) über einen Achszapfen gelenkig gelagert ist und mit einem anderen Arm des Hebels mittels eines Paares von Verbindungselementen (50) gelenkig verbunden ist, welche wiederum gelenkig mit den Enden (51) eines Querträgers (52) verbunden sind und in einen durch einen Eingriffhebel (54), der um einen zweiten, starr mit dem kastenartigen Körper verbundenen Achszapfen (56) drehbar gelagert ist, gebildeten Schlitz (53) gleiten können, wobei der Eingriffhebel (54) mit einem Kontrollelement (61) zusammenwirkt, welches um einen dritten Achszapfen (62) schwingt und eine Verlängerung (63) zum Eingriff mit einer thermischen und magnetischen Auslösevorrichtung aufweist, und wobei das Kontrollelement einen Verriegelungsdorn aufweist, mit dem eine Verriegelungsnase zusammenwirkt, welche von dem Eingriffhebel vorragt.

6. Automatischer Schutzschalter nach Anspruch 5, dadurch gekennzeichnet, daß die Vorrichtungen zur magnetischen und thermischen Intervention an einem Haken (66) des Kontrollelementes (61) zusammenwirken, welcher seitlich an dem dritten Achszapfen (62) angeordnet ist.

7. Automatischer Schutzschalter nach Anspruch 1, dadurch gekennzeichnet, daß er einen Verbindungsbereich aufweist, der mit einem Antriebshebel (71) sowohl zum Kuppeln, hinsichtlich des Auslösens, von zwei in demselben kastenartigen Körper und bezüglich der Mittelachse symmetrisch angeordneten Unterbrechern als auch zum optionalen Betätigen elektrischer Komponenten eines lateral angrenzenden kastenartigen Körpers, zusammenwirkt.

8. Automatischer Schutzschalter nach Anspruch 1, dadurch gekennzeichnet, daß die Ableitzelle (snuffer cell) (12) aus Teilen gebildet wird, die im rechten Winkel bezogen auf die rückwärtige Fläche des kastenartigen Körpers angeordnet sind.

Revendications

1. Disjoncteur électrique modulaire avec optimisation des espaces utilisés, comprenant un corps plat (1) en forme de coffret qui a, sur sa face arrière, des moyens (2) de couplage à un guide d'onde en forme d'oméga et, sur sa face avant, une protubérance centrale (3) à laquelle il est possible d'accéder à une pièce (4) d'actionnement, ledit corps en forme de coffret comprenant au moins un composant électrique, ledit au moins un composant électrique comprenant une pièce (10) de protection électrique, au moins un système cinématique pour actionner le contact électrique mobile (11), et au moins une cellule (12) d'extinction d'arc, ladite pièce (10) de protection électrique, ledit système cinématique (11) et ladite cellule (12) d'extinction d'arc étant interconnectés fonctionnellement ; caractérisé en ce qu'il comprend, dans le même corps en forme de coffret, deux composants électriques différents, dont chacun occupe la moitié correspondante de l'espace formé par ledit corps en forme de coffret ; ladite pièce (10) de protection électrique, ledit système cinématique (11) et ladite cellule (12) d'extinction d'arc dudit au moins un composant électrique n'occupant pas plus de la moitié du volume intérieur formé par ledit corps (1) en forme de coffret, ladite pièce (10) de protection électrique étant disposée juste au-dessus de ladite cellule (12) d'extinction d'arc, ladite cellule (12) d'extinction d'arc ayant ses parties ou éléments disposés verticalement par rapport à ladite face arrière dudit corps, l'autre moitié dudit volume intérieur dudit corps étant occupée par un composant électrique séparé ; ladite pièce (10) de protection électrique étant disposée au-dessus de ladite cellule (12) d'extinction d'arc et dudit système cinématique (11) pour actionner le contact électrique mobile disposé entre ladite pièce (10) de protection électrique et ladite cellule (12) d'extinction d'arc.

2. Disjoncteur électrique selon la revendication 1, caractérisé en ce que ladite moitié du volume intérieur est délimitée par le plan médian qui passe à travers ladite pièce de manoeuvre.

3. Disjoncteur électrique selon la revendication 1, caractérisé en ce que ladite pièce (10) de protection électrique est disposée dans ladite protubérance centrale (3) dans la moitié prévue entre les parois de ladite protubérance et ledit plan médian qui passe par le point de pivotement de ladite pièce (4) de manoeuvre, ladite cellule (12) d'extinction d'arc étant disposée au niveau de la face arrière dudit corps (1) en forme de coffret et ledit système cinématique (11) d'actionnement étant interposé entre ladite pièce (10) de protection électrique et ladite cellule (12) d'extinction d'arc.

4. Disjoncteur électrique selon la revendication 1, caractérisé en ce que ladite cellule (12) d'extinction d'arc est constituée par des composants qui ont un pouvoir élevé de coupure et ont un contact mobile situé de manière a pousser l'arc vers ladite cellule quand ledit contact s'ouvre.

5. Disjoncteur électrique selon la revendication 1, caractérisé en ce que ledit système cinématique (11) pour actionner ledit contact mobile comprend un étrier (41) qui est articulé dans une fente (42) formée sur le corps (43) à partir duquel s'étend la pièce d'actionnement, ledit étrier entrant en contact avec le bras (44) d'un levier (45) de mouvement fixé à pivotement audit corps (1) en forme de coffret et étant articulé sur l'autre bras dudit levier au moyen d'une paire de pièces (50) de liaison qui sont à leur tour articulées sur les extrémités (51) d'une pièce (52) transversale et peuvent coulisser dans une fente (53) formée par un levier (54) de mise en contact qui peut tourner autour d'un deuxième pivot (56) couplé rigidement audit corps en forme de coffret, ledit levier (54) de mise en contact interagissant avec une partie (61) de commande qui oscille autour d'un troisième pivot (62) et a une saillie (63) pour entrer en contact avec le dispositif thermique et magnétique de déconnexion, ladite pièce de commande ayant une languette de verrouillage avec laquelle interagit une patte de verrouillage qui s'avance depuis ledit levier de mise en contact.

6. Disjoncteur électrique selon la revendication 5, caractérisé en ce que les dispositifs pour une intervention magnétique et thermique interagissent avec un crochet (66) de ladite pièce (61) de commande, qui est disposé sur le côté dudit troisième pivot (62).

7. Disjoncteur électrique selon la revendication 1, caractérisé en ce qu'il comprend une portion d'inter-

connexion qui interagit avec un levier (71) d'entraînement pour coupler, en termes de déconnexion, deux interrupteurs situés dans le même corps en forme de coffret et disposés symétriquement par rapport à l'axe médian, ainsi que pour l'activation facultative des composants électriques d'un corps en forme de coffret adjacent latéralement.

8. Disjoncteur électrique selon la revendication 1, caractérisé en ce que ladite cellule (12) d'extinction d'arc est constituée par des éléments disposés à angle droit par rapport à ladite face arrière dudit corps en forme de coffret.

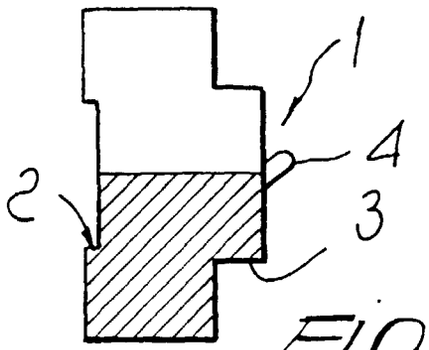

FIG. 1

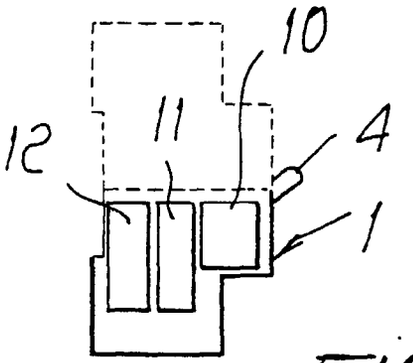

FIG. 2

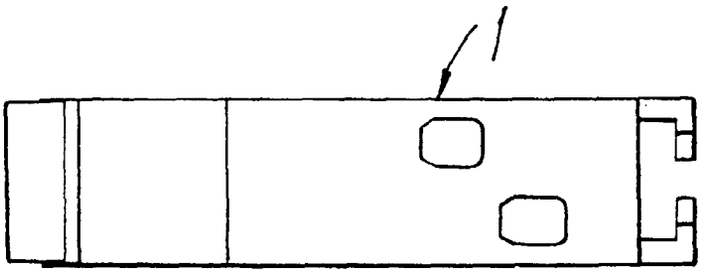

FIG. 5

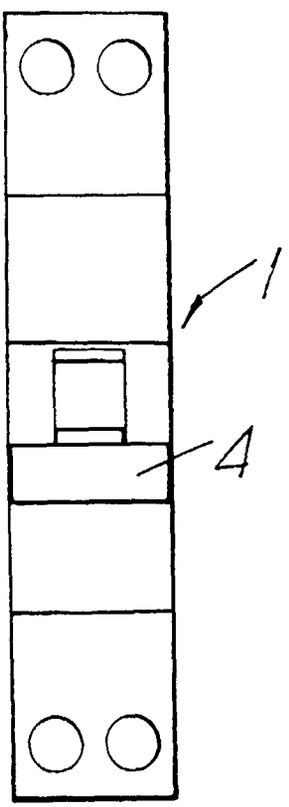

FIG. 4

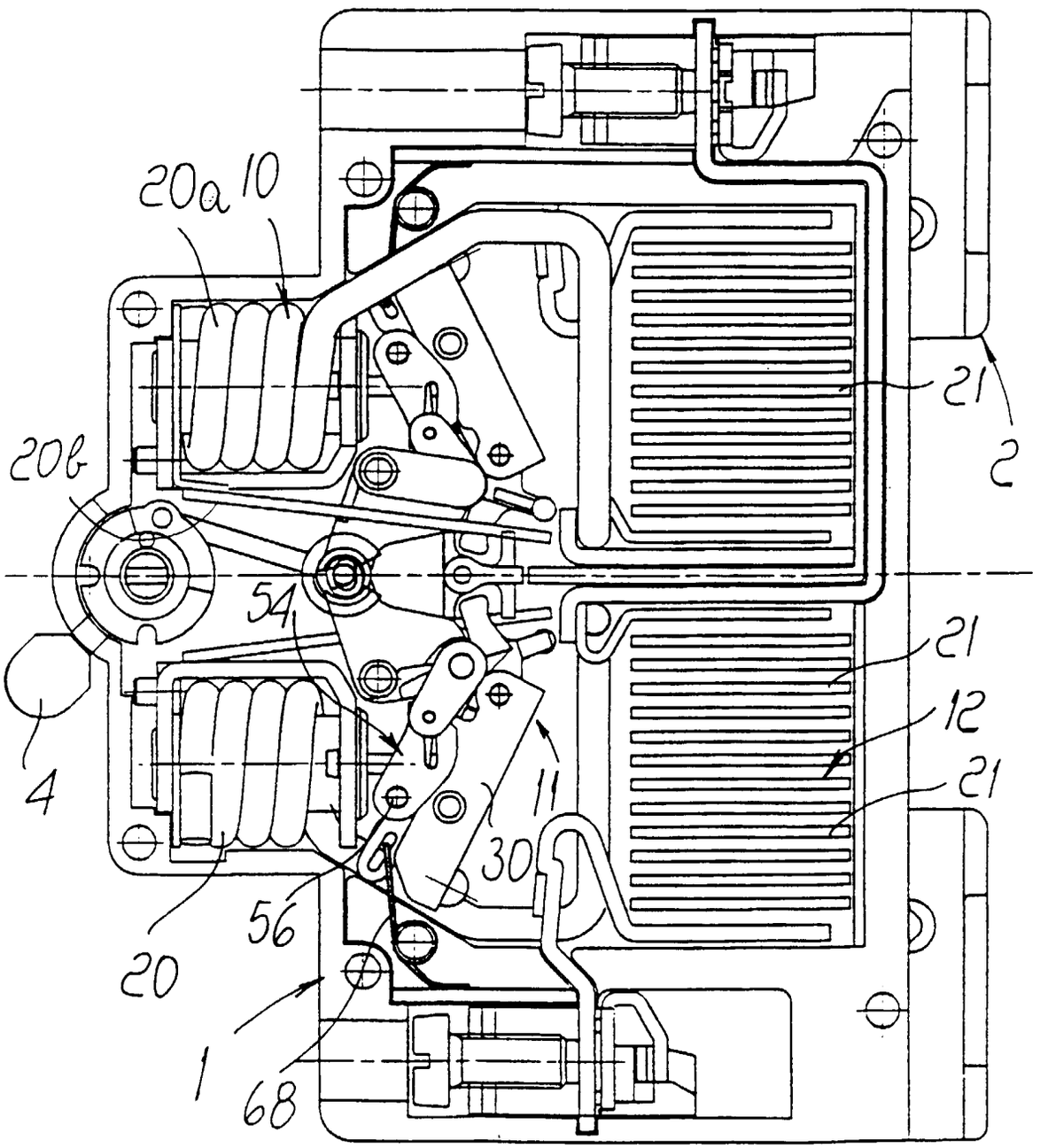

Fig. 3

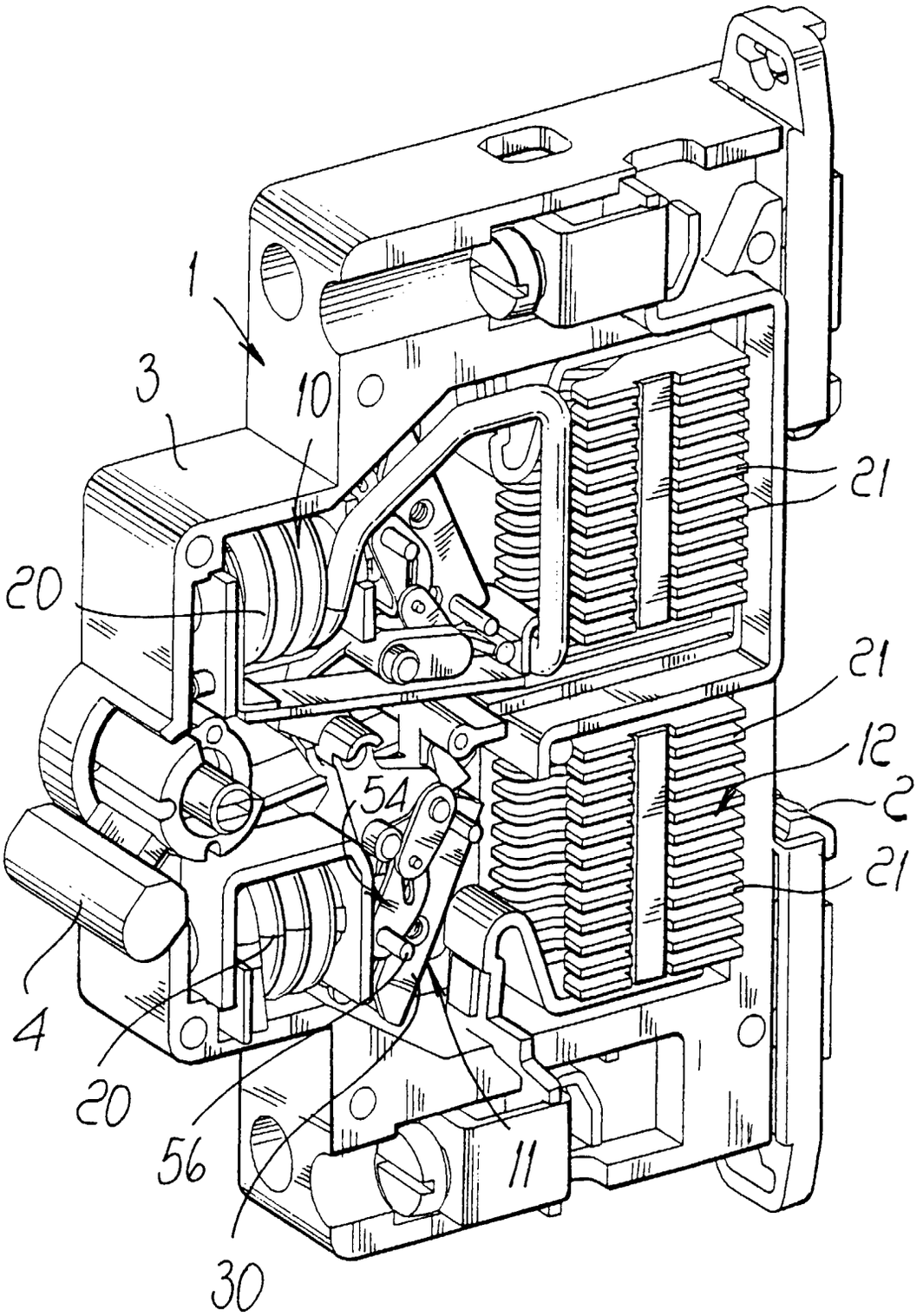

Fig. 6

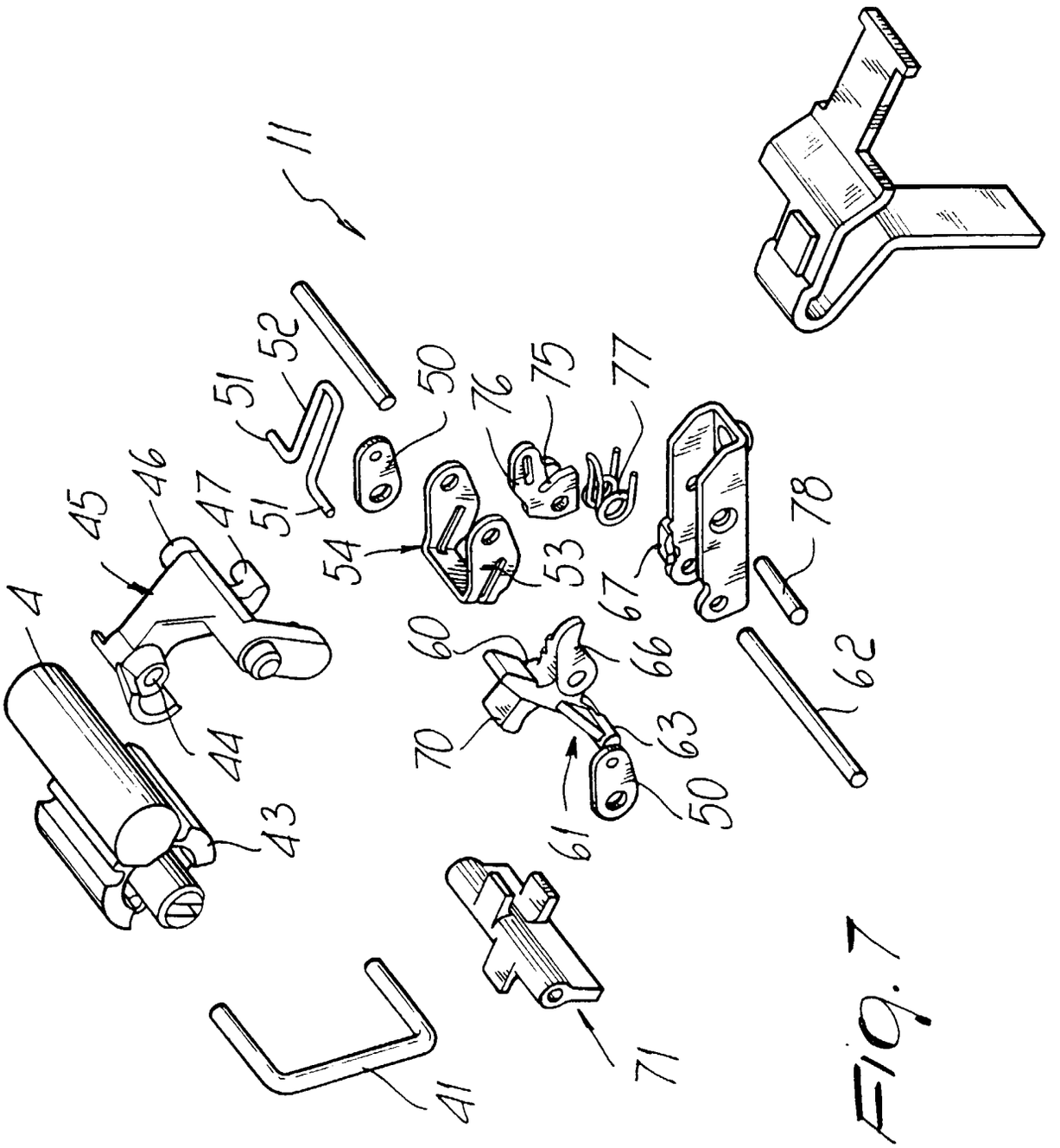
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Fig. 7

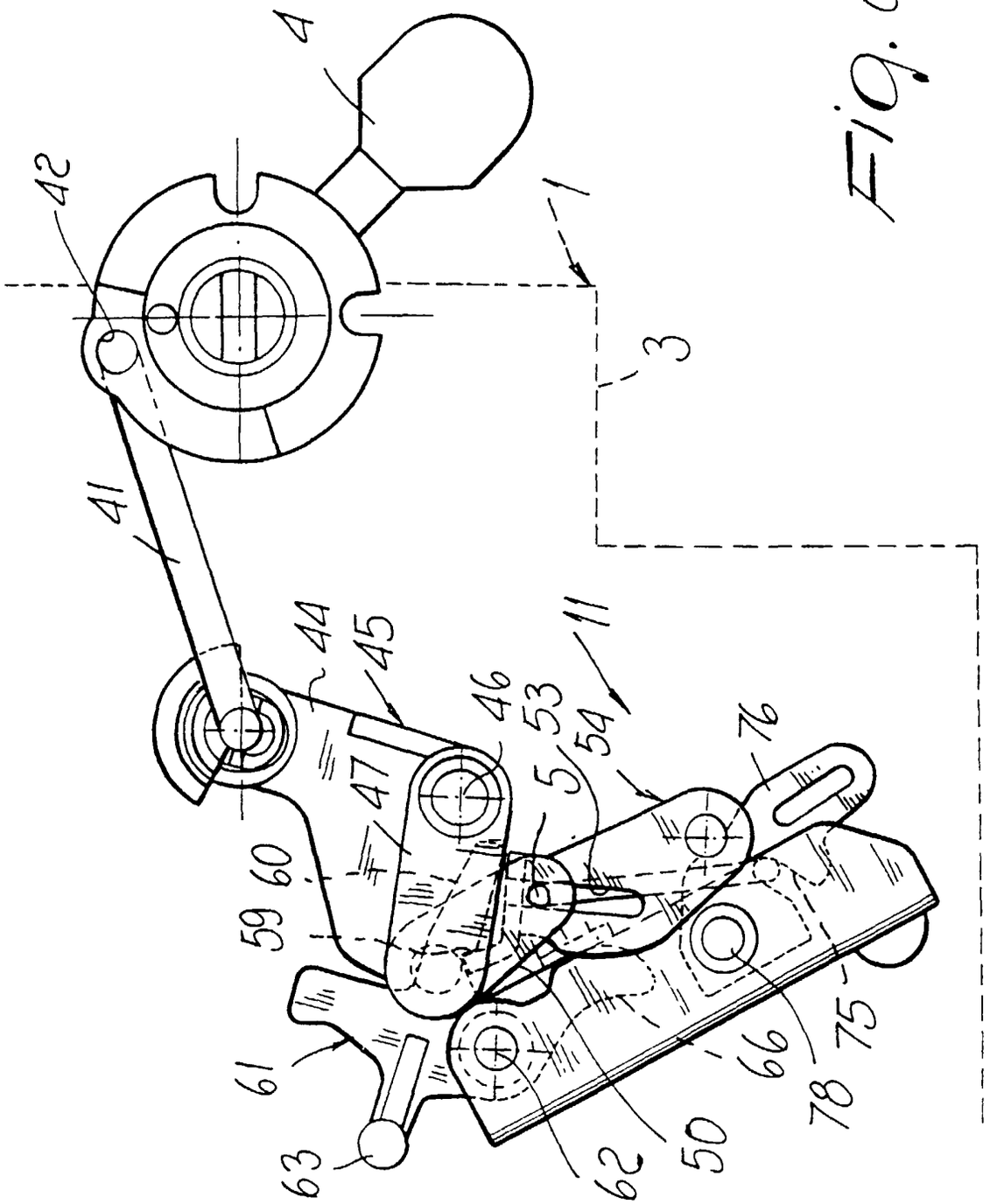

Fig. 8

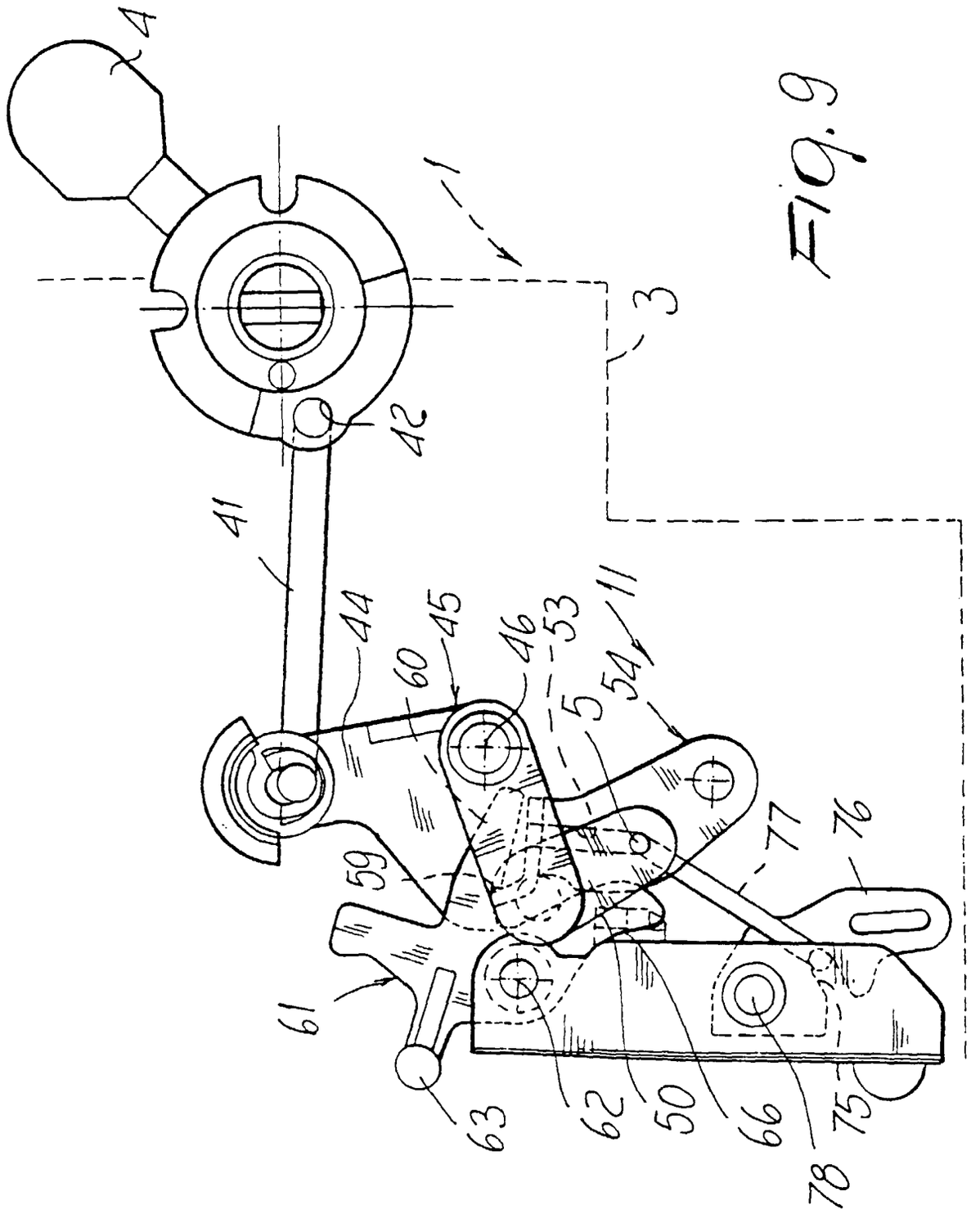

Fig. 9

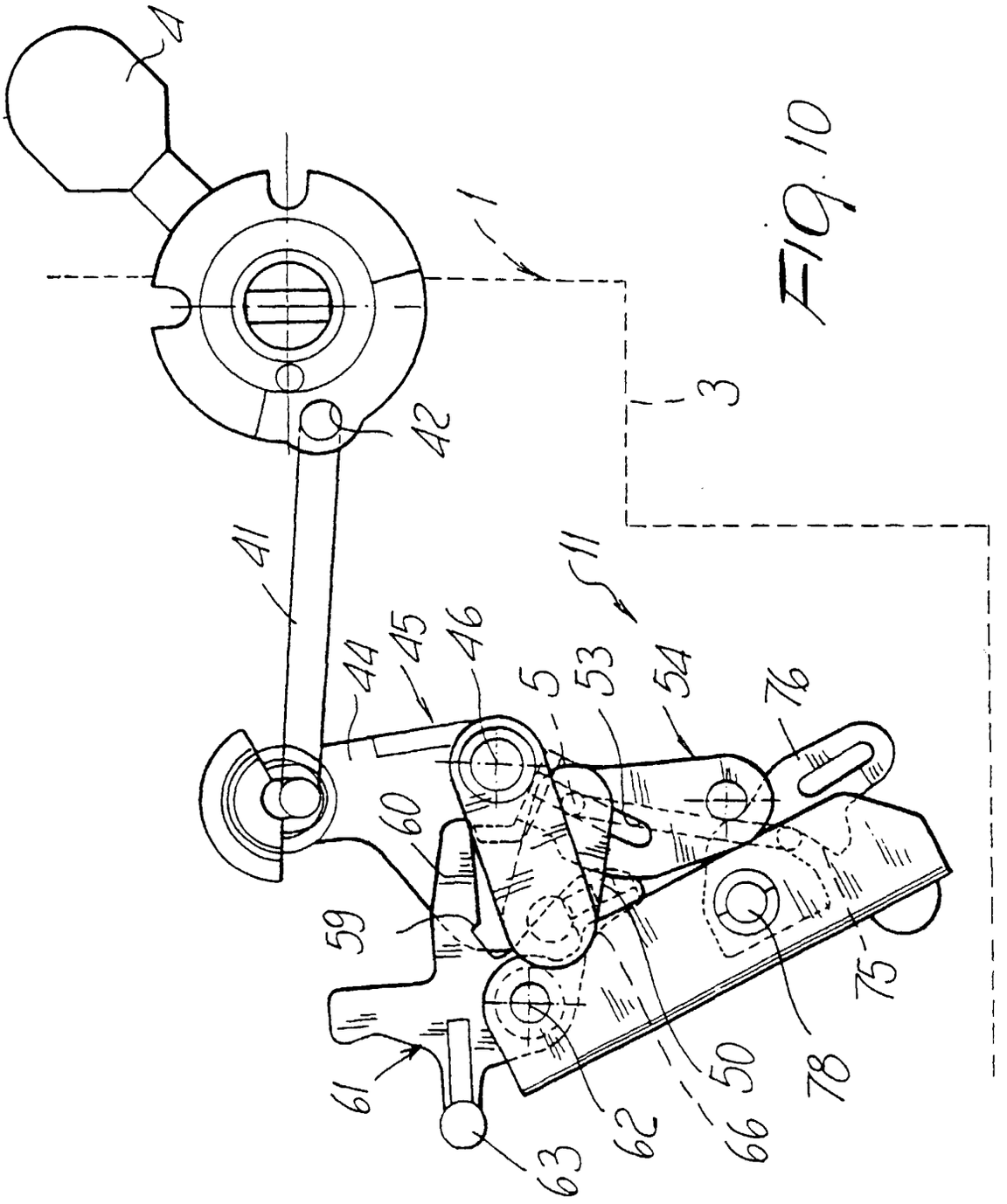

Fig. 10