(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 871 188 B2

(12) **NEW EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the opposition decision:
10.08.2005 Bulletin 2005/32

(45) Mention of the grant of the patent:
06.09.2000 Bulletin 2000/36

(21) Application number: **97117694.6**

(22) Date of filing: **13.10.1997**

(51) Int Cl.[7]: **H01H 27/00**

(54) **Key-controlled safety switch**

Schlüsselsicherheitsschalter

Interrupteur de sécurité à clé

(84) Designated Contracting States:
AT CH DE ES FR GB IT LI

(30) Priority: **11.04.1997 IT VI970054**

(43) Date of publication of application:
14.10.1998 Bulletin 1998/42

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EP 0 871 188 B2

Description

[0001] The present invention relates to a key-controlled safety switch for controlling protections of machines, and industrial plants, such as for example doors of control cabinets and moving barriers for accessing work areas. The function of this kind of switch is to send a stop signal when the protection is opened or tampered with.

[0002] Conventional switches of the above described type essentially include a case which can be anchored to the fixed part of the protection of the machine and internally accommodates at least one fixed electrical contact and at least one moving electric contact; these contactscan interact selectively in order to open or close the external electrical circuit of the machine.

[0003] A cap.or head is detachably installed on the case and contains a mechanism for locking and actuating the moving electric contact. The head is also provided with a slot for the insertion of a key-type device which can be anchored to the moving part of the protection of the machine. The insertion of the key in the slot releases and changes the position of the head actuation mechanism, causing the selective movement of the moving electric contact and the consequent opening or closure of the electric circuit.

[0004] By virtue of the patterned shape of the key, the contacts can be actuated only with the key, while actuation is practically impossible by using screwdrivers, wires or other conventional tools.

[0005] Safety switches are known in which the moving contact is fitted on a stem which can slide along a longitudinal axis of the body and on which there acts a wheel or cam which is part of the actuation mechanism. The cam is installed on supports of the head, so that it rotates about an axis which lies transversely to the axis of the stem, and is provided with locking devices which prevent its rotation unless the key has been inserted for at least a certain part of its stroke.

[0006] In a conventional type of, safety switch, the locking devices are constituted by one or more blocks located to the sides of the cam and provided with protrusions which cooperate axially with complementary hollows formed on the lateral faces, of the cam. The blocks are mounted so that they can slide but cannot rotate on the axis of the cam and are normally moved toward the cam by virtue of compression springs so as to lock the rotation of the cam. Upon insertion, the chamfered end of the key-type actuator axially moves the blocks away from the cam, so as to allow the free rotation thereof, switching the switch

[0007] In another kind of switch, the blocks that can slide axially with respect to the cam are replaced with sliders which can move at right angles to its rotation axis. The sliders have protrusions or stop members which are meant to engage complementarily shaped parts provided in the cam in order to prevent rotation thereof until the key-type actuator is inserted and pushed in the head.

[0008] US-A-5,587,569 (EJA) describes a key-controlled switch with two apertures, with two sliders which can slide along guides which are formed on the lateral supports of the actuation cam and interact with complementary parts formed on the cam.

[0009] US-A-5,516,993 (BERNSTEIN) describes a switch with two apertures and with two sliders which can slide along guides formed in the side walls of the actuation cam and rotate together with the cam.

[0010] International pubblication WO95/24726 describes a single-aperture switch with two locking sliders which slide with respect to the key along its entire insertion stroke.

[0011] In all these conventional switches, the sliding direction of the locking sliders is substantially perpendicular to the direction in which the key is inserted and made to slide. Accordingly, the movement of the locking sliders occurs by virtue of inclined planes provided on the key and on the sliders. The key-type actuator furthermore slides along the sliders over most of its insertion stroke.

[0012] Furthermore, the parts of the locking mechanism are very small, are composed of multiple components, are fragile and are subject to sudden movements.

[0013] The drawback of relative-complexity and fragility of the locking and actuation mechanisms combines with the presence of considerable friction and wear, which reduce their reliability and life, increasing the risk of jamming especially in the presence of impurities and in highly polluted environments.

[0014] Another drawback of double-aperture switches-is that the slots for the insertion of the key are located asymmetrically with respect to the head, that is to say, their distances from an end edge are different; this reduces the flexibility of the orientation of the switch if the, head is rotated in order to adapt it to the machine.

[0015] EP 0 941 549 discloses a safety switch with a rotating plate cam which is selectively blocked by a sliding interlocking member which is displaced in a single possible direction by means of guides provided in the switch housing.

[0016] An aim of the present invention is to eliminate the above drawbacks, providing a key-controlled safety switch which is constructively very simple, highly reliable, mechanically strong and flexible in assembly.

[0017] A particular object is to eliminate, or at least minimize, sliding and therefore mechanical wear, increasing life.and reliability.

[0018] A further object is to provide.a key-controlled safety switch constituted by a minimal number of very strong parts.

[0019] A further object is to facilitate the positioning of the switch, keeping the distances between its fixed and moving parts substantially unchanged.

[0020] This aim, these objects-and others which will become apparent hereinafter are achieved by a key-controlled safety switch according to the invention and according to claim 1.

[0021] By virtue of the inclination of the locking slider or sliders with respect to the key insertion direction, sliding friction caused by inclined planes is practically eliminated, increasing the reliability and durability of the switch.

[0022] Furthermore, the position of the slots simplifies the placement of the switch if the head is rotated in order to adapt it to the machine.

[0023] Further characteristics and advantages of the invention will become apparent from the detailed description of a preferred but not exclusive embodiment of a key-controlled safety switch according to the invention illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a general exploded perspective view of a switch according to the invention;

Figure 2 is a front view of a detail of Figure 1; Figures 3 is a front view of another detail of Figure 1;

Figure 4 is a partially sectional side view of another detail of Figure 1;

Figure 5 is a partially sectional side view of the switch according to the invention in a first step of its operation;

Figure 6 is a partially sectional side view of the switch according to the invention in a second step of its operation;

Figure 7 is a partially sectional side view of the switch according to the invention in a third step of its operation.

[0024] With reference to the above figures, the key-controlled safety switch according to the invention, generally designated by the reference numeral 1, includes a case 2 which is shaped approximately like a parallelepiped and can be anchored to the fixed part of a protection of a machine, for example the frame of a control cabinet and an actuation head 3 which can be detachably anchored to the case 2 in different positions to adapt it to the specific requirements of installaltion on the machine.

[0025] The case 2 accommodates pairs of fixed contacts 4 and 5 and respective pairs of moving contacts 6 and 7. The contacts are fixed to bridges which are rigidly coupled to a shank 9 which can move inside the case 2 along a longitudinal axis L and has an end 9 which protrudes outside the case 2. With reference to Figures 5 to 7, when the shank 8 is in the left stroke limit position, the contact bridge 8 closes the pair of contacts 4, whilst in the right strocke limit position the contact bridge 7 closes the pair of contacts 5, correspondingly varying the switching state of the switch.

[0026] The number of contacts and their relative positions can of course also be different without thereby, changing the essence of the invention.

[0027] The head 9 is formed by a prism-shaped cap 10 which is anchored to the case 2 by virtue of screws. 11. Two slots 12 and 13 are formed on the cap 10, respectively on two faces which are adjacent to an end edge 14. Through the slots 12 and 13 it is possible to insert a key-type actuator member 15, which is fixed to the moving part of a protection of a machine, for example the door of the previously mentioned control cabinet.

[0028] The key-type actuator 15 has a special shape, described in detail hereafter, in respective direction α and β which are mutually perpendicular and are respectively parallel and transverse with respect to the longitudinal axis L of the case 2. According to the invention, the two slots 12 and 13 have the same distance from the lateral edge 14, so as to facilitate installing the switch with its head rotated.

[0029] The cap 10 of the head internally accommostates an actuation cam 16, which has a central hub 17 whose cross-section is approximately square; a pin 18 whose axis is designated by the reference letter H is inserted in the hub. The ends of the pin 18 are keyed in two holes 19 and 20 formed in respective lateral supports 21 and 22 which protrude from a connecting plate 23.

[0030] The connecting plate 23 is provided with two lateral tabs 24 which can be inserted in a snap-together fashion in corresponding openings 25 of the cap 10, and is provided with holes 28 which are aligned with the screws 11 for the detachable anchoring of the head 3 to the case 2, keeping the cam mounted on the pin 1B.

[0031] When the head 3 is fitted-on the case 2, the rounded end 9 of the shank 8 is in contact with the extermal profile of the cam 16 by virtue of the elastic compression of a compression spring 27 which is interposed between the bottom of the case 2 and the adjacent and of the shank 8.

[0032] The external profile of the cam 16 has a protrusion 28 with a local recess 29. In order to keep the shank stably in the stroke limit position shown in Figure 5, in which the moving contacts 6 short-circuit the fixed contacts 4 when the key-type actuator 15 is not inserted in the head. On the external profile of the cam 16 there is also a first concavity 30 which is meant to keep the shank 8 in the stroke limit position shown in Figure 6, in which the moving contacts 7 short-circuit the contacts 5 when the key-type actuator 15 is inserted in the slot 12. Finally, there is a second concavity 31 which keeps the shank 8 in the same stroke limit and electrical switching position shown in Figure 6, but does so when the key-type actuator 15 is inserted in the other slot 13.

[0033] In order to promote the rotation of the cam, on the external profile of the cam there are two facing seats 32 and 33 which are separated by a central partition 34. Correspondingly, the actuator 15 has, toward the free ends of two arms 35 and 36, respective mutually opposite lugs 37 and 38 which are separated by a gap which

is slightly greater than the thickness of the partition 34; the lugs can engage the seats 32 and 33 of the cam 16.

[0034] There are locking devices to prevent the rotation of the cam 16 unless the key-type actuator 15 is used for this purpose.

[0035] In particular, the locking devices are constituted by at least one, preferably two sliders or blocks 39 which are arranged to the sides of the cam 16 and can slide along guiding devices which are perpendicular to the rotation axis of the cam. Each slider is constituted by a single monolithic component which is considerably tough and wear-resistant.

[0036] According to the invention, the direction of the sliding of each slider 39 upon insertion of the key-type actuator 15 is inclined with respect to the directions of insertion of the actuator in both slots 12 and 13.

[0037] In particular, the inclination angles μ of each slider with respect to the insertion directions a and β of the key-type actuator are substantially identical and equal to approximately 45°.

[0038] For this purpose, devices for guiding the sliders 39 are formed on the opposite side walls of the cam 16. The guiding devices are constituted by two lateral ridges 40 and 41 which guide the longitudinal sides of each slider 39 and by the central hub 17 itself of the cam 16, which guides a central longitudinal opening 42 provided in most of the length of each slider 39.

[0039] The end 43 of each slider 39 which is close to the slots 12 and 13 is rounded in order to reduce friction against the key-type actuator 15, whilst the opposite end has a stop tooth 44 which is directed laterally outward.

[0040] Each stop tooth 44 is inserted in, and guided by, a corresponding groove 45 formed on the internal faces of the lateral supports 21 and 22 of the connecting plate 23 during the rotation of each slider 39 together with the cam 16.

[0041] In particular, each groove 45 has a main portion 46 which is shaped like a circular sector and is concentric with respect to the holes 19 and 20 of the rotation axis of the cam 16 and has an aperture angle of approximately 90°; a short central portion 47 protrudes from the main portion, is directed radially toward the center and is slightly flared in a V-like shape in order to facilitate the repositioning of the stop tooth 44 in the initial position shown in Figure 5. In order to keep the stop tooth 44 of each slider 39 normally engaged in the groove portion 47, there are elastic devices which are constituted by a compression spring 48 which is inserted in the longitudinal cavity 42, is retained by a protrusion 49 and acts on the hub 17.

[0042] During use, the key-type actuator 15 can be inserted in one of the slots 12 and 13 of the head 3, as shown in Figure 5; its mutually opposite lugs 37 and 38 enter the seats 32 and 33, pushing the sliders 39 in the direction of the guides 40 and 41 on the cam 16 by an extent of the stroke which is sufficient to disengage the stop tooth 44 from the groove portion 47. Up to this point, the cam 16 cannot rotate and therefore performs no electrical switching of the switch. It is noted that the mutual sliding of each slider 39 with respect to the cam 16 is limited only to the radial extension of the groove portion 47, minimizing friction, wear and jamming which are typical of locking devices according to the prior art.

[0043] If the actuator 15 has been inserted in the slot 12, as shown in Figure 6, the lugs 37 and 38, in the second part of the insertion stroke of the actuator 15, engage the seats 32 and 33, causing the rotation of the cam 16 counterclockwise and causing the electrical switching of the switch.

[0044] If the actuator 15 has been inserted in the slot 13, as shown in Figure 7, the lugs 37 and 38, in the second part of the stroke of the actuator 15, cause the clockwise rotation of the cam 16, thus causing the electrical switching of the switch in this case as well.

Claims

1. Key-controlled safety switch, comprising a case (2) with a longitudinal axis (L) which internally accommodates fixed electric contacts (4, 5) and moving electric contacts (6, 7) which are suitable to interact in order to change the state of the switch, and an actuation head (3) with a prism-shaped cap (10) which has, on opposite sides of an end edge (14), two slots (12, 13) for the insertion of a key-type actuator (15) along two mutually perpendicular directions (α, β), wherein said head (3) supports a cam (16) for the actuation of the moving contacts (6, 7) which can rotate about a substantially transverse axis (H), and locking devices for said cam (16) which comprise at least one slider (39) which can slide substantially at right angles to the rotation axis of said cam (16), said slider (39) and said cam (16) being actuatable exclusively with said key-type actuator (15), wherein the direction of the sliding of said slider (39) is substantially perpendicular to the rotation axis (H) of said cam and is inclined with respect to both of the insertion directions of the actuator, and wherein said slots (12, 13) for the insertion of said actuator are substantially equidistant from said end edge (14), wherein said slider (39) can slide along guiding devices (40, 42, 17) which are rigidly coupled to said cam such that the slider rotates together with the cam and said slider has a lateral stop tooth (44) which is directed outward, said guiding devices being formed on a lateral face of said cam (16) at which said slider (39) is arranged.

2. Safety switch according to claim 1, **characterised in that** the inclination angles (μ) of said slider (39) with respect to the insertion directions (α, β) of said key-type actuator are substantially identical and are equal to approximately 45°.

3. Safety switch according to the preceding claims, **characterised in that** it has two sliders (39) which are arranged on both sides of said cam (16), said guiding devices (40 ,42, 17) for said two sliders (39) being formed on the lateral faces of said cam (16).

4. Safety switch according to claim 3, wherein said head (3) has two lateral supports (21, 22) with holes for the insertion of the rotation axis (H) of said cam, **characterised in that** each lateral support (21, 22) has, on its internal surface, an appropriately shaped groove (45) for accommodating and guiding said lateral stop tooth (44) of each slider (39).

5. Safety switch according to claim 4, **characterised in that** said groove (45) comprises a curved portion (46) which is concentric with respect to the rotation axis (H) of the cam (16) in order to guide said stop tooth (44) during the rotation of the slider (39) rigidly with the cam.

6. Safety switch according to claim 5, **characterised in that** said groove (45) comprises a central portion (47) which protrudes radially from said curved portion (46) toward the axis of said cam in order to lock the rotation of said slider (39) rigidly with said cam.

7. Safety switch according to claim 6, **characterised in that** it has elastic devices (48) which interact between said cam (16) and each slider (39) in order to keep said stop tooth (44) normally engaged in said central portion (47) of said groove (45).

8. Safety switch according to claim 7, **characterised in that** said central portion (47) of said groove (45) is flared in order to facilitate the automatic repositioning of the stop tooth (44) of each slider (39).

9. Safety switch according to claim 8, **characterised in that** said key-type actuator (15) has, toward its insertion end, two mutually opposite lugs (37, 38) which are adapted to actuate, during the first part of the insertion stroke, said sliders (39) with a force component which is substantially parallel to their sliding direction.

10. Safety switch according to claim 9, **characterised in that** sad cam (16) has, on its lateral faces, two shaped seats (32, 33) for accommodating said pair of mutually opposite lugs (37, 38) of said key-type actuator (15) in order to promote the rotation of said cam (16) in the second part of the insertion stroke of said key-type actuator (15).

Patentansprüche

1. Schlüsselsicherheitsschalter mit einem Gehäuse (2) mit einer longitudinalen Achse (L), in dessen Innerem befestigte elektrische Kontakte (4, 5) und bewegliche elektrische Kontakte (6, 7) angeordnet sind, die ausgebildet sind, wechselseitig zu agieren, um den Zustand des Schalters zu ändern, und einem Betätigungskopf (3) mit einer prismenförmigen Abdeckung (10), die zwei Schlitze (12, 13) an gegenüberliegenden Seiten einer Abschlußkante (14) aufweist zum Einsetzen einer schlüsselartigen Betätigungsvorrichtung (15) entlang zweier zueinander senkrechter Richtungen (α, β), wobei der Betätigungskopf (3) einen Nocken (16) hält für die Betätigung der beiden beweglichen elektrischen Kontakte (6, 7), der sich drehen kann um eine im wesentlichen transversale Achse (H) und Verriegelungsvorrichtungen für diesen Nocken (16), die mindestens eine Gleitvorrichtung (39) umfassen, die im wesentlichen mit rechten Winkeln zur Drehachse des Nockens (16) gleiten kann, wobei diese Gleitvorrichtung (39) und der Nocken (16) ausschließlich von der schlüsselartigen Betätigungsvorrichtung (15) betätigbar sind, wobei die Gleitrichtung der Gleitvorrichtung (39) im wesentlichen senkrecht ist zur Drehachse (H) des Nockens und geneigt ist bezüglich beider Einsetzrichtungen der Betätigungsvorrichtung, und die Schlitze (12, 13) zum Einsetzen der Betätigungsvorrichtung im wesentlichen gleiche Abstände von der Abschlußkante (14) haben und wobei die Gleitvorrichtung (39) entlang Führungsvorrichtungen (40, 42, 17) gleiten kann, die starr gekoppelt sind an den Nocken, so dass die Gleitvorrichtung zusammen mit dem Nokken dreht, und die Gleitvorrichtung einen seitlichen Stopvorsprung (44) aufweist, der nach außen gerichtet ist, wobei die Führungsvorrichtungen auf einer seitlichen Fläche des Nockens (16), an der die Gleitvorrichtung (39) angeordnet ist, gebildet sind.

2. Sicherheitsschalter gemäß Anspruch 1, **dadurch gekennzeichnet, daß** die Neigungswinkel (μ) der Gleitvorrichtung (39) bezüglich der Einsetzrichtungen (α, β) der schlüsselartigen Betätigungsvorrichtung im wesentlichen identisch und ungefähr gleich 45° sind.

3. Sicherheitsschalter gemäß den vorhergehenden Ansprüchen, **dadurch gekennzeichnet, daß** zwei Gleitvorrichtungen (39) vorgesehen sind, die auf beiden Seiten des Nockens (16) angeordnet sind, wobei die Führungsvorrichtungen (40, 42, 17) für die zwei Gleitvorrichtungen (39) auf den seitlichen Flächen des Nockens (16) gebildet sind.

4. Sicherheitsschalter gemäß Anspruch 3, **dadurch gekennzeichnet, dass** der Kopf (3) zwei seitliche Halterungen (21, 22) aufweist mit Löchern für das Einsetzen der Rotationsachse (H) des Nockens, **dadurch gekennzeichnet, daß** jede seitliche Hal-

terung (21, 22) auf ihrer inneren Oberfläche eine geeignet geformte Nut (45) zur Aufnahme und für die Führung des seitlichen Stopvorsprungs (44) jeder Gleitvorrichtung (39) aufweist.

5. Sicherheitsschalter gemäß Anspruch 4, **dadurch gekennzeichnet, daß** jede Nut (45) einen gekrümmten Abschnitt (46) umfaßt, der konzentrisch ist bezüglich der Rotationsachse (H) des Nockens (16), um den Stopvorsprung (44) während der Drehung der Gleitvorrichtung (39) starr mit dem Nokken (16) zu führen.

6. Sicherheitsschalter gemäß Anspruch 5, **dadurch gekennzeichnet, daß** die Nut (45) einen zentralen Abschnitt (47) umfaßt, der radial aus dem gekrümmten Abschnitt (46) hervorragt zur Achse des Nockens, um die Rotation der Gleitvorrichtung (39) starr an den Nocken zu koppeln.

7. Sicherheitsschalter gemäß Anspruch 6, **dadurch gekennzeichnet, daß** elastische Vorrichtungen (48) vorgesehen sind, die zwischen dem Nocken (16) und jeder Gleitvorrichtung (39) wirken, um Stopvorsprung (44) normal zu halten in dem zentralen Abschnitt (47) der Nut (45).

8. Sicherheitsschalter gemäß Anspruch 7, **dadurch gekennzeichnet, daß** der zentrale Abschnitt (47) der Nut (45) glockenförmig ist, um die automatische Repositionierung des Stopvorsprungs (44) jeder Gleitvorrichtung (39) zu erleichtern.

9. Sicherheitsschalter gemäß Anspruch 8, **dadurch gekennzeichnet, daß** die schlüsselartige Betätigungsvorrichtung (15) auf ihrer Einsetzseite zwei wechselseitig gegenüberliegende Ansätze (37, 38) aufweist, die ausgebildet sind, während des ersten Teils des Einsetztakts die Gleitvorrichtung (39) mit einer Kraftkomponente zu betätigen, die im wesentlichen parallel ist zu ihrer Gleitrichtung.

10. Sicherheitsschalter gemäß Anspruch 9, **dadurch gekennzeichnet, daß** die Nocke (16) auf ihren seitlichen Oberflächen zwei geformte Sitze aufweist zur Aufnahme des Paars wechselseitig gegenüberliegender Ansätze (37, 38) der schlüsselartigen Betätigungsvorrichtung (15), um die Rotation des Nokkens (16) im zweiten Teil des Einsetztakts der schlüsselartigen Betätigungsvorrichtung (15) zu fördern.

Revendications

1. Commutateur de sécurité commandé par clé, comprenant un boîtier (2) qui présente un axe longitudinal (L) et qui renferme intérieurement des contacts électriques fixes (4, 5) et des contacts électriques mobiles (6, 7) qui sont appropriés pour interagir afin de changer l'état du commutateur, et une tête d'actionnement (3) qui présente un capot (10) en forme de prisme qui comporte, de part et d'autre d'une arête terminale (14), deux fentes (12, 13) pour l'insertion d'un actionneur (15) du type clé, selon deux directions (α, β) mutuellement perpendiculaires, dans lequel ladite tête (3) supporte une came (16) destinée à l'actionnement des contacts mobiles (6, 7), qui peut tourner autour d'un axe (H), sensiblement transversal, et des dispositifs de verrouillage pour ladite came (16), qui comprennent au moins un coulisseau (39) qui peut coulisser sensiblement perpendiculairement à l'axe de rotation de ladite came (16), ledit coulisseau (39) et ladite came (16) pouvant être actionnés exclusivement au moyen dudit actionneur (15) du type clé, dans lequel la direction du coulissement dudit coulisseau (39) est sensiblement perpendiculaire à l'axe de rotation (H) de ladite came et est inclinée par rapport aux deux directions d'insertion de l'actionneur, et dans lequel lesdites fentes (12, 13) prévues pour l'insertion dudit actionneur sont sensiblement équidistantes de ladite arête terminale (14), dans lequel ledit coulisseau (39) peut coulisser le long de dispositifs de guidage (40, 42, 17) qui sont couplés rigidement avec ladite came de telle manière que le coulisseau tourne avec la came, et ledit coulisseau a une dent d'arrêt latérale (44) qui est dirigée vers l'extérieur, lesdits dispositifs de guidage étant formés sur une face latérale de ladite came (16) sur laquelle ledit coulisseau (39) est agencé.

2. Commutateur de sécurité selon la revendication 1, **caractérisé en ce que** les angles d'inclinaison (μ) dudit coulisseau (39) par rapport aux directions d'insertion (α, β) dudit actionneur du type clé sont sensiblement identiques et sont égaux à environ 45°.

3. Commutateur de sécurité selon les revendications précédentes **caractérisé en ce qu'**il possède deux coulisseaux (39) qui sont agencés sur les deux côtés de ladite came (16), lesdits dispositifs de guidage (40, 42, 17) pour lesdits deux coulisseaux (39) étant formés sur les faces latérales de ladite came (16).

4. Commutateur de sécurité selon la revendication 3, dans lequel ladite tête (3) possède deux supports latéraux (21, 22) munis de trous pour l'insertion de l'axe de rotation (H) de ladite came, **caractérisé en ce que** chaque support latéral (21, 22) présente, sur sa surface interne, une gorge (45) de forme appropriée pour recevoir et guider ladite dent d'arrêt latérale (44) de chaque coulisseau (39).

5. Commutateur de sécurité selon la revendication 4,

caractérisé en ce que ladite gorge (45) comprend une portion incurvée (46) qui est concentrique à l'axe de rotation (H) de la came (16) afin de guider ladite dent d'arrêt (44) pendant que le coulisseau (39) tourne en liaison rigide avec la came (16).

6. Commutateur de sécurité selon la revendication 5, **caractérisé en ce que** ladite gorge (45) comprend une portion centrale (47) qui fait saillie radialement à partir de ladite portion incurvée (46) en direction de l'axe de ladite came afin de bloquer la rotation dudit coulisseau (39) en liaison rigide avec ladite came.

7. Commutateur de sécurité selon la revendication 6, **caractérisé en ce qu'**il possède des dispositifs élastiques (48) qui interagissent entre ladite came (16) et ledit coulisseau (39) pour maintenir ladite dent d'arrêt (44) normalement engagée dans ladite portion centrale (47) de ladite gorge (45).

8. Commutateur de sécurité selon la revendication 7, **caractérisé en ce que** ladite portion centrale (47) de ladite gorge (45) est évasée afin de faciliter le repositionnement automatique de la dent d'arrêt (44) de chaque coulisseau (39).

9. Commutateur de sécurité selon la revendication 8, **caractérisé en ce que** ledit actionneur du type clé (15) possède, vers son extrémité d'insertion, deux pattes (37, 38) mutuellement opposées, qui sont adaptées pour actionner lesdits coulisseaux (39), pendant la première partie de la course d'insertion, avec une composante de force qui est sensiblement parallèle à leur direction de coulissement.

10. Commutateur de sécurité selon, la revendication 9, **caractérisé en ce que** ladite came (16) présente, sur ses faces latérales, deux logements (32, 33) destinés à recevoir ladite paire de pattes mutuellement opposées (37, 38) dudit actionneur du type clé (15) afin de favoriser la rotation de ladite came (16) dans la deuxième partie de la course d'insertion dudit actionneur du type clé (15).

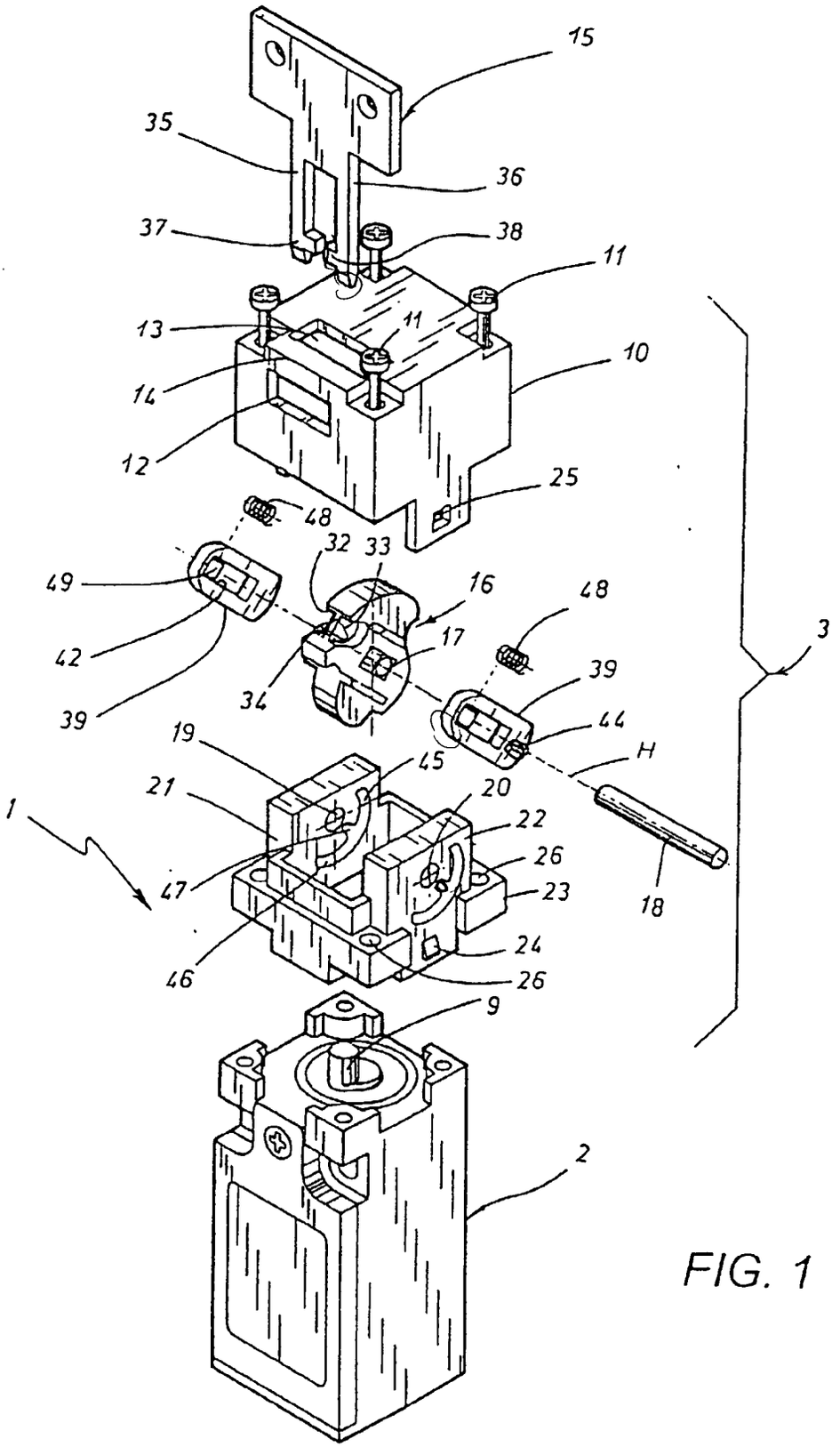
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FIG. 1

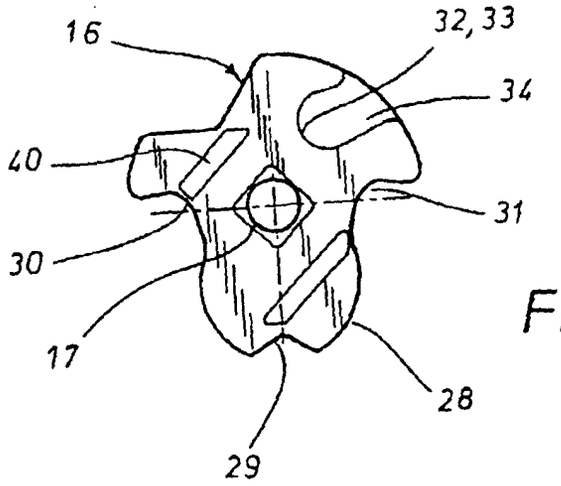

FIG. 2

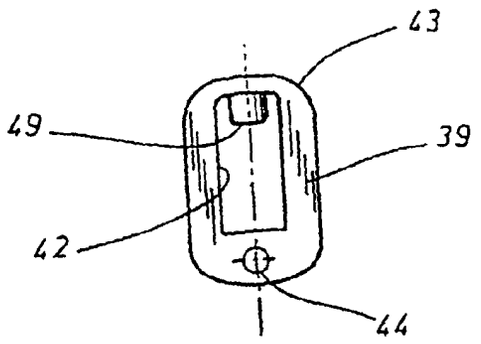

FIG. 3

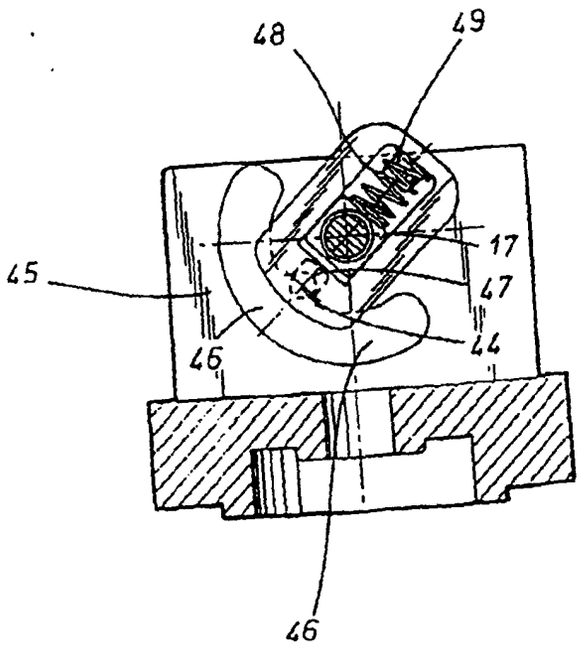

FIG. 4

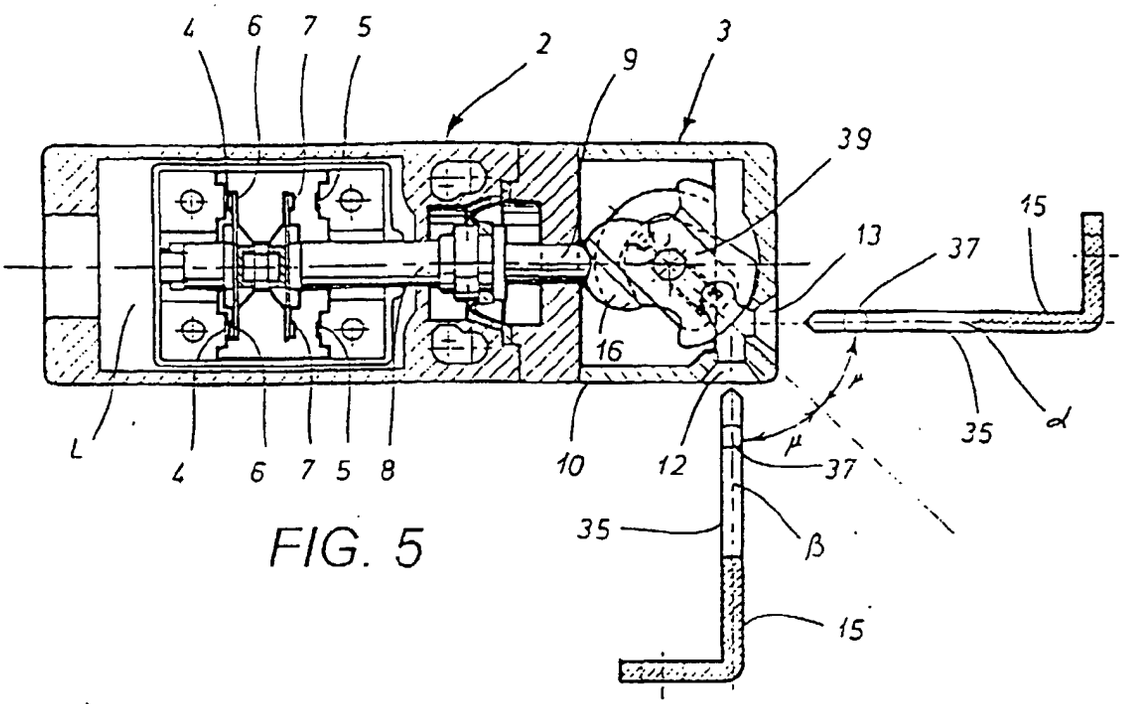

FIG. 5

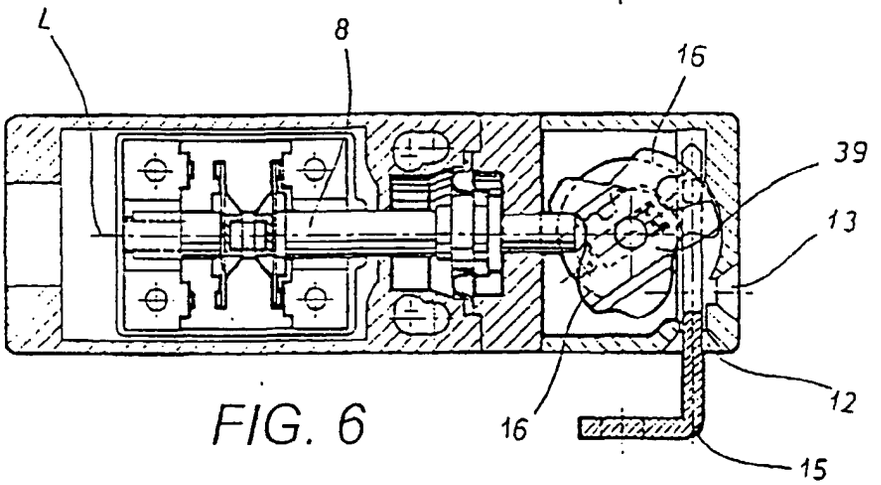

FIG. 6

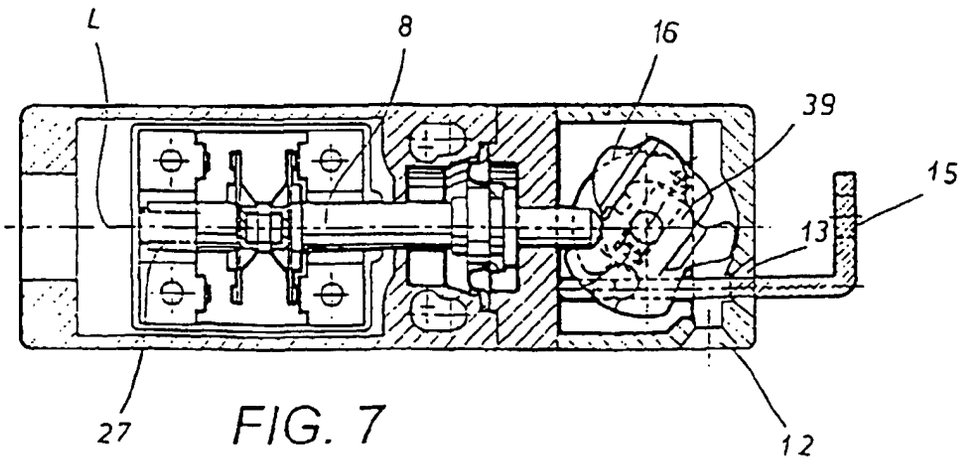

FIG. 7