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(54) **Disconnecter with electrical contact having twin-knife insertion coupling with reduced wear of the electrical contact**

Unterbrecher mit elektrischem Kontakt durch eine Zwillingsmessereinsatzkupplung für verringerten Verschleiss des elektrischen Kontakts

Interrupteur avec contact électrique par insertion entre des couteaux jumelés pour usure réduite du contact

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(56) References cited:
DE-A- 1 665 986 GB-A- 1 499 526

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Description

[0001] The present invention relates to a disconnecter with electrical contact having twin-knife insertion coupling, with reduced wear of the electrical contact.

[0002] It is known that disconnectors are electrical control devices designed to open and close inactive electrical circuits, i.e., to interrupt or establish electrical currents whose intensity is negligible with respect to the nominal current.

[0003] Among the different kinds of disconnectors, disconnectors with an electrical contact having twin-knife insertion coupling are known in which the electrical contact comprises a main contact pin and two mutually facing and spaced knives. The two knives can move on command in order to pass from a closed position, in which the mutually facing lateral surfaces of the knives engage the main contact pin, to an open position, in which the knives are disengaged and spaced from the main contact pin, and viceversa. A spacer is generally arranged between the two knives and sets the extent of maximum mutual approach of the two knives; elastic means further act on said knives and contrast their mutual spacing, so as to ensure sufficient contact pressure when they engage the main contact pin.

[0004] Generally, the knives are pivoted to a supporting structure, proximate to one of their longitudinal ends, about a pivoting axis and the main contact pin is fixed to said supporting structure in a region which is spaced with respect to the pivoting axis. The transfer of the knives from the open position to the closed position is achieved by the rotation of the knives about their pivoting axis through an arc having a preset breadth.

[0005] Since disconnectors are designed to open and close an inactive electric circuits, theoretically no electrical discharge should occur between the knives and the main contact pin during the opening of the electrical circuit. However, residual voltages may be present in the electrical circuit, for example if, along the electrical circuit, capacitors are provided that are not fully discharged when said electrical circuit is opened. As a consequence of this fact, during the opening of the electrical circuit performed by disengaging the knives from the main contact pin, an electric arc can occur between the knives and the main contact pin. Said electric arc causes a gradual wear of the contact region of the knives and of the main contact pin. If the electric arc has a relatively high intensity, beading may form on the contact surfaces due to the partial melting of the material that constitutes the knives and the main contact pin; said beading, during the operation of the disconnecter, can become interposed between the knives and the main contact pin, reducing the mutual contact surface and therefore increasing the electrical resistance of the contact. This increase in electrical resistance in the region of contact can generate overheating, which further worsens the wear of the regions of contact.

[0006] In order to avoid this effect, other kinds of dis-

connectors, such as for example disconnectors using an arm-type or pressure-based contact, use sacrificial contacts which are meant to transfer the region where the electric arc is triggered onto said sacrificial contacts instead of on the main contact pin or on the knives, so as to protect these elements from wear.

[0007] Sacrificial contacts are generally constituted by flexible laminae which are fixed to the main contact pin or to the knives and maintain the electrical connection between the knives and the main contact pin after said knives have disengaged from the main contact pin. However, these sacrificial contacts have the drawback that they delay excessively the opening of the electrical circuit and cause a flow of current between the knives and the laminae or between the main contact pin and the laminae in non-optimum conditions, because the resistance of the electrical contact between the laminae and the knives or between the laminae and the main contact pin is inversely proportional to the pressure applied by the laminae to the knives or to the main contact pin. This pressure is usually such as to induce high resistance in the region of contact, leading to overheating with consequent rapid damage of the laminae.

[0008] A relatively long duration of the electric arc can also induce an extension of said electric arc to nearby regions, rendering the sacrificial contact useless.

[0009] The aim of the present invention is to solve the above-described problems, providing a disconnecter with electrical contact having twin-knife insertion coupling which can have an extremely reduced wear even if it has to operate, for a large number of opening and closing cycles, in the presence of residual voltages in the electric circuit in which it is installed.

[0010] Within the scope of this aim, an object of the invention is to provide a disconnecter which has very short times during the opening transient, so as to rapidly quench any electric arc that might form between the electric contacts.

[0011] Another object of the invention is to provide a disconnecter which gives the greatest assurances of safety and can be manufactured at low costs.

[0012] This aim, these objects and others which will become apparent hereinafter are achieved by a disconnecter with electrical contact having twin-knife insertion coupling, which comprises a main contact pin and two mutually spaced and facing knives, said two knives being movable on command in order to pass from a closed position, in which the mutually facing lateral surfaces of said knives engage said main contact pin, to an open position, in which the knives are disengaged and spaced from said main contact pin, and viceversa; characterized in that it comprises a sacrificial contact which is associated with said main contact pin and protrudes from said main contact pin toward said knives in the open position; said sacrificial contact being in a position in which it can be contacted by said knives at least in their passage from the closed position to the open position and being disengaged by said knives after their disengage-

ment from said main contact pin; the portion of said sacrificial contact that can be engaged by said knives being movable with respect to said main contact pin in a direction which has a component which is parallel to the direction of motion of said knives; means being provided for moving said portion of the sacrificial contact away from said knives when said knives disengage from said portion of the sacrificial contact in passing from said closed position to said open position.

[0013] Further characteristics and advantages of the disconnecter according to the invention will become apparent from the following detailed description of a preferred but not exclusive embodiment of the disconnecter according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a schematic and partially sectional lateral elevation view of the disconnecter according to the invention;

Figure 2 is a sectional view of Figure 1, taken along the plane II-II, with the knives in the closed position; Figure 3 is a sectional view, similar to Figure 2, with the knives during their transfer from the closed position to the open position;

Figure 4 is a partially sectional view of the sacrificial contact of the disconnecter according to the invention.

[0014] With reference to the above figures, the disconnecter according to the invention, generally designated by the reference numeral 1, comprises a fixed main contact pin 2 and two mutually facing and spaced knives 3a and 3b.

[0015] The two knives 3a and 3b can move on command in order to pass from a closed position, in which the mutually facing lateral surfaces of the knives 3a and 3b engage the main contact pin 2, to an open position, in which the knives 3a and 3b are disengaged and spaced from the main contact pin 2, and viceversa.

[0016] More particularly, the main contact pin 2 is fixed, in a per se known manner, to a supporting structure 4, while the knives 3a and 3b are preferably pivoted to the supporting structure 4 about a pivoting axis 5 which is spaced from the main contact pin 2.

[0017] The knives 3a and 3b are moved from the open position to the closed position and viceversa by turning them through an arc having a preset breadth about the pivoting axis 5.

[0018] In a per se known manner, a spacer is arranged between the knives 3a and 3b and limits the maximum mutual approach of the knives 3a and 3b, and elastic means act on the knives 3a and 3b and are meant to contrast their mutual spacing, so as to ensure an adequate pressure of the knives 3a and 3b against two opposite faces of the main contact pin 2 when the knives 3a and 3b are moved to the closed position. The spacer and the elastic means that contrast the mutual spacing

of the knives 3a and 3b are of a known type and are not shown for the sake of simplicity.

[0019] According to the invention, the disconnecter comprises a sacrificial contact, generally designated by the reference numeral 6, which is associated with the main contact pin 2 and protrudes from it toward the knives 3a and 3b in the open position.

[0020] The sacrificial contact 6 is in such a position that the knives 3a and 3b make contact with it at least in their transfer from the closed position to the open position, and is disengaged by the knives 3a and 3b after their disengagement from the main contact pin 2.

[0021] The portion of the sacrificial contact 6 that can be engaged by the knives 3a and 3b is movable with respect to the main contact pin 2 in a direction which has a component which is parallel to the direction of motion of the knives 3a and 3b.

[0022] There are also means for moving said portion of the sacrificial contact 6 away from the knives 3a and 3b when the knives 3a and 3b disengage from said portion of the sacrificial contact 6 in moving from the closed position to the open position, as will become apparent hereinafter.

[0023] More particularly, if, as in the illustrated embodiment, the knives 3a and 3b are pivoted to the supporting structure 4 about a pivoting axis 5, the portion of the sacrificial contact 6 that is meant to be contacted by the knives 3a and 3b can move in a direction which is tangent to the path followed by the region of the knives 3a and 3b that is meant to make contact with the sacrificial contact 6 during the rotation of the knives 3a and 3b about the pivoting axis 5.

[0024] More particularly, the sacrificial contact 6 is associated with the end of the main contact pin 2 that is directed toward the knives 3a and 3b in the open position and protrudes from the main contact pin 2 toward the knives 3a and 3b in the open position.

[0025] The sacrificial contact 6 conveniently comprises a shaft 7 which has a threaded end 7a which can engage a female thread 8 formed in the main contact pin 2 or, as shown, in the supporting structure 4. The end 7b of the threaded shaft 7 that lies opposite the threaded end 7a has an enlarged portion that protrudes from the main contact pin 2 and forms a shoulder 9 which is directed toward the main contact pin 2. The sacrificial contact 6 furthermore comprises a head 10 which constitutes the portion of the sacrificial contact that is meant to be contacted by the knives 3a and 3b and is associated so as to be able to slide around the shaft 7 proximate to the end 7b.

[0026] The means for moving the portion or head 10 of the sacrificial contact 6 comprise first elastic means which are advantageously constituted by a helical spring 11 which is wound around the shaft 7 and is interposed between the shoulder 9 and an opposite shoulder 12 formed in the head 10.

[0027] Conveniently, the spring 11 is accommodated inside a seat 13 which is provided for this purpose in the

head 10 and is delimited by the shoulder 12 on the opposite side with respect to the end of the seat 13 that is directed toward the end 7b.

[0028] Conveniently, second elastic means are interposed between the head 10 and the main contact pin 2 and contrast the movement of the head 10 with respect to the shaft 7 toward the main contact pin 2. Said second elastic means are conveniently constituted by a pack of Belleville spring washers 14 which rest, on one side, against the bottom of a seat 15 formed in the end of the main contact pin 2 whereon the sacrificial contact 6 is arranged and rest, on the other side, against the head 10.

[0029] The second elastic means, constituted by the Belleville spring washer 14, conveniently have a higher rigidity than the first elastic means constituted by the spring 11.

[0030] Preferably, the head 10 has a substantially spherical shape and has larger dimensions, at right angles to the planes of arrangement of the knives 3a and 3b, than the main contact pin 2. Furthermore, the position of the head 10 is such as to ensure the disengagement of the knives 3a and 3b from said head 10 when the knives are in the closed position, i.e., correctly engaged with the main contact pin 2.

[0031] Advantageously, the region 20 in which the knives 3a and 3b make contact with the main contact pin 2, shown in dashed lines in Figure 1, is spaced from the contact region 21 that is meant to engage the sacrificial contact 6.

[0032] For the sake of completeness in description, it is noted that the knives 3a and 3b can move from the closed position to the open position and viceversa by rotating about the pivoting axis 5 through the action of an actuator 22 which can be constituted by an electric motor whose output shaft is connected to a threaded shaft 23. The threaded shaft 23 engages a female thread formed in a block 24 which is prevented from rotating about the axis of the shaft 23 and can slide parallel to the axis of said shaft 23. The block 24 is connected to an element 25 which is pivoted to the supporting structure 4 about an axis 26 which is parallel to the pivoting axis 5 and is connected, by means of a linkage 27, to the pair of knives 3a and 3b. By actuating the motor 22, the element 25 is made to rotate about the axis 26 and accordingly the knives 3a and 3b are made to rotate about the pivoting axis 5 for their transfer from the open position to the closed position or viceversa.

[0033] The motor 22 can of course be replaced with an actuator of the fluid-driven type or by another adapted actuator.

[0034] The operation of the disconnecter according to the invention is as follows.

[0035] When the knives 3a and 3b are in the closed position, their mutually facing lateral surfaces engage the main contact pin 2 at the contact region 20.

[0036] When the knives 3a and 3b are rotated about the pivoting axis 5 with respect to the supporting struc-

ture 4 in order to pass from the closed position to the open position, the knives 3a and 3b engage the contact region 21, which is spaced from the contact region 20, by means of the head 10 of the sacrificial contact 6. The engagement of the knives 3a and 3b with the head 10 causes the separation of the knives 3a and 3b from the main contact pin 2 because, as mentioned, the head 10 preferably has larger dimensions, at right angles to the planes of arrangement of the knives 3a and 3b, than the main contact pin 2 in the same direction. The engagement of the knives 3a and 3b with the head 10 of the sacrificial contact 6, together with the movement of said knives 3a and 3b in order to pass from the closed position to the open position, draws the head 10 away from the main contact pin 2. This movement causes the compression of the spring 11, as shown in figure 3, and when the knives 3a and 3b, continuing in their movement away from the main contact pin 2, disengage the head 10 of the sacrificial contact 6, said head is suddenly moved toward the main contact pin 2 and therefore away from the knives 3a and 3b by the elastic reaction of the spring 11.

[0037] This movement of the head 10, caused by the elastic reaction of the spring 11, reduces the duration of the electric arc that might occur between the knives 3a and 3b and the sacrificial contact 6 and therefore reduces the wear of the knives 3a and 3b and of said sacrificial contact 6.

[0038] When the knives 3a and 3b are returned to the closed position, they first engage the head 10 of the sacrificial contact 6, which produces the spacing of the knives 3a and 3b by an extent which is greater than the dimensions of the main pin 2; said spacing is maintained until the knives 3a and 3b disengage from the head 10, i.e., proximate to the end of the movement of the knives 3a and 3b to reach the closed position. Thanks to this fact, the knives 3a and 3b engage the main contact pin 2 by means of a mutual approach movement and contact with the head 10 does not occur, avoiding or substantially limiting mutual sliding between the knives 3a and 3b and the main contact pin 2. As a consequence of this fact, wear of the region of contact 20 of the knives 3a and 3b and of the main contact pin 2 is reduced.

[0039] When the knives 3a and 3b begin to make contact with the head 10 of the sacrificial contact 6, said head moves toward the main contact pin 2, loading the springs 14, which have a shock-absorbing function, reducing the impact of the knives 3a and 3b on the head 10.

[0040] In practice it has been observed that the disconnecter according to the invention fully achieves the intended aim, since by protecting the main contact pin from the effects of a possible electric arc and by reducing the duration of the electric arc it significantly limits the wear of the electrical contact.

[0041] Another advantage of the disconnecter according to the invention is that it reduces sliding between the knives and the main contact pin.

[0042] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A disconnecter with electrical contact having twin-knife insertion coupling, comprising a main contact pin (2) and two mutually spaced and facing knives (3a, 3b), said two knives being movable on command in order to pass from a closed position, in which the mutually facing lateral surfaces of said knives engage said main contact pin, to an open position, in which the knives are disengaged and spaced from said main contact pin (2), and viceversa; **characterized in that** it comprises a sacrificial contact (6) which is associated with said main contact pin and protrudes from said main contact pin (2) toward said knives (3a, 3b) in the open position; said sacrificial contact (6) being in a position in which it can be contacted by said knives (3a, 3b) at least in their passage from the closed position to the open position and being disengaged by said knives (3a, 3b) after their disengagement from said main contact pin (2); the portion of said sacrificial contact (6) that can be engaged by said knives (3a, 3b) being movable with respect to said main contact pin (2) in a direction which has a component which is parallel to the direction of motion of said knives (3a, 3b); means being provided for moving said portion of the sacrificial contact (6) away from said knives (3a, 3b) when said knives disengage from said portion of the sacrificial contact (6) in passing from said closed position to said open position.
2. The disconnecter according to claim 1, **characterized in that** said sacrificial contact (6) is associated with the end of said main contact pin (2) that is directed toward said knives (3a, 3b) in the open position and protrudes from it toward the knives (3a, 3b) in the open position.
3. The disconnecter according to claim 1, **characterized in that** said means for moving said portion of the sacrificial contact (6) comprise first elastic means which are interposed between said portion of the sacrificial contact (6) and said main contact pin (2), said first elastic means contrasting the movement of said portion of the sacrificial contact (6) in the direction that corresponds to the movement of said knives (3a, 3b) in their transfer from the closed position to said open position.
4. The disconnecter according to claim 3, **characterized in that** said sacrificial contact comprises a shaft which is connected to said main contact pin and a head which constitutes said portion of the sacrificial contact (6) which can move along said shaft in contrast with, or by virtue of the action of, said first elastic means.
5. The disconnecter according to claim 4, **characterized in that** said shaft is directed so that its axis has a component which is parallel to the direction of motion of said knives (3a, 3b), said first elastic means being constituted by a spring which is interposed between a shoulder of said shaft that is directed toward said main contact pin (2) and an opposite shoulder of said head.
6. The disconnecter according to claim 5, **characterized in that** said spring is accommodated in said head.
7. The disconnecter according claim 3, **characterized in that** second elastic means are interposed between said head and said main contact pin (2) and contrast the movement of said head along said shaft toward said main contact pin (2).
8. The disconnecter according to claim 7, **characterized in that** said second elastic means are constituted by at least one spring which is at least partially accommodated in said main contact pin (2).
9. The disconnecter according to claim 7, **characterized in that** said second elastic means have a higher rigidity than said first elastic means.
10. The disconnecter according to claim 3, **characterized in that** said head has, at right angles to the planes of arrangement of said knives (3a, 3b), larger dimensions than said main contact pin (2) and is disengaged from said knives (3a, 3b) in the closed position.
11. The disconnecter according to claim 1, **characterized in that** the region of contact of said knives (3a, 3b) with said sacrificial contact (6) is spaced from the region of contact of said knives (3a, 3b) with said main contact pin (2).
12. The disconnecter according to claim 1, **characterized in that** said main contact pin (2) is fixed to a supporting structure, said knives (3a, 3b) being pivoted to said supporting structure about a pivoting axis which is spaced from said main contact pin (2) and being able to rotate on command about said pivoting axis in order to pass from said closed position to said open position or viceversa; said shaft being orientated along a line which is tangent to the

path followed, in its rotation about said pivoting axis, by the region of contact of said knives (3a, 3b) with said sacrificial contact (6).

13. The disconnecter according to claim 3, **characterized in that** said head has a substantially spherical shape.

Patentansprüche

1. Trennschalter mit einem elektrischen Kontakt, welcher eine Doppelmesser-Einsteckverbindung hat und einen Hauptkontaktstift (2) und zwei wechselseitig beabstandete und einander zugewandte Messerteile (3a, 3b) hat, wobei die beiden Messerteile auf Betätigung bewegbar sind, um von einer Schließstellung, in welcher die wechselseitig gegenüberliegenden Seitenflächen der Messerteile in Eingriff mit dem Hauptkontaktstift sind, zu einer Offenstellung weiterzuschalten, in welcher die Messerteile außer Eingriff und beabstandet von dem Hauptkontaktstift (2) sind und umgekehrt, **dadurch gekennzeichnet, daß** ein Schutzkontakt (6) vorgesehen ist, welcher dem Hauptkontaktstift zugeordnet ist und von dem Hauptkontaktstift (2) in Richtung zu den Messertellen (3a, 3b) in der Offenstellung vorsteht; der Schutzkontakt (6) in einer Position angeordnet ist, in welcher er in Kontakt mit den Messerteilen (3a, 3b) wenigstens bei dem Durchgang von der Schließstellung zu der Offenstellung kommen kann, und von den Messertellen (3a, 3b) außer Eingriff kommt, nachdem diese von dem Hauptkontaktstift (2) abgerückt sind; der Abschnitt des Schutzkontakts (6), welcher in Eingriff mit den Messertellen (3a, 3b) kommen kann, bezüglich des Hauptkontaktstifts (2) in einer Richtung beweglich ist, die eine Komponente hat, welche parallel zur Bewegungsrichtung der Messerteile (3a, 3b) ist; und eine Einrichtung aufweist, welche vorgesehen ist, um den Abschnitt des Schutzkontakts (6) von den Messerteilen (3a, 3b) weg zu bewegen, wenn die Messertelle von dem Abschnitt des Schutzkontakts (6) bei der Bewegung von der Schließstellung zu der Offenstellung außer Eingriff sind.
2. Trennschalter nach Anspruch 1, **dadurch gekennzeichnet, daß** der Schutzkontakt (6) dem Ende des Hauptkontaktstifts (2) zugeordnet ist, welches in Richtung zu den Messerteilen (3a, 3b) in der Offenstellung weist, und von diesem in Richtung zu den Messerteilen (3a, 3b) in der Offenstellung vorsteht.
3. Trennschalter nach Anspruch 1, **dadurch gekennzeichnet, daß** die Einrichtung zur Bewegung des Abschnitts des Schutzkontakts (6) eine erste elastische Einrichtung aufweist, welche zwischen dem Abschnitt des Schutzkontakts (6) und dem Haupt-

kontaktstift (2) angeordnet ist, und daß die erste elastische Einrichtung der Bewegung des Abschnitts des Schutzkontakts (6) in der Richtung entgegenwirkt, die der Bewegung der Messertelle (3a, 3b) von der Schließstellung zu der Offenstellung entspricht.

4. Trennschalter nach Anspruch 3, **dadurch gekennzeichnet, daß** der Schutzkontakt einen Schaft aufweist, welcher mit dem Hauptkontaktstift verbunden ist, und einen Kopf aufweist, welcher den Teil des Schutzkontakts (6) bildet, welcher längs des Schafts in Gegenwirkung zu oder durch die Wirkung der ersten elastischen Einrichtung bewegt werden kann.
5. Trennschalter nach Anspruch 4, **dadurch gekennzeichnet, daß** der Schaft derart ausgerichtet ist, daß seine Achse eine Komponente hat, welche parallel zur Bewegungsrichtung der Messertelle (3a, 3b) ist, und daß die erste elastische Einrichtung von einer Feder gebildet wird, welche zwischen einer Schulter des Schafts, die in Richtung zu dem Hauptkontaktstift (2) weist, und einer gegenüberliegenden Schulter des Kopfs angeordnet ist.
6. Trennschalter nach Anspruch 5, **dadurch gekennzeichnet, daß** die Feder in dem Kopf untergebracht ist.
7. Trennschalter nach Anspruch 3, **dadurch gekennzeichnet, daß** die zweite elastische Einrichtung zwischen dem Kopf und dem Hauptkontaktstift (2) angeordnet ist und der Bewegung des Kopfs längs des Schafts in Richtung zu dem Hauptkontaktstift (2) entgegenwirkt.
8. Trennschalter nach Anspruch 7, **dadurch gekennzeichnet, daß** die zweite elastische Einrichtung von wenigstens einer Feder gebildet wird, welche wenigstens teilweise in dem Hauptkontaktstift (2) aufgenommen ist.
9. Trennschalter nach Anspruch 7, **dadurch gekennzeichnet, daß** die zweite elastische Einrichtung eine höhere Steifigkeit als die erste elastische Einrichtung hat.
10. Trennschalter nach Anspruch 3, **dadurch gekennzeichnet, daß** der Kopf rechtwinklig zu der Anordnungsebene der Messerteile (3a, 3b) größere Abmessungen als der Hauptkontaktstift (2) hat, und außer Eingriff von den Messerteilen (3a, 3b) in der Schließstellung ist.
11. Trennschalter nach Anspruch 1, **dadurch gekennzeichnet, daß** der Kontaktbereich der Messerteile (3a, 3b) mit dem Schutzkontakt (6) von dem Kon-

taktbereich der Messerteile (3a, 3b) mit dem Hauptkontaktstift (2) beabstandet ist.

12. Trennschalter nach Anspruch 1, **dadurch gekennzeichnet, daß** der Hauptkontaktstift (2) an einer Tragkonstruktion befestigt ist, die Messerteile (3a, 3b) schwenkbar an der Tragkonstruktion um eine Schwenkachse angeordnet sind, welche von dem Hauptkontaktstift (2) beabstandet ist, und durch Betätigung um die Schwenkachse drehbar ist, um eine Schaltbewegung von der Schließstellung zu der Offenstellung oder umgekehrt durchzuführen; und der Schaft längs einer Linie ausgerichtet ist, welche tangential zu der Bewegungsbahn um die Schwenkachse und dem Kontaktbereich der Messerteile (3a, 3b) mit dem Schutzkontakt (6) ist.
13. Trennschalter nach Anspruch 3, **dadurch gekennzeichnet, daß** der Kopf eine im wesentlichen sphärische Gestalt hat.

Revendications

1. Interrupteur muni d'un contact électrique ayant un accouplement par insertion entre deux lames, comportant une broche de contact principale (2) et deux lames mutuellement séparées et en vis-à-vis (3a, 3b), lesdites deux lames étant mobiles sur commande pour passer d'une position fermée, dans laquelle les surfaces latérales mutuellement en vis-à-vis desdites lames viennent en contact avec ladite broche de contact principale, vers une position ouverte dans laquelle les lames sont libérées et séparées de ladite broche de contact principale (2), et vice versa, **caractérisé en ce qu'il** comporte un contact sacrificiel (6) qui est associé à ladite broche de contact principale, et qui fait saillie à partir de ladite broche de contact principale (2) vers les deux lames (3a, 3b) dans la position ouverte, ledit contact sacrificiel (6) étant dans une position dans laquelle les deux lames (3a, 3b) peuvent venir en contact avec celui-ci, au moins pendant leur passage de la position fermée vers la position ouverte, et étant libéré par lesdites lames (3a, 3b) après leur libération à partir de ladite broche de contact principale (2), la partie dudit contact sacrificiel (6) avec laquelle lesdites lames (3a, 3b) peuvent venir en prise étant mobile par rapport à ladite broche de contact principale (2) dans une direction qui a une composante qui est parallèle à la direction de déplacement desdites lames (3a, 3b), des moyens étant fournis pour déplacer ladite partie du contact sacrificiel (6) loin desdites lames (3a, 3b) lorsque lesdites lames se libèrent de ladite partie du contact sacrificiel (6) en passant de ladite position fermée vers ladite position ouverte.
2. Interrupteur selon la revendication 1, **caractérisé en ce que** ledit contact sacrificiel (6) est associé à l'extrémité de ladite broche de contact principale (2) qui est dirigée vers lesdites lames (3a, 3b) dans la position ouverte, et fait saillie à partir de celle-ci en direction des lames (3a, 3b) dans la position ouverte.
3. Interrupteur selon la revendication 1, **caractérisé en ce que** lesdits moyens pour déplacer ladite partie du contact sacrificiel (6) comportent des premiers moyens élastiques qui sont interposés entre ladite partie du contact sacrificiel (6) et ladite broche de contact principale (2), lesdits premiers moyens élastiques s'opposant au déplacement de ladite partie du contact sacrificiel (6) dans la direction qui correspond au déplacement desdites lames (3a, 3b) dans leur transfert de ladite position fermée vers ladite position ouverte.
4. Interrupteur selon la revendication 3, **caractérisé en ce que** ledit contact sacrificiel comporte un arbre qui est connecté à ladite broche de contact principale, et une tête qui constitue ladite partie du contact sacrificiel (6) qui peut se déplacer le long dudit arbre contrairement auxdits premiers moyens élastiques, ou en vertu de l'action de ceux-ci.
5. Interrupteur selon la revendication 4, **caractérisé en ce que** ledit arbre est dirigé de sorte que son axe a une composante qui est parallèle à la direction de déplacement desdites lames (3a, 3b), lesdits premiers moyens élastiques étant constitués par un ressort qui est interposé entre un épaulement dudit arbre qui est dirigé vers ladite broche de contact principale (2) et un épaulement opposé de ladite tête.
6. Interrupteur selon la revendication 5, **caractérisé en ce que** ledit ressort est reçu dans ladite tête.
7. Interrupteur selon la revendication 3, **caractérisé en ce que** des seconds moyens élastiques sont interposés entre ladite tête et ladite broche de contact principale (2), et s'opposent au déplacement de ladite tête le long dudit arbre vers ladite broche de contact principale (2).
8. Interrupteur selon la revendication 7, **caractérisé en ce que** lesdits seconds moyens élastiques sont constitués par au moins un ressort qui est au moins reçu partiellement dans ladite broche de contact principale (2).
9. Interrupteur selon la revendication 7, **caractérisé en ce que** lesdits seconds moyens élastiques ont une rigidité supérieure auxdits premiers moyens élastiques.

10. Interrupteur selon la revendication 3, **caractérisé en ce que** ladite tête a, à angle droit par rapport au plan d'agencement desdites lames (3a, 3b), des dimensions supérieures à ladite broche de contact principale (2), et est dégagée desdites lames (3a, 3b) dans la position fermée. 5
11. Interrupteur selon la revendication 1, **caractérisé en ce que** la zone de contact desdites lames (3a, 3b) avec ledit contact sacrificiel (6) est séparée de la zone de contact desdites lames (3a, 3b) avec ladite broche de contact principale (2). 10
12. Interrupteur selon la revendication 1, **caractérisé en ce que** ladite broche de contact principale (2) est fixée sur une structure de support, lesdites lames (3a, 3b) étant pivotées vers ladite structure de support autour d'un axe de pivotement qui est séparé de ladite broche de contact principale (2), et pouvant tourner sur commande autour dudit axe de pivotement pour passer de ladite position fermée vers ladite position ouverte ou vice versa, ledit arbre étant orienté le long d'une ligne qui est tangente au trajet suivi, pendant sa rotation autour dudit axe de pivotement, par la zone de contact desdites lames (3a, 3b) avec ledit contact sacrificiel (6). 15 20 25
13. Interrupteur selon la revendication 3, **caractérisé en ce que** ladite tête a une forme sensiblement sphérique. 30

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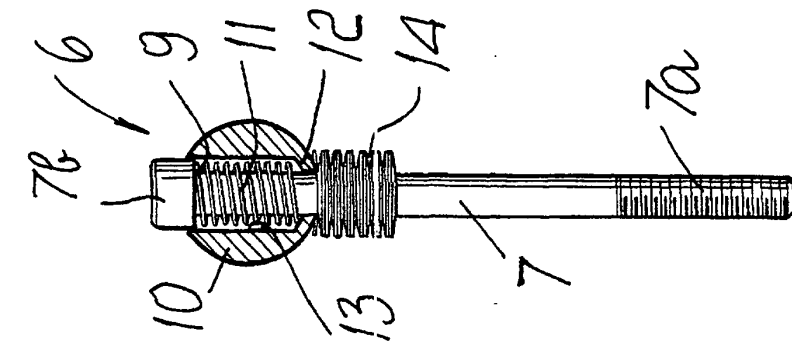


Fig. 4

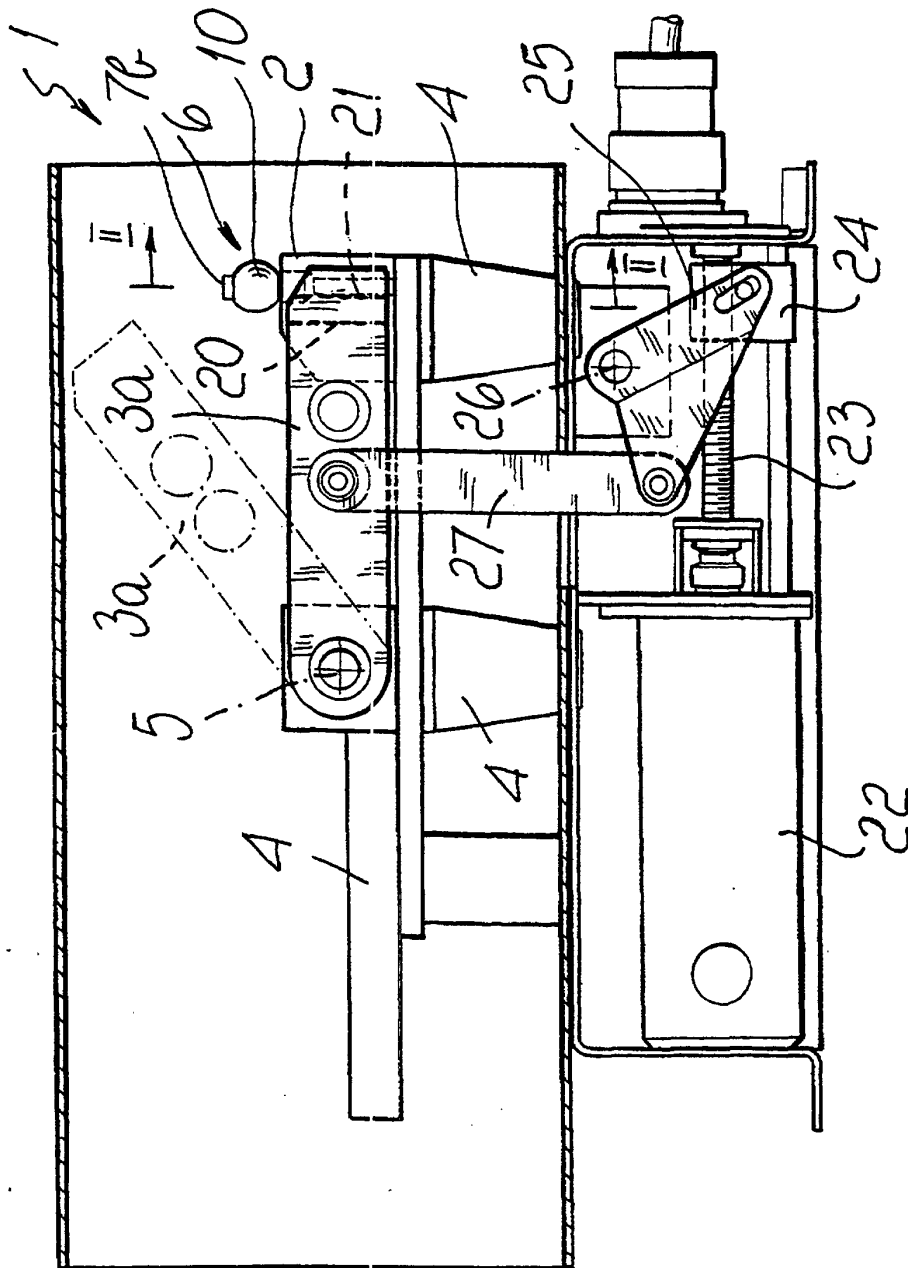


Fig. 1

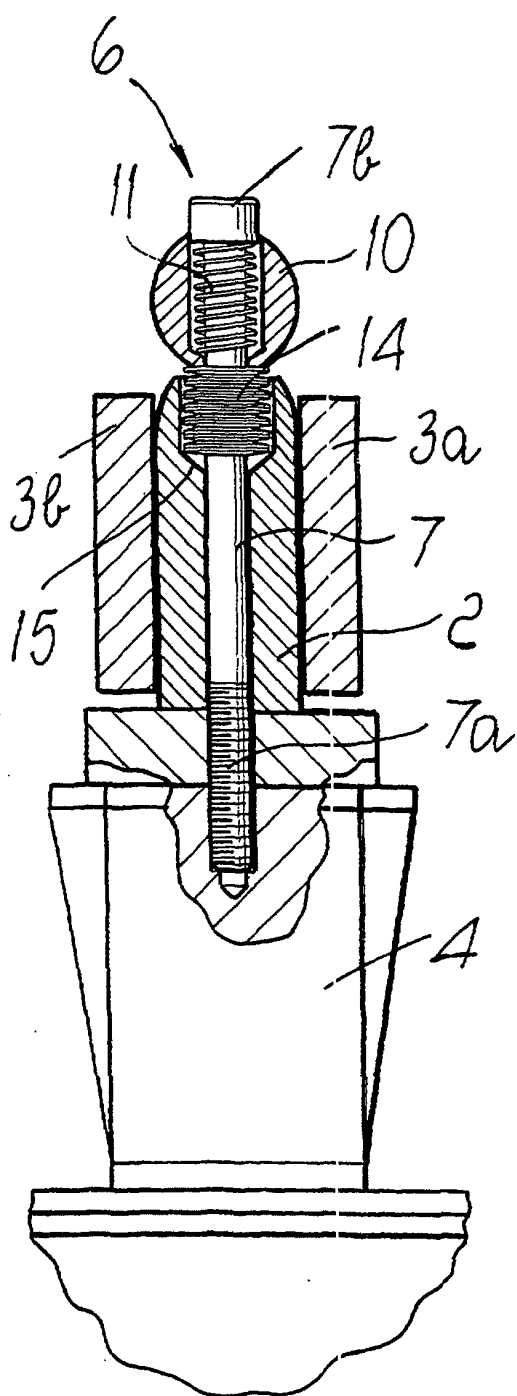


Fig. 2

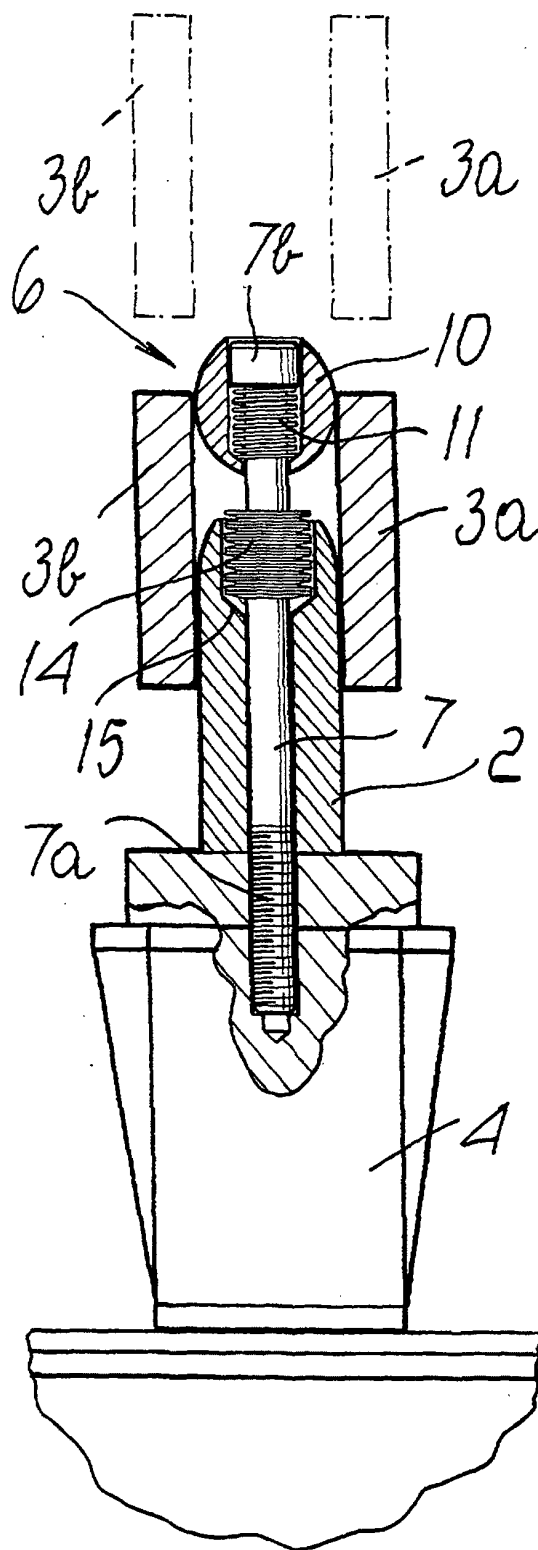


Fig. 3