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

(11) **EP 2 617 105 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
06.07.2016 Bulletin 2016/27

(21) Application number: **10776190.0**

(22) Date of filing: **27.09.2010**

(51) Int Cl.:
H01R 13/62 *(2006.01)* ***H01R 13/71*** *(2006.01)*
H01R 13/24 *(2006.01)*

(86) International application number:
PCT/IT2010/000409

(87) International publication number:
WO 2012/035567 (22.03.2012 Gazette 2012/12)

(54) MAGNETICALLY ENSLAVED UNIPOLAR ELECTRICAL CONTACT ARRANGED FOR EMBEDDING IN THE SIDES OF GENERIC FRAMES AND IN PARTICULAR OF GLASS-CHAMBER FRAMES

MAGNETISCH UNTERJOCHTER EINPOLIGER ELEKTRISCHER KONTAKT ZUR EINBETTUNG IN DIE SEITEN VON RAHMEN IM ALLGEMEINEN UND GLASKAMMERNRAHMEN IN BESONDEREN

CONTACT ÉLECTRIQUE UNIPOLAIRE ASSERVI MAGNÉTIQUEMENT CONÇU POUR ÊTRE INTÉGRÉ AUX CÔTÉS DE CHÂSSIS GÉNÉRIQUES ET NOTAMMENT DE CHÂSSIS DE CHAMBRES DE VERRE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
BA ME RS

(30) Priority: **16.09.2010 IT MI20101679**

(43) Date of publication of application:
24.07.2013 Bulletin 2013/30

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Description

Field of application of the invention

[0001] The present invention is related to the field of the frame electrification devices, and in particular to a magnetically enslaved unipolar electrical contact arranged for embedding in the sides of generic frames and in particular of glass-chamber frames.

[0002] Several reasons entail the need of electrify the frames, in particular frames in the facades of public and private buildings. The applicant, for example, is a manufacturer of glass-chamber systems, in some implementations of which electrical type interfaces must be arranged to feed the electric motors inside the glass-chambers used to move pleated or Venetian blinds placed therein. In the above mentioned technical field another requirement arises in the alarm systems. With anti-theft devices, for example, closure of doors and windows is continually monitored. Another requirement arises in the latest air-conditioning plants which include warnings to the control systems for keeping a watch on whether individual doors and windows are open or closed. Different methods of operating this kind of control are technically possible, for example those described as volumetric, but the only one of interest to the present invention concerns monitoring electrical continuity between the two cooperating parts (hereinafter called semi-contacts) of an electrical contact operated by a same door or window frame. The semi-contacts are wired to a control unit that supplies the low voltage current (usually 12V DC) needed for this use. The contacts fitted to each pair of door or window frames can be connected in series or in parallel. Contacts are known as unipolar because they disconnect a single polarity. Embedded contacts, whether mechanical or Reed, con be united in a single piece constituting a double contact, also called bipolar.

Review of the known art

[0003] The contacts for alarm systems are nearly all of the mechanical type and consist of two unipolar semi-contacts applied to the two frames, for example one on the jamb and the other on the leaf of a door or window to be controlled. In anti-theft systems for private dwellings, this type of contacts has been replaced by the less expensive Reed-type magnetic contact. Mechanical contacts are however still used in alarm systems for heavily protected frames, such as safes in strong rooms at the banks, where mechanical or electrical strength and reliability over time are essential. The Reed contact consists of two laminas of ferromagnetic material separated by a few tenths of a millimetre. Contacts of diffused gold are placed on the opposing laminas, which are then sealed inside a small container filled with inert gas. The ends of the laminas opposite the contacts project from the container and form the terminals of the contacts, connected to two lengths of an electric wire. In the presence of an external magnetic field crosswise to the laminas, opposite poles, tending to attract each other, form on the opposing lamina faces. If the magnetic field is strong enough, their force of attraction overcomes resistance to flexion and closes the contact. A permanent magnet is mounted on the edge of a door or window and the Reed contact is mounted on the frame. As long as the door is closed the permanent magnet keeps the contact closed. If the door is opened the magnet is no longer close enough and the contact opens because of the elastic recovery of the laminas. In the case of Reed contacts there is no bouncing but they are mechanically fragile with such thin and delicate laminas, and possible door banging will damage them in time. Further, the Reed contacts cannot be used for relays with breakaway currents of more than 1 ampere because, generally speaking, they cannot commute them.

[0004] More points of comparison would seem to come from a mechanical contact that will be explained with the aid of **Figures 1** to **3.** The contact is bipolar but as the two semi-contacts are exactly the same, what is said is true for the single unipolar contact, as described in the preamble of the claim 1.

[0005] Figure 1 shows an exploded perspective view of two frames 1, 2 in whose sides that will be faced at the end of the closing manoeuvre, embedded in their respective seats 3 and 4, are two bipolar semi-contacts 5, 6, part of a more general bipolar contact available on the market. Frames 1 and 2 are rotated to form an acute angle, either during opening or closing of the door/window space into which both are fitted. The left-hand bipolar semi-contact 5 comprises an insulating support 7 for inclusion of two mobile contact elements 8 and 9. Semi-contact 8 is doubly symmetrical along two perpendicular planes passing through respectively crosswise and longitudinal axes (horizontal and vertical). The right-hand bipolar semi-contact comprises an insulating support 12 of plastic material whose front rim is fixed to the frame 2 by two screws; the rim is contiguous to a rear capsule embedded in its seat 4. Flush with the external face of the rim are the heads 13 and 14 of two fixed contact elements aligned one above the other in a central position. The two fixed semi-contacts can also be accessed from the rear wall of the capsule to join up the ends of two electric wires 10b and 11b. The outer face of the rim of bipolar semi-contact 6 extends for a short way alongside the heads 13 and 14, then bends towards the frame 2 forming a slide 15 on the side facing the opening.

[0006] Figure 2 shows a section of semi-contact 5 along the longitudinal plane of symmetry. Semi-contact 5 is shown in the open position. Both Figures 1 and 2 show that on the insulating support 7 there is a front rim 7a, screwed into frame 1, contiguous to a rear capsule 7b embedded in its own seat 3. The two mobile elements of contact, 8 and 9, are identical, each consisting of a head, respectively 8a and 9a, joined to a perpendicular shank, respectively 8b and 9b. The heads 8a and 9a, aligned in a central position one above the other, emerge

for a suitable length from the front face of rim 7a. Inside capsule 7b are two longitudinal parallel cavities, adequately spaced to allow free movement of the head and shank of the mobile contact elements, respectively 8 and 9, and a rear wall in which are two holes through which pass the two shanks 8b and 9b. In each of the two cavities is a helical spring, respectively 16 and 17, through which passes the shank, respectively 8b and 9b. Each of the two ends of each spring respectively rests against the head of its own mobile element of contact and against the rear wall of capsule 7b. In both shanks, 8b and 9b, is a circular cut, respectively 18 and 19, made to take a "seger" type stop ring, external to the capsule 7b. The ends of shanks 8b, 9b are joined to two electric wires, respectively 10a, 11 a, the bare ends of which fit into two crosswise holes and are held in place by axial screws, respectively 20, 21. When the bipolar contact shown in the figure is open, the two springs 16, 17 are nearly exhausted and of a length able to keep each stop ring against the rear wall of capsule 7b, thus determining the length of the contact head emerging from the rim 7a.

[0007] Figure 3 shows the bipolar contact when closed; note that heads 8a, 9a of the mobile contact elements are almost entirely inside capsule 7b pressed in by the heads 13, 14 of the fixed contact elements when frames 1 and 2 have been closed and current passes between the bipolar semi-contacts 5, 6. Backward movement of the heads 8a, 9a of sprung elements 8, 9 is facilitated by the slide 15. In the closed position, springs 16, 17 are fully compressed and shanks 8b, 9b further project from capsule 7b carrying with them the stop rings 18, 19 when are then idle. The document DE 20 2005 009818 U1 discloses semi-contacts according to the preamble of claims 1, 9, 14.

Explanation of the technical problem

[0008] The mot serious drawback that may occur during the use of unipolar contacts, whether or not similar to one or other of the two bipolar contact components in Figures 1 to 3, is that the electrical connection at the end of the shank of the mobile contact element may become damaged. This is mainly due to wear caused by continual movement in both directions of the electric wire together with the shank of the mobile element fixed to it. A worn connection may disconnect due to the wire becoming detached, or else inducing damaging micro-disconnections caused by mechanical oscillations (bouncing) of the wire becoming loose in its hole. The need for the head of the mobile contact to project permanently from the side of the door or window frame when open might be thought to give an unsatisfactory appearance. Extension of the head of the mobile contact beyond the side of the frame is the essential starting condition for being able to touch the head of the fixed contact when the two heads are separated by a gap at the closure of the frames. The two frames are usually fixed so that they can be closed without the sides having to slide one against the other. This implies the existence of a gap that, unless closed by elastic backward movement of the mobile contact, would prevent recreation of an electric contact between the two frames. Other drawback is that, running on the slide, the mobile contacts are subjected to be flexed and their insulating support could be broken consequently or the mobile contacts could be stopped. With such a spring configuration, the side of the frame must be milled in order to lodge the mobile contacts.

Purpose of the invention

[0009] The main purpose of the invention is to overcome the following drawbacks pointed out for the mechanical contacts:

- possible detachment or loosening of the electric wire from their connections,
- possible contact of the electric wires with the frame, producing current dispersion or short-circuit;
- milling of the frame sides.

[0010] A further purpose of the present invention is to suggest a different operating mode compared with that for Reed contacts by enslaving to a magnetic field the closing of an electric contact embedded into a frame.

Summary of the invention

[0011] To achieve these purposes, subject of the present invention is an unipolar electric contact comprising two semi-contacts each having its insulating support prepared for embedding in the sides of respective frames, such as the jambs and leaves of doors and windows, or leaves only, said semi-contacts cooperating to maintain electrical continuity between a mobile contact element and a fixed contact element, belonging to respective semi-contacts, said mobile contact element being coupled to resilient means to elastically deform them during closure of the frames, and therefore also while closing the unipolar contact, thus compensating the residual distance between the sides of the frames, in which according to the invention the contact also includes:

- magnetizing means able to generate a force of attraction between the fixed and mobile contact elements, respectively;
- non-magnetic metal guiding means to guide bidirectional translation of the mobile contact element, respectively, towards the fixed contact element by the magnetizing effect when an intervention threshold distance is crossed while the mobile contact element is approaching the fixed one, and in the opposite direction by the returning action exerted by the resilient means when said intervention threshold distance is crossed while said mobile contact element is moving away from the fixed one;
- means for connecting the guiding means to an elec-

tric wire placed in electrical continuity with the mobile contact element through the guide means, as described in claim 1.

[0012] A further subject of the invention is the single electrical semi-contact including a mobile contact element, as described in an independent claim.

[0013] A further subject of the invention is the single electrical semi-contact including a fixed contact element as described in an independent claim.

[0014] Further characteristics of the present invention in its various embodiments considered innovative, are described in the dependent claims.

[0015] According to one aspect of the invention the resilient means are made of electrically conductive material and the mobile contact element engages the resilient means in their turn engaged by the guiding means.

[0016] According to another aspect of the invention both fixed and mobile contact elements have a head with a flat contact face, preferably circular, and an opposite face perpendicularly joined to a shank supporting the connection to its respective electric wire.

[0017] According to another aspect of the invention both the heads of the fixed and mobile contact elements are flush with the external faces of their respective insulating supports to be embedded.

[0018] According to another aspect of the invention, the rim of one contact face is included in the rim of the other to correct any misalignments between the axes of the two semi-contacts.

[0019] According to another aspect of the invention, the resilient means consist of a helical spring made of a good electrical conducting material.

[0020] In one embodiment of the invention the guide is a bushing with a longitudinal hole through it containing the resilient means, said mobile contact element is coupled to the resilient means to compress them while being magnetically moved towards the fixed contact element.

[0021] In one embodiment of the invention, a semi-contact includes a permanent magnet through which passes the shank of the fixed contact element, the permanent magnet resting against the head of the fixed contact element; while in the other semi-contact the mobile contact element is made of paramagnetic material, the fixed contact element is made of magnetically transparent material and protects the permanent magnet from shocks received from the head of the mobile contact element on exceeding the distance of magnetic effect.

[0022] In a dual embodiment of the invention, the mobile contact element is permanently magnetized and a protective disk of metallic non-magnetic material is fixed over its contact face; while the fixed contact element is made of paramagnetic material.

Advantages of the invention

[0023] The main advantage of the invention is that the conductor, connected electrically but not rigidly to the mobile element of the unipolar contact, remains stationary in relation to the frame while the door or window space is being closed or opened. In this way, the causes of conductor disconnection, and consequent permanent opening of electrical connections, no longer exist. Similarly, there is no longer any reason for contact bouncing due to the screws that hold the conductors in place becoming loosened. Again, compared with mechanical contacts of the type shown in Figures 1 to 3 (where the mobile element compresses the spring moving back towards its frame pressed by the fixed semi-contact) the mobile element of the present invention compresses the spring during the outward pull on its own frame applied by the magnet embedded in the other frame. In this way both heads of the contact elements remain flush with the wall of the insulating supports when the frames are open. This feature makes the unipolar contact of the present invention easier to be installed because a milling of the side of the frame is not required, instead only a simple drilling is requested which can be executed in place.

[0024] The same feature not only improves the appearance of the contacts but also makes the presence of the control system less noticeable.

[0025] Compared with the Reed contacts, where a single device applied to a single frame includes both parts of the contact (qualifying such device like a simple proximity sensor of the magnet), with the device of the present invention the two parts of the contact are applied to different frames; so that the magnet plays a different role consisting in favouring establishment of an electrically uninterrupted metal bridge between the two frames while they are closing. With a configuration of the unipolar contact such as this, ill-intentioned persons cannot elude control, unlike a Reed-type device where the strong magnetic field close to the contact could simulate the magnet and allow the frames to be opened eluding the control.

Short description of the figures

[0026] Further purposes and advantages of the present invention will become clear from the following detailed description of an example of its realization and by the attached drawings given for purely explanatory purposes and in no way limitative, wherein:

Figure 1 is an exploded perspective view of a bipolar electric contact embeddable in the sides of door and window frames, realized according to the known art.

Figure 2 is a section along the longitudinal plane of symmetry of the semi-contact marked number 1 in Figure 1, shown when open.

Figure 3 shows the semi-contact in Figure 2 when closed.

Figure 4A is a perspective view of the two components (semi-contacts) of a bipolar electric contact embeddable in the sides of respective frames of doors and windows, realized according to the present invention.

The sequence of figures **4B, 4C, 4D,** shows the gradual approach of the two frames in Figure 4A till the unipolar contact reaches the closed position.

Figure 5 is an exploded perspective view of the (fixed) semi-contact 32 in Figure 4A.

Figure 6 is a section cut along a longitudinal plane of symmetry of an insulating support used in the semi-contact shown in Figure 5.

Figure 7 is an exploded perspective view of the (mobile) semi-contact 33 in Figure 4A.

Figure 8 is a section cut along a longitudinal plane of symmetry of an insulating support used in the semi-contact shown in Figure 7 **Figure 9** shows two views, side and front, of the semi-contact in Figure 5.

Figure 10 shows two views, side and front, of the semi-contact in Figure 7.

Figure 11 shows a side view substantially grouping the semi-contacts in
Figures 9 arid 10, with the contact open.

Figure 12 is a side view that substantially groups the semi-contacts in Figures 9 and 10 with the contact closed.

Figures 13A, 13B show a section along a longitudinal plane of symmetry of the open contact in Figure 11.

Figure 14 shows a detail of Figure 13B

Figure 15 is a cross section along the plane A-A in Figure 13B.

Figures 16A, 16B show a section along a longitudinal plane of symmetry of the closed contact in Figure 12.

Figure 17 represents Figures 16A and 16B reciprocally out of line.

Figure 18 is a front view of the two heads out of line in Figure 17.

Detailed description of some preferred forms of realizing the invention

[0027] In the following description, equal elements that appear in different figures may be marked with the same symbols. In describing a figure reference may be made to parts not expressly appearing in that figure but in previous ones. The scale and proportions of the various elements designed does not necessarily correspond to reality.

[0028] **Figure 4A** is a perspective view of the part of two frames, 30, 31, of a single door or window opening (space) where two unipolar contacts (shown extracted for clarity) are embedded, each contact consisting of a pair of semi-contacts, 32, 33 and 32a, 33a, respectively. The two semi-contacts 32, 32a are embedded in their respective holes, 34, 34a, one aligned below the other in the side of the frame 30. The two semi-contacts 33, 33a are respectively embedded in holes 35, 35a one aligned below the other in the side of frame 31. Each semi-contact is screwed onto its respective frame and is connected to a respective electric wire that penetrates inside the frame. The frames 30, 31 can either be the jamb to which the leaf of a door or the wing of a window is hinged, or the two leaves hinged to the same jamb. Hereinafter the jamb is the fixed frame walled on three sides. The unipolar contacts in **Figure 4A** can be used with other types of frames with opposing edges when closed, such as sliding or folding doors or roller shutters, etc.. The presence of two unipolar contacts in no way limits the invention since a single unipolar contact is enough to set off an alarm in case of need. The arrow in **Figure 4A** shows that the two frames 30, 31 are approaching each other due to rotation of one around its hinge, or else to rotation of both frames. **Figures 4B, 4C, 4D** show the sequence of approach until the frames are closed, and the two unipolar contacts as well, as in **Figure 4D** where the semi-contacts 32, 33 touch each other; current can therefore pass through them and through a respective current limiting resistor in the control unit.

[0029] **Figures 5, 7** show an exploded perspective view of all the parts of the two semi-contacts 32, 33 each of which can be embedded either in the jamb or in the leaf. Semi-contact 32 contains no moving parts but semi-contact 33 does. In **Figure 5** there is an insulating support 38 of plastic material consisting of a flat base 39 against the side of the frame (not shown), perpendicularly joined to a hollow substantially cylindrical extension 40 to be embedded in a hole in the frame. Close to one end of the flat base 39 is a hollow circular seat 41 axial to the cylindrical extension 40 and communicating with the cavity inside them by an axial hole 42 in the partition wall. The farther end of the cylindrical extension 40 is open and the wall too is open at a longitudinal gap to permit connection to an electric conductor. Close to the other end of the flat base 39 is a hole 43 for insertion of a screw 44 fixing it to the frame. The form of the flat base 39 is that generated by extrusion of the flat figure consisting of two opposing semi-circumferences joined by two tangential lines at the diametric points. Inside the circular seat 41 is a cylindrically shaped permanent magnet 45 with a central hole 46 axial to the hole 41. The outer face of the magnet 45 rests against the head of a mushroom-shaped metal element 47 made of non-magnetic material, a good electric conductor. The head 48 of the metal mushroom 47 is flat and circular and is perpendicularly joined to a short shank 49. This shank passes through the hole 46 in the centre of the magnet 45, through the hole 42 in the partition wall and penetrates inside the cavity 40a of the insulating cylindrical extension 40. Thickness of the magnet 45 plus that of the head 48 of the mushroom 47 is about equal to the depth of the seat 41, so that the head 48 lies substantially flush with the outer wall of the flat base 39. Passing through the free end of shank 49 is a short threaded axial hole 51 that ends in a through hole 52 crosswise to the shank. The shank 49 is electrically connected to the control system by an electric wire 61. To do this one end of wire 61 fits into the crosswise hole 52 in the shank 49 where it is fixed by a screw 62 that penetrates into the axial hole 51. The mushroom 47 is

an element of contact through which passes electric current from the unipolar electric contact when in its closed position; as this contact is immobilized in relation to the insulating support 38, as will be seen below, and therefore in relation to the frame, it will hereinafter be called 'fixed contact element'.

[0030] **Figure 5** shows two additional insulating elements 53, 57 of different thicknesses, useful if it becomes necessary to reduce the depth of the embedded part, increasing to a similar degree extension of the remaining part beyond the side of the frame. The shape of insulating elements 53, 57 is the same as that of the flat base 39 and may be considered optional. At one end of insulating element 53 there is a hole 54 through which to pass the insulating cylindrical extension 40. At the other end is a hole 55 for the fixing screw 44. Aligned immediately beyond the hole 55 is a circular anti-slippage tooth 56. The depth of insulating element 57 is about half that of element 53; there is a hole 58 in it at one end for passage of. the insulating cylindrical body 40. At the other end is a hole 59 to receive the screw 44. Aligned immediately beyond the hole 59 is a circular anti-slippage tooth 60.

[0031] **Figure 5A** shows that, apart from a very short cylindrical section where the head 48 joins, shank 49 presents a lined and smoothed (worked) surface so that it can be locked inside the insulating support 38; or rather, the cylindrical surface of shank 49 presents a succession of triangular teeth 50 that extend beyond the head 48 for the entire depth of hole 42, the surface of shank 49 is smoothed at two parallel faces that cut through the teeth 50. These teeth are forced against the wall of hole 42 to prevent translation of shank 49 (as more clearly seen in Figure 13A).

[0032] **Figure 6** shows a longitudinal section of insulating support 38, detailing a cross section of the partition wall, the flat base 39 and the cylindrical extension 40 of insulating support 38. The shape of hole 42, equal to the cross-section of shank 49, serving to block rotation of shank 49, otherwise possible when screwing in axial screw 62 against the conductor 61. The figure shows accessibility to the open cavity 40a for connecting the electric wire 61 both longitudinally through the rear opening in the cylindrical extension 40, and at a longitudinal notch 40b in its wall starting from the edge. A circular notch 56a is made inward in the wall of the flat base 39 to receive the tooth 56 on insulating element 53 and prevent it from rotating.

[0033] **Figure 7** shows an insulating support 70 of the same shape as that of insulating support 38, this too consisting of a flat base 71 against the side of the frame (not shown) joined to a hollow cylindrical extension 72 longer than extension 40. Close to one end of the flat base 71 is a hollow circular seat 73 communicating with internal cavity 72a (Figure 8) in the cylindrical extension 72 through a hole 74 in the partition wall, out of line in relation to the axis of extension 72. The farther end of cylindrical extension 72 is open and there is a recess in the edge of the wall to allow the tip of a screwdriver to penetrate. Close to the other end of flat base 71 is a through hole 75 for insertion of a screw 76 to fix it to the frame.

[0034] Semi-contact 33 comprises an element of contact 77, this too mushroom-shaped and made of paramagnetic material, a good conductor of electricity (a paramagnetic material magnetizes approaching to a magnet and loses its magnetism when the magnet is moved away). The cylindrical head 78 of mushroom 77 is flat and is perpendicularly joined to a shank 79 in which there is a short axial hole (shown subsequently) at the farther end. The diameter of head 78 is about half that of head 48 of the fixed contact element 47 while shank 79 is longer than shank 49. Shank 79 passes through hole 74 and penetrates inside the cavity of the cylindrical insulating extension 72, stopping when head 78 reaches the end wall of the circular seat 73. The thickness of head 78 is about equal to the depth of seat 73 so that, when in position, it is substantially flush with the outer wall of the base 71. Mushroom 77 is an element of contact carrying electric current through the unipolar electrical contact with in the closed position, and as it can translate in both directions through hole 74, in relation to insulating support 70, and therefore to the frame, it will hereinafter be called a 'mobile contact element'

[0035] Semi-contact 33, like semi-contact 32, includes optional insulating elements 80, 84 of the same shape and depth as elements 53, 57, though the thickness might differ. At one end of insulating element 80 there is a hole 81 to allow passage of insulating cylindrical extension 72, and at the other end a hole 82 for the screw 76 to fix it in place. A circular anti-slippage tooth 83 is aligned just beyond hole 82. In insulating element 84 there is a hole 85 at one end for passage of insulating cylindrical extension 72 and, at the other end, a hole 86 for the passage of screw 76. A circular tooth 87 is aligned just beyond the hole 86.

[0036] Inside cavity 72a of the insulating cylindrical extension 72 is a bushing 88 of non-magnetic material. Inside bushing 88 is a longitudinal eccentric hole 89 that occupies the entire length of said bushing 88. Inside hole 89 is a helical spring 92 that, when in its idle position, is about as long as the hole 89. This later is aligned with hole 74 allowing shank 79 to translate in the helical spring 92 and, obviously, in hole 89. The farther end of spring 92 rests against the head of a screw 93, axially penetrating the threaded end of shank 79. The diameter of the head of screw 93 is smaller than the diameter of hole 89 so that the head can translate with the mobile contact element 77, pressing the spring 92 against the against the wall in correspondence of a reduction of cross section of the hole 89 when element 77 is attracted towards the permanent magnet 45. Hole 89 being eccentric, there is space inside the bushing 88 for a second longitudinal hole 90 of a diameter inferior to that of the previous one, for insertion of an end of an electric wire 94 connected to the control system,. A short screw 95 penetrates a crosswise hole 91 in communication with the hole 90 for screwing up the conductor 94.

[0037] **Figure 8** illustrates a longitudinal section of insulating support 70. It will be noted that the hole 74 in the wall of the circular seat 73 is not on the axis of the cylindrical extension 72. There is also a circular notch 83a in the wall of the flat base 71 to receive the tooth 83 on insulating element 80, preventing its rotation.

[0038] **Figures 9, 10** show the two semi-contacts 32, 33 already described, with the pawls on the respective insulating elements and corresponding circular notches in adjacent elements, that were not visible in the preceding figures. Proceeding in **Figure 9** from inside outwards of the semi-contact 32, in the insulating element 57 there is a circular notch 60b available for a possible further insulating element and, on the opposite wall, the tooth 60. In element 53 there is a circular notch 60a for insertion of tooth 60 and, on the opposite wall, tooth 56 that penetrates notch 56a in the wall of flat base 39. Proceeding in **Figure 10** from inside to the outside of semi-contact 33, in insulating element 84 there is a circular notch 87b available for a possible further insulating element and, on the opposite wall, the tooth 87; in insulating element 80 there is a circular notch 87a for insertion of tooth 87 and, on the opposite wall, the tooth 83 penetrates inside the notch 83a in the wall of flat base 71.

[0039] **Figure 11** shows the unipolar contact in its open position with its two semi-contacts 32, 33 opposite and separated; it will be seen that the two contact heads 48, 78 are substantially flush with the external walls of the respective insulating supports 38, 70. At the position of a hole 96 in the wall there is a break in the circular edge at the end of the insulating extension 72 of the semi-contact 33 giving accessibility from outside to the head of the crosswise screw 95.

[0040] **Figure 12** shows the unipolar contact in its closed position with the two contact heads 48, 78 touching each other due to magnetic attraction, even though the respective semi-contacts 32, 33 are still not fully adjacent as an initial section of shank 79 is still projecting from its insulating support.

[0041] **Figure 13A** is obtained including the permanent magnet 45 in Figure 5 in the circular seat 41 of the insulating support 38 in Figure 6, subsequently introducing shank 49 of fixed contact element 47 in the non-circular hole 42 until the head 48 comes against the cylindrical magnet 45. Introduction of shank 48 requires application of slight pressure by the teeth 50 against the wall of hole 42, in this way preventing any possibility of translation of the fixed contact element 47. In this position the head of contact 48 is substantially flush with the wall of flat base 39. Semi-contact 32, complete with electrical connection, is embedded in a 12 mm circular hole made in the side of the frame to which it is fixed by screw 44 that holds the flat base 39 firm. No particular processing (milling) is needed on the profiles. The figure shows magnetic polarity corresponding to axial magnetization of the ferromagnetic cylinder 45. The rigid head 49 protects the magnet 45 (like all magnets particularly sensitive to shocks) from shocks inflicted by the mobile contact element 77 caused by magnetic attraction at close range. The magnet field crosses the head 48 without suffering loss of power.

[0042] **Figure 13B** is obtained by first including the non-magnetic bushing 88 in the cavity 72a in the cylindrical extension 72, with the helical spring 92 inside the eccentric hole 89. Shank 79 on mobile contact element 77 is then inserted into the hole 74 in the insulating support 70 and in the longitudinal hole 89 in the bushing 88, penetrating inside the fully extended spring 92 where it is prevented from leaving hole 89 by the head of screw 93 axially fixed to shank 79. In this position the helical spring 92 exerts a slight pressure against the head of the screw 93 in a way to hold the head of contact 78 substantially flush with the wall of flat base 71. Independently of next considerations, the spring 92 maintains electrical continuity between bushing 88 and the shank 79. In fact, one end of the spring 92 rests against the wall at the reduced cross-section of hole 89, while the other end rests against the head of the screw 93 connected to the shank 79. Semi-contact 33, complete with its electrical connection, is embedded in a 12 mm circular hole in the side of the frame to which it fixed by the screw 76 that immobilizes the flat base 71. There is thus no need to mill the profiles. The Figure shows weak magnetic polarity induced by magnet 45 in the head 78 of mobile contact element 77 at that distance still outside the capture distance.

[0043] **Figure 14** gives a longitudinal section of the bushing 88 showing up the change of diameter of eccentric hole 89. The diameter of the initial part 89a of eccentric hole 89, at the innermost end in contact with the base 71, is slightly less than that of the remainder 89b. One end of the helical spring 92 rests against the residual wall 89c at the interface between hole 89a and hole 89b where the diameter changes; the other end rests against the head of screw 93 axial to shank 88 and is compressed by the advance of mobile contact element 77. Shank 79 is in contact with the wall of the initial part 89a of hole 89 so as to maintain electrical continuity with the bushing 88, whatever configuration the unipolar semi-contact may have assumed before, during and after translation towards the fixed contact element 47.

[0044] **Figure 15,** showing the cross section of semi-contact 33 along plane A-A in Figure 13B, better clarifies the reciprocal arrangement of elements at the farther end inside the frame. The eccentricity of hole 89 allows greater space in the bushing 88 for the other longitudinal hole 90 containing conductor 94, and for the crosswise threaded hole 91 to take the screw 95. The diameter of the initial part 91a of hole 91 is greater to allow translation of the head of screw 95. In the same way, there is an opening 96 the side wall of the cylindrical extension 72 starting from the border at the head of screw 95, to allow space for the tip of a screwdriver. The figure shows part 89b of the eccentric hole present in the bushing 88 where shank 79 of mobile contact element 77 is inserted with the possibility of sliding inside the helical spring 92. The section

is taken at the position of the shank of axial screw 93 so that pressure of the spring against the head of the screw is not evident.

[0045] **Figures 16A, 16B** together show changes in the shape of semi-contact 33 only, including the mobile contact element 77, when the two frames are near to closure. As appears from **Figure 16B,** the shorter distance of head 78 from fixed magnet 45 has intensified the magnetic field induced in head 78 (and in shank 79) causing it to make rapid impact against head 48 of the other semi-contact, even before the frames are completely closed. The figure shows that the moment of impact coincides with maximum shortening of spring 92, compressed by the initial section of shank 79 emerging from its insulating support 70. The figure also shows that the electric wire 94 has had no part in movement of shank 79 but even so has maintained electrical continuity with it through the wall of the bushing 88 at the position of hole 89a. Electrical continuity between the two semi-contacts 32, 33 is assured by mechanical contact between the two cylindrical heads 48 and 78, stabilized by magnetic attraction that keeps the two heads in close contact eliminating any vibrations often the cause of micro-interruptions and consequent false alarms.

[0046] **Figures 17, 18** show that reliability of the condition of closed contact is improved by assigning different diameters to the two heads of contacts 48, 78. Referring to Figure 17 it will be seen that the diameter of circular head 48 of fixed contact element 47 is equal to that of magnet 45 onto which it rests, greater (roughly double) the diameter of the circular head 78 of mobile contact element 77. It will also be seen that the two contact elements, both of cylindrical symmetry, are off-axis in the position of maximum coverage of head 78 by head 48, more clearly seen in **Figure 18.** Surface contact, and thus the conductance of the electrical contact, remains therefore unaltered even if non-alignment between the two semi-contacts 32, 33 encompasses 360°.

[0047] Further configurations that semi-contact 33 may assume, as from **Figure 16B,** are not found in corresponding figures but are in any case similar to those already existing. With the two frames closed, head 48 fully returns to circular seat 73 pressing shank 79 inwards, allowing spring 92 to extend as in **Figure 13B** although present in shank 79 a magnetic field of maximum intensity. In this way spring 92 does not oppose the magnetic force of attraction. When starting to open the frames semi-contact 33 briefly reassumes the shape it had in **Figure 16B** where the spring 92 is once again compressed and the two heads 48, 78 touch. Electrical contact is still maintained in this stage. As the distance between frames increases, the magnetic field weakens and head 78 once more returns to its seat 73 drawn back by the effect of the returning action exerted by spring 92 on shank 79; in this way the initial configuration of open contact as in **Figure 13B** is restored with a short delay in opening given by the preceding stage, so making this configuration more reliable.

[0048] As regards the materials used:

- insulating supports 38, 70 are of plastic material;
- permanent magnet 45 is made of neodymium, iron and boron;
- fixed contact element 47 is made of nickel-plated brass;
- mobile contact element 77 is made of magnetic nickel-plated steel;
- bushing 88 is made of nickel-plated brass.

[0049] Based on this description of a preferred realization, some changes can be made by an expert in the field without thereby departing from the sphere of the invention as will be made clear by the following claims.

Claims

1. Unipolar electric contact comprising two semi-contacts (32, 33) each having its insulating support (38, 70) arranged for embedding in the sides of respective frames (30,31), such as the jambs and leaves of doors and windows, or leaves only, said semi-contacts cooperating to maintain electrical continuity between a mobile contact element (77) and a fixed contact element (47), belonging to respective semi-contacts (33, 32), said mobile contact element (77) being coupled to resilient means (92) to elastically deform them during closure of the frames (30, 31), and therefore also while closing the unipolar contact, thus compensating the residual distance between the sides of the frames wherein the contact also includes:

- magnetizing means (45) able to generate a force of attraction between the fixed (47) and mobile (77) contact elements, respectively; **characterized in that** the contact further includes
- non-magnetic metal guiding means (88) to guide bidirectional translation of the mobile contact element (77), respectively, towards the fixed contact element (47) by the magnetizing effect when an intervention threshold distance is crossed while the mobile contact element (77) is approaching the fixed one (47), and in the opposite direction by the returning action exerted by the resilient means (92) when said intervention threshold distance is crossed while said mobile contact element (77) is moving away from the fixed one (47);
- means (95) for connecting the guiding means (88) to an electric wire (94) placed in electrical continuity with the mobile contact element (77) through the guide means (88).

2. Unipolar electric contact as in claim 1, **characterized**

in that said resilient means (92) are made of electrically conductive material and that said mobile contact element (77) engages the resilient means (92) in their turn engaged by the guiding means (88).

3. Unipolar electric contact as in claim 1 or 2, **characterized in that** said mobile contact element (77) compresses the resilient means (92) during translation by magnetic effect towards the fixed contact element (47).

4. Unipolar contact element as in claim 1, **characterized in that** the rim of the contact surface of one of the two contact elements (78) is contained in the rim of the contact surface of the other contact element (48) to compensate for any misalignment there may be.

5. Unipolar contact element as in claim 1, **characterized in that** the semi-contact (32) that includes the fixed contact element (47) includes an axially magnetised cylindrical permanent magnet (45), while the mobile contact element (77) included in the other semi-contact (33) is made of paramagnetic material.

6. Unipolar electric contact as in claim 5, **characterized in that** the fixed contact element (47) is made of metal material transparent to the magnetic field and is placed in front of the permanent magnet (45) to protect it from shocks received from the mobile contact element (77) in the final stage of approach.

7. Unipolar electric contact as in claim 6, **characterized in that** fixed contact element (47) has a head (48) joined to a shank (49), one face of the head being accessible from outside the insulating support (38) and an opposite face matching with one face of the permanent magnet (45), while the shank (49) passes through an axial hole (46) in the permanent magnet (45) and comprises, at its farther head, means (51, 52, 62) for connecting it to an electric wire (61).

8. Unipolar electric contact as in claim 7, **characterized in that** the shank (49) of said fixed contact element (47) includes means (42, 50) for attaching it to the insulating support (38) for avoiding its translation and rotation.

9. Unipolar electric semi-contact (33) including.

- an insulating support (70) suitable for embedding in a hole (35) made in the side of the frame such as the jamb or leaf of a door or window;
- a mobile contact element (77) made of paramagnetic metal material consisting of a head (78) joined to a shank (79), said shank elastically engaging resilient means (92), **characterized in that** the semi-contact further includes a non-magnetic metal bushing (88) the shank being partially included in the hole (89) of the on-magnetic metal bushing (88), the shank (79) being able to translate through the hole (89) by effect of an attracting magnetic field applied to the head (78), staying in contact with the wall (89a) of the hole (89);
- means (95) for connecting the bushing (88) to an electric wire (94).

10. The semi-contact (33) as in claim 9, **characterized in that** the resilient means consist of a helical spring (92) including said shank (79) inside it, the ends of the helical spring (92) resting, respectively, against stopping means (93) at the end of the shank (79) and against the wall (89c) in correspondence of a reduction (89a) of cross-section of the hole (89).

11. The semi-contact (33) as in claim 10, **characterized in that** the length of the helical spring (92) when released is grater than the maximum length of the shank (79) inside said hole (89).

12. The semi-contact (33) as in claim 9, **characterized in that** said hole (89) occupies an eccentric position in the bushing (88), so permitting a second hole (90) parallel to the first one (89) for inserting one end of the electric wire (94), and also permitting a crosswise threaded hole (91) entering the second hole (90) for introducing a fastening screw (95) accessible by a cut (96) in the wall of the insulating support (70).

13. The semi-contact (33) as in claim 9, **characterized in that** said insulating support (70) includes a seat (73) to take the head (78) of the mobile contact element (77) flush with the external wall.

14. Unipolar electric semi-contact (32) able to cooperate with the semi-contact of claim 9 to create a unipolar electric contact, including :

- an insulating support (38) suitable for embedding in a hole (34) made in the side of the frame such as the jamb or leaf of a door or window;
- a permanent magnet (45) placed in a seat (41) of the insulating support (38); **characterized in that** the semi-contact further includes
- a fixed contact element (47) made of metal material transparent to the magnetic field, having a head (48) joined to a shank (49) immobilized to the insulating support (38), the head (48) having one face matching with a face of the permanent magnet (45) and an opposite face turned toward the outside of the insulating support (38), the shank (49) passing through an axial hole (42) in the permanent magnet (45) and having at its free end means (51, 52, 62) for connecting an electric wire (61).

15. Semi-contact (32) as in claim 14, **characterized in that** the depth of said seat (41) in said insulating support (38) is such that the head (48) of the fixed contact element (47) is flush with the external wall.

16. Semi-contact (32) as in claim 14, **characterized in that** the part of the shank (49) adjacent to the head (48) includes a sequence of circumferential teeth (50) broken at two opposing walls of the shank, said teeth (50) engaging the wall of a hole (42) in the insulating support (38) through which the shank (49) passes, thus stopping its translation, said flat opposite walls of the shank (49) matching with two other walls of said hole (42) that prevent the shank from rotating.

Patentansprüche

1. Einpoliger elektrischer Kontakt, umfassend zwei Teilkontakte (32, 33), jeweils mit ihrem isolierenden Träger (38, 70), der zur Einbettung in die Seiten jeweiliger Rahmen (30,31) wie beispielsweise Flügel und Pfosten von Türen und Fenstern oder nur Flügeln angeordnet ist, wobei die Teilkontakte zusammenwirken, um die elektrische Kontinuität zwischen einem beweglichen Kontaktelement (77) und einem festen Kontaktelement (47) aufrechtzuerhalten, die zu jeweiligen Teilkontakten (33, 32) gehören, wobei das beweglichen Kontaktelement (77) mit elastischen Mitteln (92) verbunden ist, um sie während des Schließens der Rahmen (30, 31) und daher auch beim Schließen des einpoligen Kontakts elastisch zu verformen und folglich den Restabstand zwischen den Seiten der Rahmen auszugleichen, wobei der Kontakt ferner Folgendes aufweist:

- Magnetisierungsmittel (45), die in der Lage sind, jeweils eine Anziehungskraft zwischen den festen (47) und den beweglichen (77) Kontaktelementen zu erzeugen, die **dadurch gekennzeichnet sind, dass** der Kontakt ferner Folgendes aufweist:
- amagnetische Führungsmittel (88) aus Metall, um die bidirektionale Translation des beweglichen Kontaktelements (77) in Richtung zum festen Kontaktelement (47) durch die Magnetisierungswirkung zu führen, wenn ein Interventionsschwellabstand überschritten wird, während das bewegliche Kontaktelement (77) sich dem festen (47) nähert, und in die umgekehrte Richtung durch die von den elastischen Mitteln (92) ausgeübte Rückholkraft, wenn der Interventionsschwellabstand überschritten wird, während das bewegliche Kontaktelement (77) sich von dem festen (47) entfernt;
- Mittel (95) zum Anschließen der Führungsmittel (88) an einen elektrischen Draht (94), der durch die Führungsmittel (88) in elektrische Kontinuität mit dem beweglichen Kontaktelement (77) versetzt wird.

2. Einpoliger elektrischer Kontakt nach Anspruch 1, **dadurch gekennzeichnet, dass** die elastischen Mittel (92) aus einem elektrisch leitfähigen Material hergestellt sind und das bewegliche Kontaktelement (77) die elastischen Mittel (92) in Eingriff nimmt, die ihrerseits von den Führungsmitteln (88) in Eingriff genommen werden.

3. Einpoliger elektrischer Kontakt nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** das bewegliche Kontaktelement (77) die elastischen Mittel (92) während der Translation durch Magnetwirkung in Richtung zum festen Kontaktelement (47) zusammendrückt.

4. Einpoliges Kontaktelement nach Anspruch 1, **dadurch gekennzeichnet, dass** die Kante der Kontaktfläche eines der beiden Kontaktelemente (78) in der Kante der Kontaktfläche des anderen Kontaktelements (48) enthalten ist, um jegliche mögliche Fehlausrichtungen zu kompensieren.

5. Einpoliges Kontaktelement nach Anspruch 1, **dadurch gekennzeichnet, dass** der Teilkontakt (32), der das feste Kontaktelement (47) aufweist, einen axial magnetisierten zylinderförmigen Dauermagneten (45) aufweist, während das bewegliche Kontaktelement (77), das in dem anderen Teilkontakt (33) enthalten ist, aus paramagnetischem Material hergestellt ist.

6. Einpoliger elektrischer Kontakt nach Anspruch 5, **dadurch gekennzeichnet, dass** das feste Kontaktelement (47) aus einem für das magnetische Feld durchlässigen, metallischen Material hergestellt und vor dem Dauermagneten (45) angeordnet ist, um es vor Schlägen seitens des beweglichen Kontaktelements (77) in der Endphase der Annäherung zu schützen.

7. Einpoliger elektrischer Kontakt nach Anspruch 6, **dadurch gekennzeichnet, dass** das feste Kontaktelement (47) einen Kopf (48) aufweist, der mit einem Schaft (49) verbunden ist, wobei eine Fläche des Kopfes von außerhalb des isolierenden Trägers (38) zugänglich ist und eine gegenüberliegende Fläche mit einer Fläche des Dauermagneten (45) übereinstimmt, während der Schaft (49) durch ein Axialloch (46) im Dauermagneten (45) hindurchgeht und an seinem ferneren Kopf Mittel (51, 52, 62) zum Anschließen desselben an einen elektrischen Draht (61) umfasst.

8. Einpoliger elektrischer Kontakt nach Anspruch 7, **da-**

durch gekennzeichnet, dass der Schaft (49) des festen Kontaktelements (47) Mittel (42, 50) zum Anbringen desselben an dem isolierenden Träger (38) umfasst, um eine Translation und Rotation desselben zu vermeiden.

9. Einpoliger elektrischer Teilkontakt (33) aufweisend:

- einen isolierenden Träger (70), der zur Einbettung in einem Loch (35) geeignet ist, das in der Seite des Rahmens, wie beispielsweise des Flügels oder Pfostens einer Tür oder eines Fensters herausgearbeitet ist;
- ein bewegliches Kontaktelement (77), das aus paramagnetischem metallischem Material hergestellt ist, bestehend aus einem Kopf (78), der mit einem Schaft (79) verbunden ist, wobei der Schaft auf elastische Weise elastische Mittel (92) in Eingriff nimmt, **dadurch gekennzeichnet, dass** der Teilkontakt ferner eine amagnetische Metallbuchse (88) aufweist, wobei der Schaft teilweise in dem Loch (89) der amagnetischen Metallbuchse (88) enthalten ist, wobei der Schaft (79) in der Lage ist, sich durch das Loch (89) dank eines anziehenden Magnetfelds zu bewegen, das auf dem Kopf (78) angelegt wird, der sich mit der Wand (89a) des Loches (89) in Kontakt befindet;
- Mittel (95) zum Anschließen der Buchse (88) an einen elektrischen Draht (94).

10. Teilkontakt (33) nach Anspruch 9, **dadurch gekennzeichnet, dass** die elastischen Mittel eine Spiralfeder (92) aufweisen, die den Schaft (79) in ihrem Inneren aufweist, wobei die Enden der Spiralfeder (92) jeweils an Anschlagmitteln (93) am Ende des Schafts (79) und an der Wand (89c) an einer Verengung (89a) des Querschnitts des Loches (89) zur Anlage kommen.

11. Teilkontakt (33) nach Anspruch 10, **dadurch gekennzeichnet, dass** die Länge der Spiralfeder (92), wenn sie ausgelöst wird, größer als die Höchstlänge des Schafts (79) im Inneren des Loches (89) ist.

12. Teilkontakt (33) nach Anspruch 9, **dadurch gekennzeichnet, dass** das Loch (89) eine exzentrische Stellung in der Buchse (88) einnimmt und dadurch ein zweites Loch (90), parallel zum ersten (89), ermöglicht, um ein Ende eines elektrischen Drahtes (94) einzustecken und ferner ein Kreuzgewindeloch (91) ermöglicht, das in das zweite Loch (90) einmündet, um eine Befestigungsschraube (95) einzusetzen, die durch einen Schnitt (96) in der Wand des isolierenden Trägers (70) zugänglich ist.

13. Teilkontakt (33) nach Anspruch 9, **dadurch gekennzeichnet, dass** der isolierende Träger (70) einen Sitz (73) aufweist, um den Kopf (78) des beweglichen Kontaktelements (77) mit der äußeren Wand bündig aufzunehmen.

14. Einpoliger elektrischer Teilkontakt (32), der in der Lage ist, mit dem Teilkontakt nach Anspruch 9 zusammenzuwirken, um einen einpoligen elektrischen Kontakt zu erzeugen, aufweisend:

- einen isolierenden Träger (38), der zur Einbettung in ein Loch (34) geeignet ist, das in der Seite des Rahmens, wie beispielsweise des Flügels oder Pfostens einer Tür oder eines Fensters herausgearbeitet ist;
- einen Dauermagneten (45), der in einem Sitz (41) des isolierenden Trägers (38) angeordnet ist, **dadurch gekennzeichnet, dass** der Teilkontakt ferner Folgendes aufweist:

  - ein festes Kontaktelement (47), das aus einem für das magnetische Feld durchlässigen, metallischen Material hergestellt ist, mit einem Kopf (48), der mit einem Schaft (49) verbunden ist, der an dem isolierenden Träger (38) festgelegt ist, wobei der Kopf (48) eine Fläche aufweist, die mit einer Fläche des Dauermagneten (45) übereinstimmt, und eine gegenüberliegende Fläche, die zur Außenseite des isolierenden Trägers (38) gerichtet ist, wobei der Schaft (49) durch ein Axialloch (42) in dem Dauermagneten (45) hindurchgeht und an seinem freien Ende Mittel (51, 52, 62) zum Anschließen an einen elektrischen Draht (61) aufweist.

15. Teilkontakt (32) nach Anspruch 14, **dadurch gekennzeichnet, dass** die Tiefe des Sitzes (41) in dem isolierenden Träger (38) derart ist, dass der Kopf (48) des festen Kontaktelements (47) mit der äußeren Wand bündig ist.

16. Teilkontakt (32) nach Anspruch 14, **dadurch gekennzeichnet, dass** der Teil des Schafts (49), der an den Kopf (48) angrenzt, eine Reihe von Umfangszähnen (50) aufweist, die an zwei gegenüberliegenden Wänden des Schafts gebrochen sind, wobei die Zähne (50) die Wand eines Loches (42) in dem isolierenden Träger (38), durch die der Schaft (49) hindurchgeht, in Eingriff nehmen, wodurch seine Translation unterbrochen wird, wobei die flachen, gegenüberliegenden Wände des Schafts (49) mit zwei anderen Wänden des Loches (42) übereinstimmen, die eine Rotation des Schafts verhindern.

Revendications

1. Contact électrique unipolaire comprenant deux demi-contacts (32, 33) ayant chacun son support isolant (38, 70) agencé pour l'incorporation dans les côtés de châssis respectifs (30,31), tels que les montants et les vantaux de portes et fenêtres, ou seulement les vantaux, lesdits demi-contacts coopérant pour maintenir une continuité électrique entre un élément de contact mobile (77) et un élément de contact fixe (47), appartenant à des demi-contacts respectifs (33, 32), ledit élément de contact mobile (77) étant couplé à des moyens élastiques (92) pour les déformer élastiquement durant la fermeture des châssis (30, 31), et par conséquent tout en fermant aussi le contact unipolaire, en compensant ainsi la distance résiduelle entre les côtés des châssis, dans lequel le contact comprend également :

   - des moyens de magnétisation (45) capables de générer une force d'attraction entre les éléments de contact fixe (47) et mobile (77), respectivement ; **caractérisé en ce que** le contact comprend en outre :
   - des moyens de guidage métalliques non magnétiques (88) pour guider une translation bidirectionnelle de l'élément de contact mobile (77), respectivement, vers l'élément de contact fixe (47) par l'effet de magnétisation quand une distance de seuil d'intervention est coupée alors que l'élément de contact mobile (77) s'approche de l'élément fixe (47), et dans la direction opposée par l'action de retour exercée par les moyens élastiques (92) quand ladite distance de seuil d'intervention est coupée alors que l'élément de contact mobile (77) s'éloigne de l'élément fixe (47) ;
   - des moyens (95) pour connecter les moyens de guidage (88) à un fil électrique (94) placé en continuité électrique avec l'élément de contact mobile (77) à travers les moyens de guidage (88).

2. Contact électrique unipolaire selon la revendication 1, **caractérisé en ce que** lesdits moyens élastiques (92) sont réalisés en matériau électriquement conducteur et **en ce que** ledit élément de contact mobile (77) engage les moyens élastiques (92) engagés à leur tour par les moyens de guidage (88).

3. Contact électrique unipolaire selon la revendication 1 ou 2, **caractérisé en ce que** ledit élément de contact mobile (77) comprime les moyens élastiques (92) durant la translation par effet magnétique vers l'élément de contact fixe (47).

4. Elément de contact unipolaire selon la revendication 1, **caractérisé en ce que** le bord de la surface de contact d'un des deux éléments de contact (78) est contenu dans le bord de la surface de contact de l'autre élément de contact (48) pour compenser tout désalignement susceptible d'exister.

5. Elément de contact unipolaire selon la revendication 1, **caractérisé en ce que** le demi-contact (32) qui comprend l'élément de contact fixe (47) comprend un aimant permanent cylindrique magnétisé axialement (45), alors que l'élément de contact mobile (77) compris dans l'autre demi-contact (33) est réalisé en matériau paramagnétique.

6. Contact électrique unipolaire selon la revendication 5, **caractérisé en ce que** l'élément de contact fixe (47) est réalisé en matériau métallique transparent au champ magnétique et est placé en face de l'aimant permanent (45) pour le protéger de chocs reçus à partir de l'élément de contact mobile (77) dans la phase finale d'approche.

7. Contact électrique unipolaire selon la revendication 6, **caractérisé en ce que** l'élément de contact fixe (47) comporte une tête (48) unie à une tige (49), une face de la tête étant accessible de l'extérieur du support isolant (38) et une face opposée s'adaptant avec une face de l'aimant permanent (45), alors que la tige (49) passe à travers un trou axial (46) dans l'aimant permanent (45) et comprend, au niveau de sa tête plus éloignée, des moyens (51, 52, 62) pour le connecter à un fil électrique (61).

8. Contact électrique unipolaire selon la revendication 7, **caractérisé en ce que** la tige (49) dudit élément de contact fixe (47) comprend des moyens (42, 50) pour la fixer au support isolant (38) pour empêcher sa translation et sa rotation.

9. Demi-contact électrique unipolaire (33) comprenant :

   - un support isolant (70) adapté pour l'incorporation dans un trou (35) ménagé dans le côté du châssis tel que le montant ou le vantail d'une porte ou fenêtré ;
   - un élément de contact mobile (77) réalisé en matériau métallique paramagnétique comprenant une tête (78) unie à une tige (79), ladite tige engageant élastiquement des moyens élastiques (92), **caractérisé en ce que** le demi-contact comprend en outre une bague métallique non magnétique (88), la tige étant partiellement incluse dans le trou (89) de la bague métallique non magnétique (88), la tige (79) étant capable de se déplacer par translation à travers le trou (89) sous l'effet d'un champ magnétique d'attraction appliqué à la tête (78), en restant en contact avec la paroi (89a) du trou (89) ;

- des moyens (95) pour connecter la bague (88) à un fil électrique (94).

10. Demi-contact (33) selon la revendication 9, **caractérisé en ce que** les moyens élastiques comprennent un ressort hélicoïdal (92) comportant ladite tige (79) à l'intérieur de celui-ci, les extrémités du ressort hélicoïdal (92) reposant, respectivement, contre des moyens d'arrêt (93) à l'extrémité de la tige (79) et contre la paroi (89c) en correspondance d'une réduction (89a) de section transversale du trou (89).

11. Demi-contact (33) selon la revendication 10, **caractérisé en ce que** la longueur du ressort hélicoïdal (92) quand il est relâché est supérieure à la longueur maximale de la tige (79) à l'intérieur dudit trou (89).

12. Demi-contact (33) selon la revendication 9, **caractérisé en ce que** ledit trou (89) occupe une position excentrique dans la bague (88), en laissant ainsi un deuxième trou (90) parallèle au premier (89) pour l'insertion d'une extrémité du fil électrique (94), et en permettant également un trou fileté transversal (91) pénétrant dans le deuxième trou (90) pour l'introduction d'une vis de fixation (95) accessible par une découpe (96) dans la paroi du support isolant (70).

13. Demi-contact (33) selon la revendication 9, **caractérisé en ce que** ledit support isolant (70) comprend un siège (73) pour recevoir la tête (78) de l'élément de contact mobile (77) affleurant avec la paroi externe.

14. Demi-contact électrique unipolaire (32) capable de coopérer avec le demi-contact selon la revendication 9 pour créer un contact électrique unipolaire, comprenant :

- un support isolant (38) adapté pour l'incorporation dans un trou (34) ménagé dans le côté du châssis tel que le montant ou le vantail d'une porte ou fenêtré ;
- un aimant permanent (45) placé dans un siège (41) du support isolant (38) ; **caractérisé en ce que** le demi-contact comprend en outre :

  - un élément de contact fixe (47) réalisé en matériau métallique transparent au champ magnétique, ayant une tête (48) unie à une tige (49) immobilisée sur le support isolant (38), la tête (48) ayant une face s'adaptant à une face de l'aimant permanent (45) et une face opposée tournée vers l'extérieur du support isolant (38), la tige (49) passant à travers un trou axial (42) dans l'aimant permanent (45) et ayant à son extrémité libre des moyens (51, 52, 62) pour connecter un fil électrique (61).

15. Demi-contact (32) selon la revendication 14, **caractérisé en ce que** la profondeur dudit siège (41) dans ledit support isolant (38) est telle que la tête (48) de l'élément de contact fixe (47) soit affleurante avec la paroi externe.

16. Demi-contact (32) selon la revendication 14, **caractérisé en ce que** la partie de la tige (49) adjacente à la tête (48) comprend une séquence de dents circonférentielles (50) brisée au niveau de deux parois opposées de la tige, lesdites dents (50) engageant la paroi d'un trou (42) dans le support isolant (38) à travers lequel la tige (49) passe, en arrêtant ainsi sa translation, lesdites parois opposées plates de la tige (49) s'adaptant avec deux autres parois dudit trou (42) qui empêchent la tige de tourner.

KNOWN ART

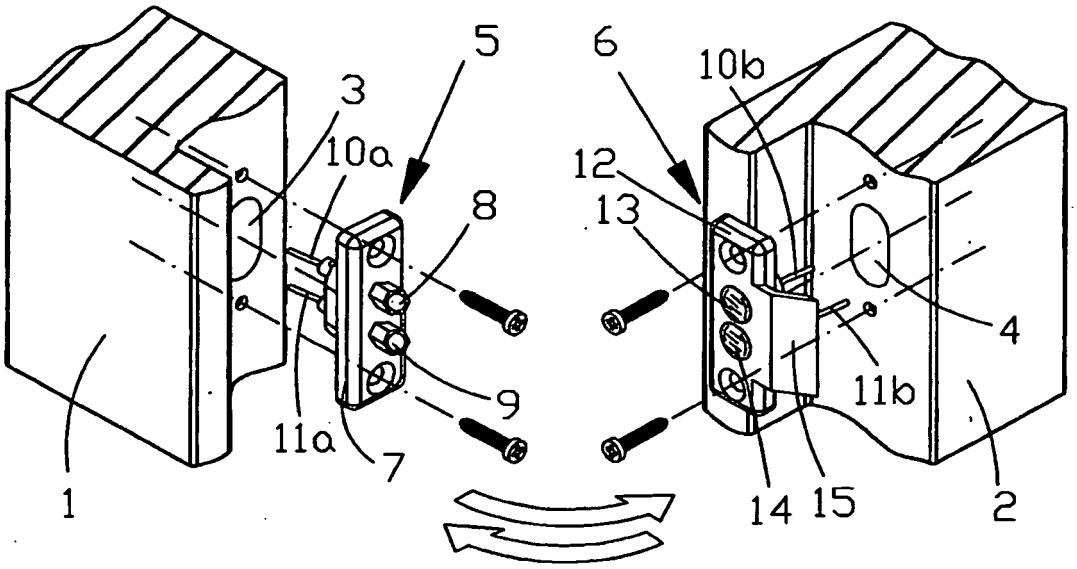


FIG. 1

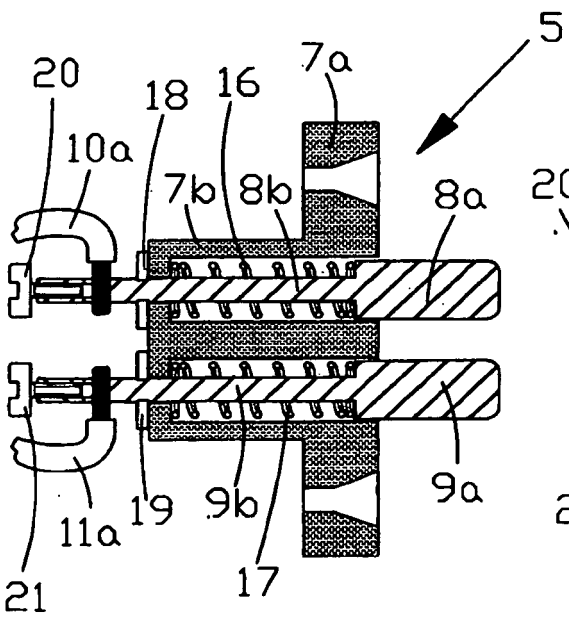


FIG. 2

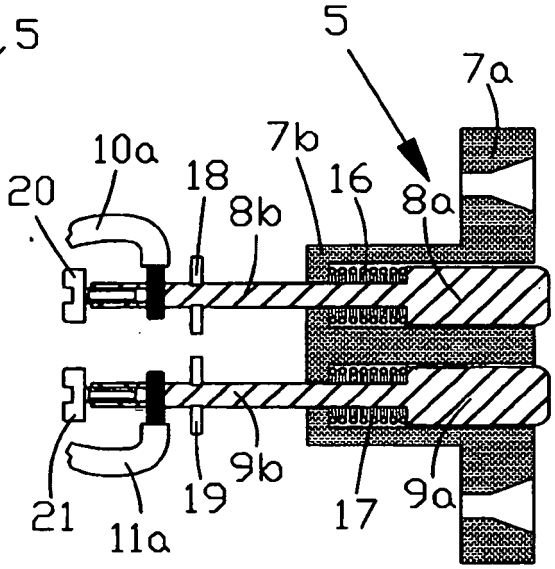


FIG. 3

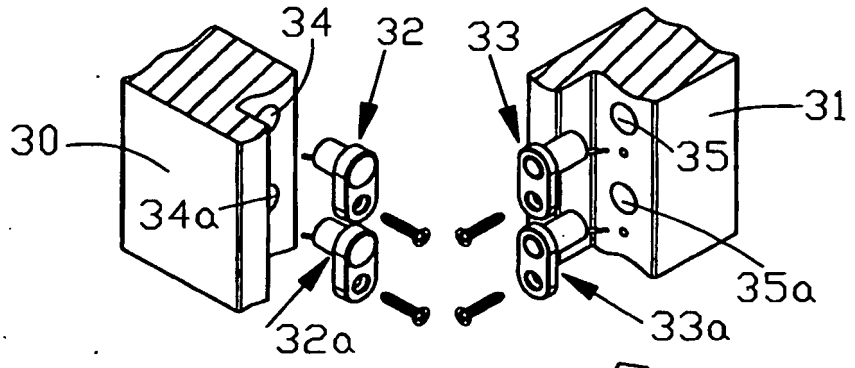


FIG. 4A

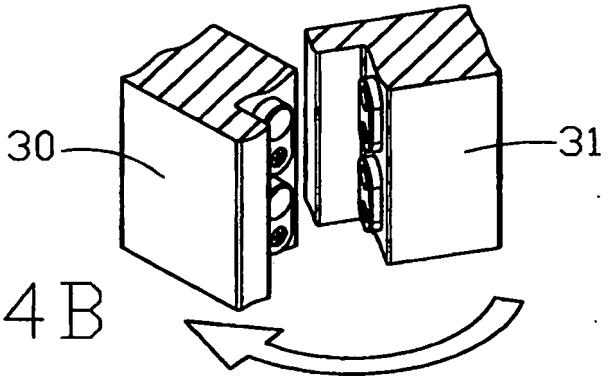


FIG. 4B

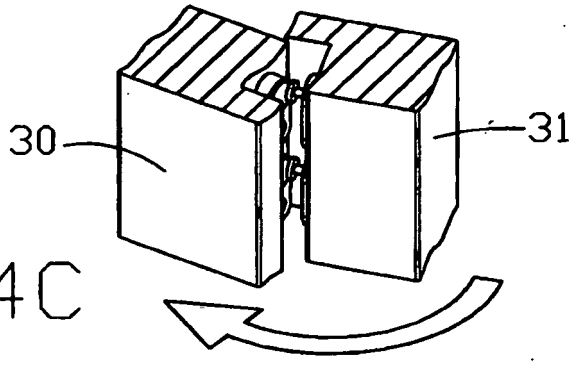


FIG. 4C

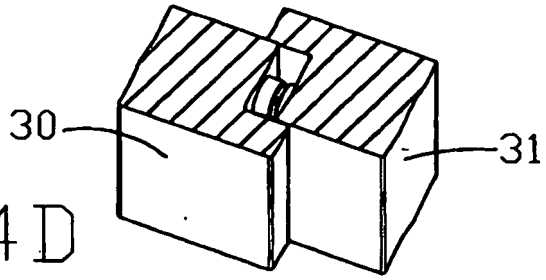


FIG. 4D

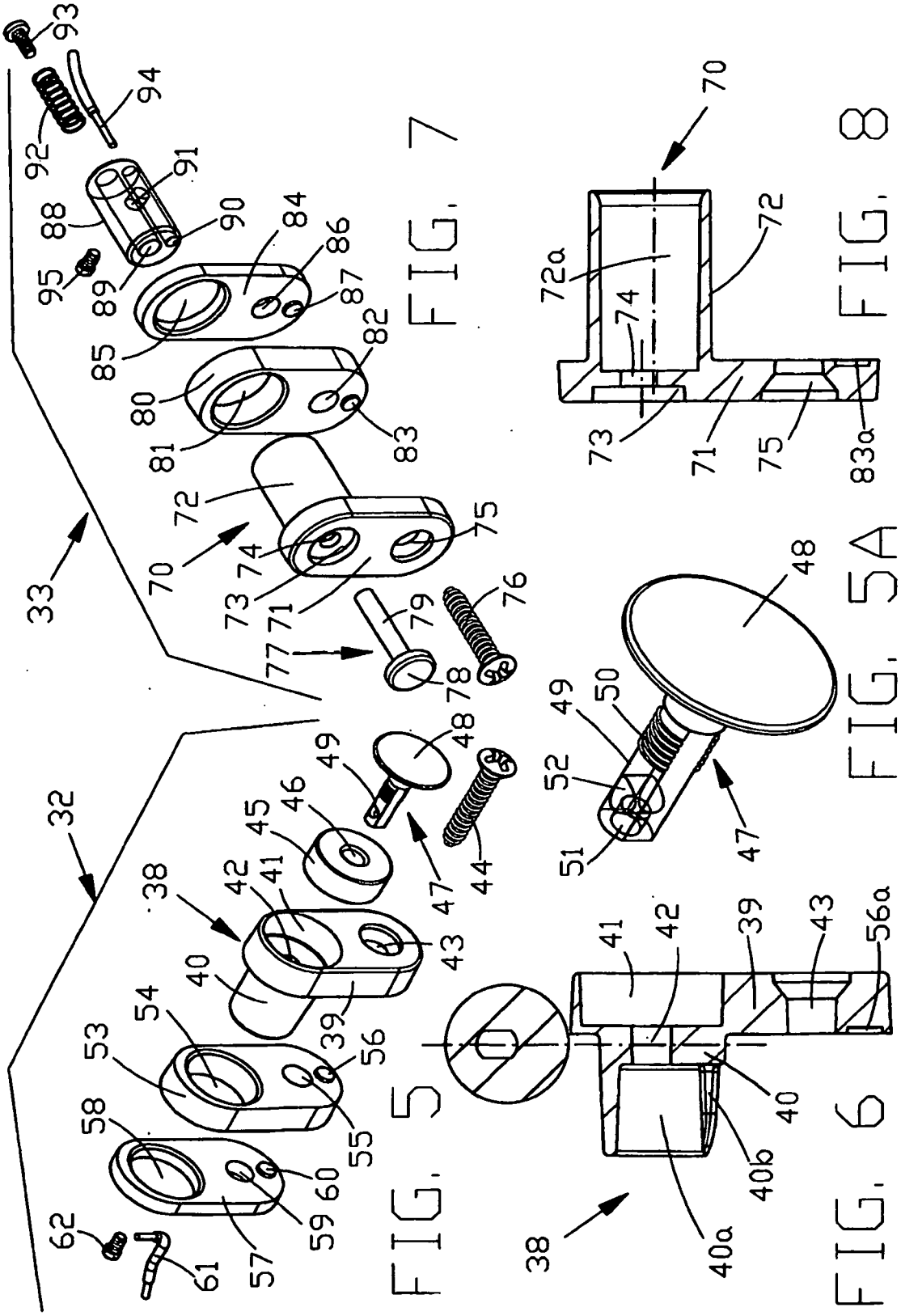


FIG. 7

FIG. 8

FIG. 5A

FIG. 6

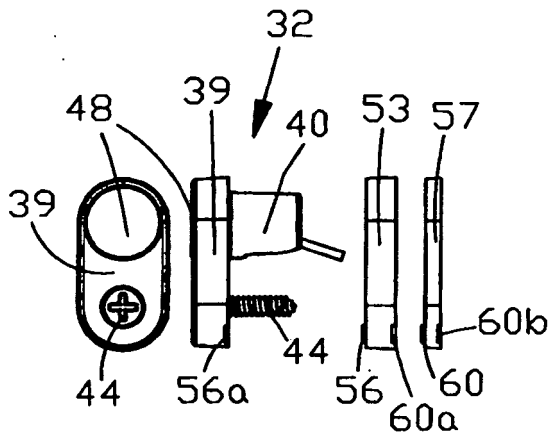


FIG. 9

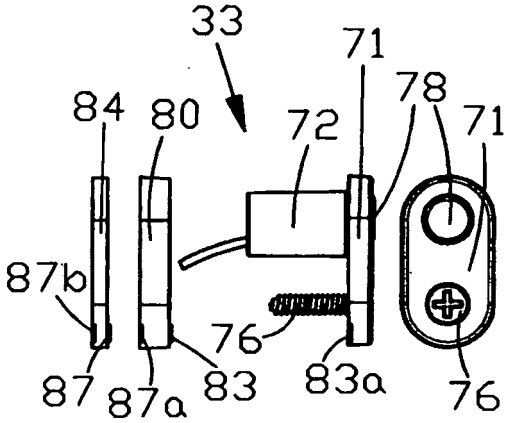


FIG. 10

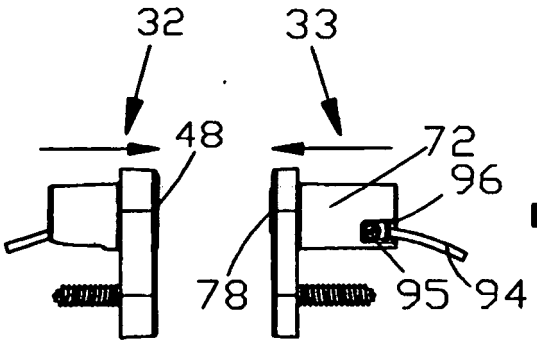


FIG. 11

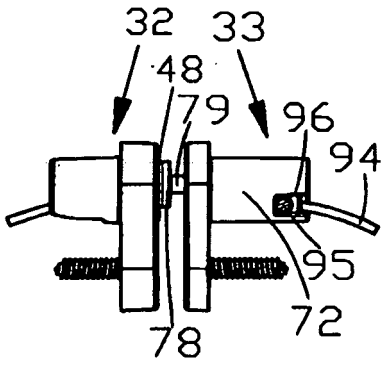


FIG. 12

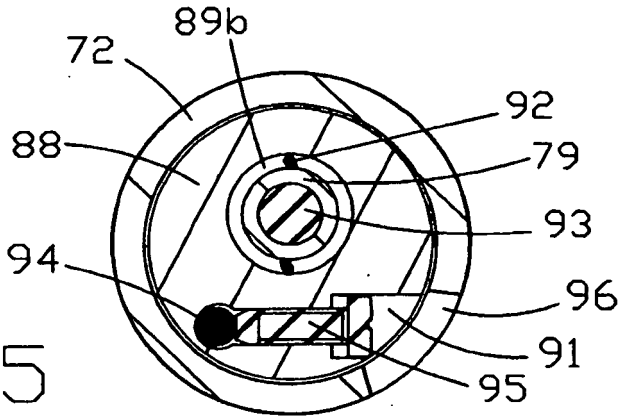


FIG. 15

FIG.13A

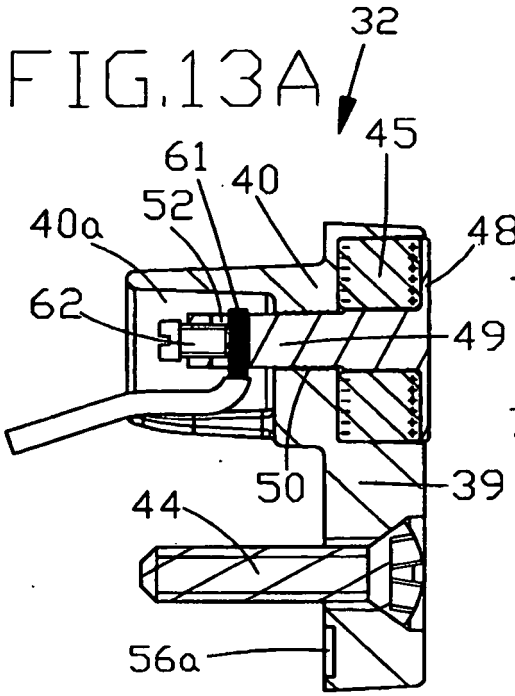


FIG.13B

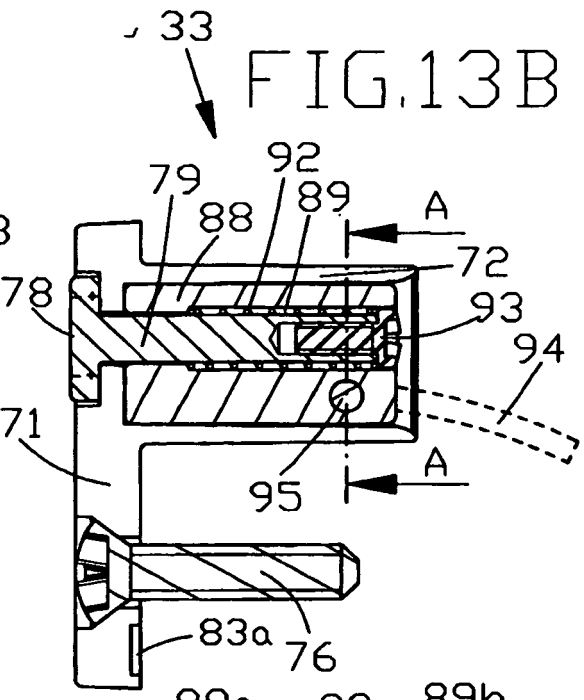


FIG. 14

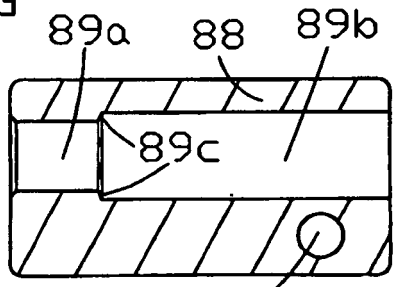


FIG.16A

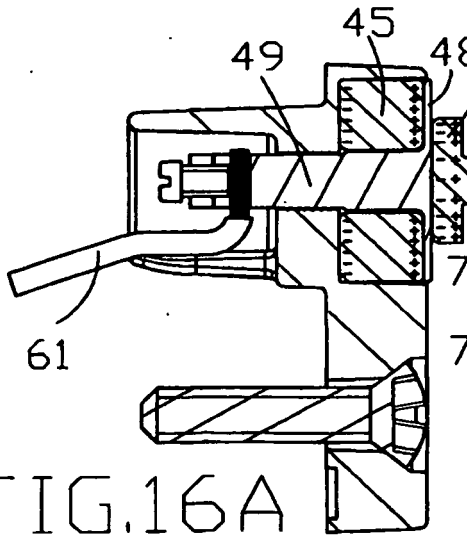
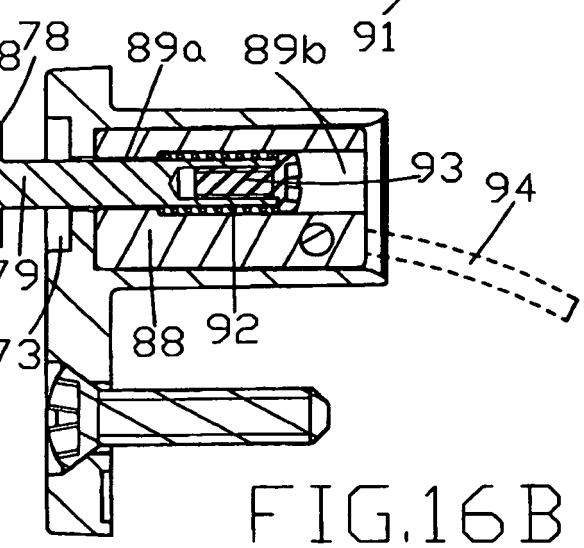


FIG.16B



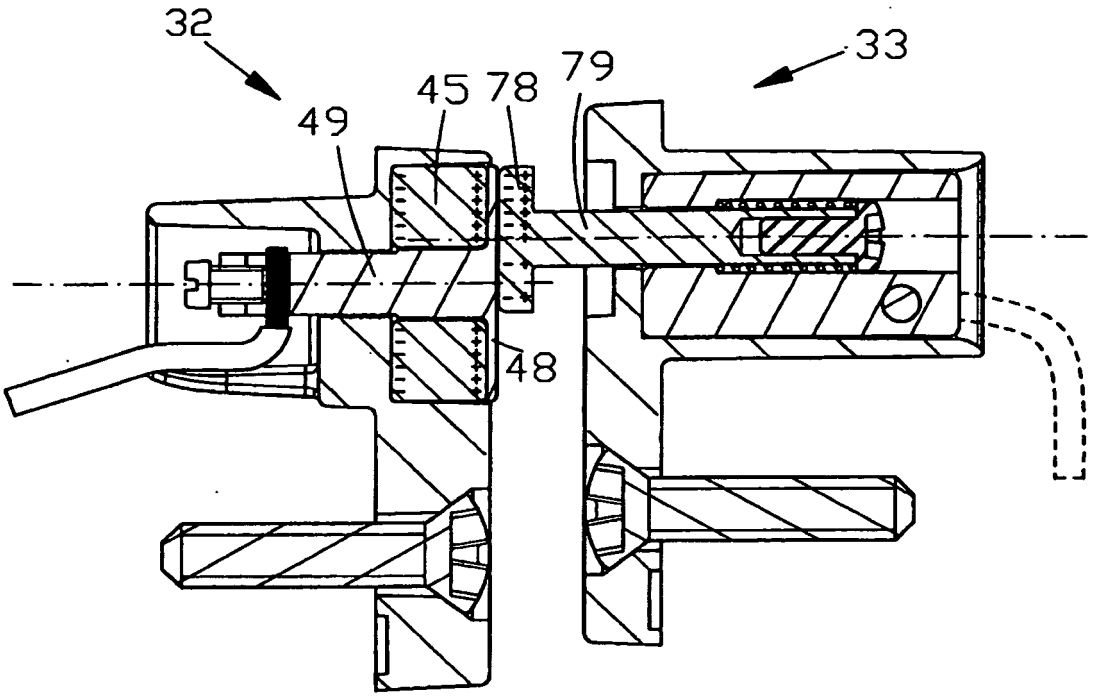


FIG. 17

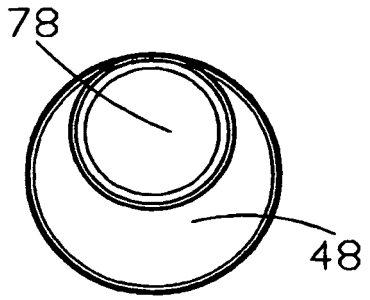


FIG. 18

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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