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(54) **THERMALLY RESPONSIVE ELECTRIC SWITCH**

WÄRMEEMPFINDLICHER ELEKTRISCHER SCHALTER

INTERRUPTEUR ELECTRIQUE A SENSIBILITE THERMIQUE

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Description

This invention ccncerns improvements relating to thermally responsive electric switches for use for example in domestic electrical appliances such as fan heaters, toasters, cable reels etc. for switching off or substantially reducing the supply of power to the appliance in an overtemperature situation.

Background of the Invention:

Since the electrical currents that are drawn in use by appliances such as are mentioned above are significantly different from one appliance type to another, the requirement exists that a protective switch of the kind with which the present invention is concerned should be current insensitive or at least relatively so. Additional requirements are for automatically resetting thermal cut-out switches which break the power supply in response to a sensed overtemperature situation and then remake or reconnect the power supply after a time period such as to enable the appliance to cool sufficiently, manual reset cut-out switches which having operated in response to a sensed overtemperature situation will not reset until manually operated (such switches either having a wide differential so that their remake temperature is lower than normal ambient temperature or alternatively incorporating a latch mechanism), and cut-out switches incorporating a PTCR (Positive Temperature Coefficient of Resistance) element arranged to carry the load current once the switch breaks whereupon the resistance of the PTCR element increases and significantly reduces the power supply to the appliance and heat is developed in the PTCR element and serves to maintain the cut-out in its break condition.

An exemplary cut-out switch incorporating a PTCR element as abovementioned is disclosed in DE-U-8617033.3 and comprises an electrically insulating body portion, first and second electrically-conductive terminal parts, the first terminal part serving additionally as a mounting for a first electrical contact of the switch and the second terminal part serving additionally as a mounting for a cantilevered electrically-conductive spring member having at its free end a second electrical contact of the switch, said first and second electrical contacts being arranged to effect switching operations in operation of the switch, and a bimetallic element being mounted on said spring member and being arranged to effect switch-operating movement thereof when it changes its state in response to a temperature change. The switch of DE-U-8617033.3 further comprises a PTCR element accommodated in a recess in the body portion of the switch, and leaf springs connect opposite sides of the PTCR element to the first and second terminal parts of the switch and also support the PTCR element in its recess.

In addition to the abovementioned functional requirements, another problem faced by industry is that different countries, even within Europe, have different standards and electrical safety requirements. As a result, many different cut-out switches are currently available from various manufacturers to meet more or less specific requirements and the industry has not hitherto tackled the problem of how to configure a universal switch. Accordingly there is a requirement for a low cost, current insensitive, compact cut-out switch suitable for use in a variety of different applications.

Summary of the Invention:

The present invention proposes to meet the abovementioned requirement by provision of a switch comprising a body portion, first and second electrically-conductive terminal parts, the first terminal part serving additionally as or as a mounting for a first electrical contact of the switch and the second terminal part serving additionally as a mounting for a cantilevered spring member having at its free end a second electrical contact of the switch, said first and second electrical contacts being arranged to effect switching operations in operation of the switch, a bimetallic element being mounted on said spring member and being arranged to effect switch-operating movement thereof when it changes its state in response to a temperature change, and the body portion of the switch furthermore including means for accommodating a PTCR element in electrical contact with said second terminal part and a mounting for accommodating a push-fit conductor element adapted when fitted to make electrical contact between said PTCR element and said first terminal part, the switch thus being configurable, selectively, as a switch with a PTCR element, in which case said PTCR element and said conductor element are provided in the switch, or as a switch without a PTCR element, in which case said PTCR element and said conductor element are omitted.

As compared to the switch of DE-U-8617033.3 for example, which has many features in common with the switch of the present invention, the switch of the present invention provides for the optional inclusion of the PTCR element and the conductor element in the switch, whereas in the switch of DE-U-8617033.3 the PTCR element and its supporting and electrically contacting leaf springs are an essential part of the switch. There is no disclosure or suggestion in DE-U-8617033.3 of arranging the PTCR element to be an optional component of the switch so that the switch can be selectively configured as including or not including a PTCR element. The switch of DE-U-8617033.3 is thus exclusively a switch incorporating a PTCR element and is not selectively configurable to include or not include a PTCR element.

In a preferred embodiment of the present invention which will be described in detail hereinafter the body portion of the switch is generally rectangular and defines spaced-apart end surfaces from which the first and second terminal parts project for enabling electrical connections to be made to the switch, an upper surface whereat

the first terminal part of the switch is exposed and has affixed thereto the first electrical contact (namely the fixed contact) of the switch and whereat the second terminal part of the switch is exposed and has affixed thereto said cantilevered spring member, an under surface whereat a recess is defined for optionally accommodating a PTCR element and exposes an under surface of the second metal terminal part to contact by said PTCR element when fitted, whereat a mounting is provided for accommodating said conductor element in push-fit manner, and whereat an under surface of said first metal terminal part is exposed for being contacted by said conductor element when fitted, and two plain side surfaces. As an example, the body portion of such a switch might be 20mm long, 5mm high and 7mm wide.

The cantilevered spring member conveniently comprises a leaf spring which advantageously may be attached to the second metal terminal part of the switch by means of a rivet formed as an integral part of the second metal terminal part. The bimetallic element preferably is a dished snap-acting blade and may conveniently be mounted on top of the cantilevered leaf spring by virtue of the leaf spring having released therefrom a pair of opposed attachment tabs between which the bimetallic blade is adapted to fit.

The push-fit conductor element may advantageously comprise a conductor spring formed of beryllium copper or stainless steel for example, and may advantageously be retained to the moulded plastics body portion by virtue of the conductor spring being formed with one or more X-shaped, H-shaped, star-shaped or otherwise shaped cut-outs adapted to fit tightly over one or more studs moulded integrally with the body portion of the switch, the cut-out(s) of the conductor spring being designed to make an interference fit over the stud (s) and to dig into the stud(s) when put under load thereby ensuring that high spring forces are developed to hold the PTCR element immobile and ensure good electrical contact.

The switch arrangement may be automatically resetting, where no PTCR element is provided, so that the switch will automatically reset once the bimetallic element cools after a switch-opening operation, or alternatively the switch may be configured to be manually reset. A manual reset switch may be obtained by use of a bimetallic element having a large differential or, as described hereinafter, by use of a spring member which is bistable so that it will move in response to switch-actuating movement of the bimetallic element in one sense but will not respond to bimetal movement in the opposite sense.

As will become apparent from the following, the switch of the present invention can be configured as an auto-reset switch by omission of the PTCR element or as a PTCR switch by inclusion of the PTCR element. By provision of a reset push rod or the like in an accommodating part of the moulded plastics body portion and by use of a wide temperature differential bimetal and/or of a bistable spring member, the switch can also readily be configured as a manual reset switch.

The above and other features of the invention are set forth with particularity in the appended claims and will be well understood from consideration of the following detailed description of exemplary embodiments given with reference to the accompanying drawings.

Description of the drawings:

Figures 1A to 1F illustrate the embodiment when configured as an auto-reset switch, Figs. 1A and 1B being side elevation views, Fig. 1C being a bottom plan view, Fig. 1D being a sectional side elevation view, Fig. 1E being a top plan view and Fig. 1F showing two different perspective views;

Figures 2A to 2F illustrate the embodiment when configured as a PTCR switch, Fig. 2A showing a perspective view of the basic switch unit as viewed from the underside, Fig. 2B showing the unit with the PTCR element added, Fig. 2C showing the completed switch with the connector spring affixed, and Figs. 2D, 2E and 2F being views similar to Figs. 1C, 1D and 1E respectively; and

Figures 3A to 3E illustrate a slightly modified form of the embodiment configured as a manual reset switch, Figs. 3A and 3B showing plan and side elevation views of a bistable leaf spring that is provided in this switch configuration, Fig. 3C being a side elevation view of the manual reset switch in condition where the bimetallic element of the switch has reset with falling temperature and yet the leaf spring remains in its "hot" position, Fig. 3D being a perspective showing (partly enlarged) of the form of a reset push rod of the switch and the manner of its incorporation into the switch, and Fig. 3E being a cross-sectional view through the switch in the plane of the push rod.

Detailed Description of the Embodiments:

Referring first to Figs. 1A to 1F, it will be seen that the switch comprises a moulded plastics body portion 20 having first and second metal terminal parts 1, 2 captured therein, the terminal parts projecting beyond the body portion 20 for enabling electrical connection to be made to the switch. Within the envelope of the body portion 20, as best seen in Fig. 1D, the first terminal part 1 serves as a mounting for a fixed switch contact 3, and the second terminal part 2 serves as a mounting for a cantilevered leaf spring 4 which is affixed to the terminal part 2 by means of an integrally-formed rivet and carries at its free end a moving switch contact 5 which is positioned to cooperate with the fixed contact 3. The leaf spring 4 has opposed attachment tabs 6 released therefrom and a dished, snap-acting bimetallic blade 7 is received between the tabs and thereby attached to the leaf spring 4. As best shown in Figs. 1A and 1B, the bimetal

blade 7 is capable of adopting two different curvature states dependent upon its temperature, and in its "hot" condition as shown in Fig. 1A serves to lift the free end of the leaf spring 4 and thereby open the switch contacts, and in its "cold" condition as shown in Fig. 1B does not resist the natural tendency of the leaf spring 4 to hold the switch contacts closed.

On the opposite side of the switch body portion 20 from the side which carries the leaf spring 4 and the other component parts abovementioned, there are provided a recess 8 providing access to the first terminal part 1, a recess 9 providing access to the second terminal part 2, and a body portion which bridges the recesses 8, 9 and has formed thereon a pair of studs 10. As shown in Figs, 2A to 2F, the recess 9 is designed to receive a PTCR element 11 in the form of a small cylindrical pellet, and the studs 10 are designed to receive a conductor spring 12 having generally H-shaped cut-outs 13 which push-fit over the studs. The spring 12 extends into the recess 8 where it contacts the first terminal 1, the spring 12 thus constituting a conductor connecting the PTCR element 11 (which is itself in contact with the second terminal 2) to the first terminal 1. The H-shaped cut-outs 13 in the conductor spring 12 are such that the tension that is developed in the spring when it is pushed over the studs 10 causes the spring to bite into the studs so as to ensure proper firm location of the spring, with the PTCR element 11 held firmly in the recess 9 in good electrical contact with second terminal 2 and with good electrical contact made with first terminal 1.

As will be appreciated, in the configuration shown in Figs. 1A to 1F the switch operates as an automatically resetting switch which opens its contacts at a predetermined temperature in a rising temperature situation and subsequently recloses the contacts at a second, lower, predetermined temperature as the bimetal cools. In the configuration shown in Figs. 2A to 2F, simply by the addition of the PTCR element and the connector spring the switch is reconfigured as a switch which will maintain its contacts open, once they have opened in a rising temperature situation, by virtue of heat developed in the PTCR element being conducted into the bimetal blade. The PTCR element is normally shortcircuited by the closed switch contacts so long as the switch is operating within its upper temperature limit, but carries current when the switch contacts open and experiences a rapid increase in resistance which dramatically reduces the current supply to the load as soon as the switch contacts open. The PTCR switch configuration can only be reset by switching off the power supply to the switch and its associated appliance and allowing time for the PTCR and bimetal to cool to its remake temperature.

A manual reset version of the described switch could for example readily be configured by provision of a through hole in the body moulding of the switch, extending from a location intermediate the studs 10 on the rear of the body moulding through to a location on the front of the moulding underlying the leaf spring and bimetal blade assembly, and by provision of a push-rod in such through hole arranged so as when depressed to be capable of bearing upon the underside of the bimetal blade, an opening being provided in the leaf spring to allow the push-rod to access the bimetal. With the bimetal selected to have such a wide differential that its automatic reset temperature would never be reached under normal conditions, the bimetal would remain in its contacts-open condition until it was manually reset by application of a resetting force from the push-rod. To avoid the risk of unduly stressing the leaf spring and/or the bimetal blade during operation of the push-rod, the switch advantageously might be formed with a backstop for limiting the contacts-opening movement of the leaf spring and/or of the bimetal blade and, in keeping with the aim of enhanced versatility, such backstop could be formed as a separate component, a plastics moulding for example, arranged to be clipped onto or otherwise detachably secured to the body moulding of the switch, though it could equally well be formed as an integral part of the body moulding. As an alternative to the provision of a push-rod arrangement, or in addition thereto, a mechanical and manually-releasable latch may be provided for latching the leaf spring in its contacts open condition.

As an alternative to using a wide differential bimetal in a manual reset version of the switch, the moving contact carrying leaf spring of the switch could itself be made bistable and arranged so that it will not return to its contacts closed "cold" condition in the absence of manual intervention even when the bimetal has reset. Such a manual reset version of the subject switch is illustrated in Figures 3A to 3E of the accompanying drawings wherein the same reference numerals are used to identify like parts to those correspondingly identified in the other drawing figures.

Figs. 3A and 3B show the form of the leaf spring 4 and it will be seen that the spring is generally rectangular with an elongate central cut-out 15 defining spaced-apart legs 16, and furthermore is tooled using a spherical punch in order to produce a domed region 17 in the area identified by the circle 18 in Fig. 3A and render the spring bistable in operation. The amount of doming is controlled such that the inner edges of the twisted spring legs 16 do not protrude above the central pillar 19 of the switch body portion 20 when the spring is welded to the respective part of switch terminal 2, and such that the spring will generate the requisite contact pressure without being too stiff for the bimetal 7 to overcome. Fig. 3D shows the switch body 20 configured to receive a push-rod 25 which is inserted into a complementarily profiled opening formed through the switch body before attachment of the leaf spring 4 and its actuating bimetal 7 to the switch. The push-rod 25 is also shown in enlarged view in Fig. 3D and it will be seen to have a hemispherical groove 26 in one face which forms a guiding surface with the central pillar 19 when the push-rod is inserted into the switch body 20. The push-rod additionally has

an enlarged upper end or head 27 which serves to retain it in the switch and a pair of projecting abutments 28 are provided on the upper surface of this head 27 for contacting the inside edges of the legs 16 of the leaf spring 4 in order to effect resetting of the switch.

In operation of the thus described manual reset version of the subject switch, when the bimetal heats to its operating temperature and snaps into its "hot" configuration, it lifts the contact-carrying end of leaf spring 4 and reverses the twist in its legs 16, thereby causing the leaf spring to snap to its oppositely dished other stable state. The switch is thus opened and disrupts the current supply to the appliance or whatever is being protected. As the bimetal cools, it is permitted to creep away from the central pillar 19, against which it pushes for opening the switch, whilst being held in place by the tabs 6 provided on the leaf spring 4 and, on reaching its remake temperature, it snaps back to its "cold" condition. The contacts however remain open by virtue of the bistable nature of the leaf spring 4 which cannot reset without manual intervention. Figs. 3C and 3E show the state of the switch under these circumstances. In order to reset the switch from this condition, it is necessary only to push the push-rod 25 in the direction of the arrow shown in Fig. 3E so as to cause the two abutments 23 to contact the inside edges of the legs 16 and reverse the curvature of the legs, thereby allowing the switch contacts to remake when the reset force on the push-rod is removed. An advantage of such a switch configuration as compared to the previously mentioned manual reset switch employing a wide differential bimetal is that its operation is not dependent on the ambient temperature. Wide differential bimetal switches might for example be such that the bimetal will not remake above, say, -10°C without manual intervention and thus are of limited application by virtue of being ambient dependent. The switch of Figs. 3A to 3E is not limited in this way.

As described in the foregoing, the switch of the present invention is adapted to be configured selectively as an auto-reset switch, a manual reset switch, or a PTCR switch. The bimetal and leaf spring characteristics can be varied so as selectively to accommodate different switching requirements, for example by use of a more or less resistive material for the leaf spring so as to render the switch more or less current sensitive, without requiring any change in the geometry of the switch. As a result, the invention provides a versatile switch design which enables the diverse requirements of different applications to be satisfied by a single switch geometry which is designed to enable automatic manufacture and assembly of the various switch parts.

A summary of the foregoing might be worded as follows: a thermally-responsive electrical switch for use in domestic electrical appliances for switching off the electrical supply to the appliance in an over temperature situation is configured to be manufactured as an auto-reset switch, as a manual reset switch, or as a PTCR switch without significant manufacturing changes. The switch body is moulded plastics and incorporates first and second terminal parts, one of which provides a cantilever mounting for a switching element which moves to effect switching operations between its free end and the other terminal part. A bimetallic switch-actuating element is mounted on the switching element so as by its temperature-responsive movements to effect switch-operating movement of the switching element. The switch body is configured to be capable of accepting a PTCR element which is retained by a conductor such that the PTCR element is placed in a current conducting path through the switch when the switch contacts are opened, the heat developed in the PTCR element then holding the condition of the switch whilst substantially reducing the through current to the switch load. By omission of the PTCR element, an auto-reset switch is obtained, and by selection of the characteristics of the bimetallic element and/or arranging the switching element to be bistable, a manual reset version of the switch can be obtained.

The invention having been described in the foregoing by reference to specific embodiments, it is to be well understood that the invention is not limited to the specific embodiments described and that modifications and variations could be made thereto without departure from the scope of the invention as defined by the claims.

Claims

1. A thermally responsive electrical switch comprising a body portion (20), first and second electrically conductive terminal parts (1,2) the first terminal part (1) serving additionally as or as a mounting for a first electrical contact (3) of the switch and the second terminal part (2) serving additionally as a mounting for a cantilevered electrically-conductive spring member (4) having at its free end a second electrical contact (5) of the switch, said first and second electrical contacts (3, 5) being arranged to effect switching operations in operation of the switch, a bimetallic element (7) being mounted on said spring member (4) and being arranged to effect switch-operating movement thereof when it changes its state in response to a temperature change, characterized in that the body portion (20) of the switch furthermore includes means (9) for accommodating a PTCR element (11) in electrical contact with said second terminal part (2) and a mounting (10) for accommodating a push-fit conductor element (12) adapted when fitted to make electrical contact between said PTCR element (11) and said first terminal part (1), the switch thus being configurable, selectively, as a switch with a PTCR element, in which case said PTCR element (11) and said conductor element (12) are provided in the switch, or as a switch without a PTCR element, in which case said PTCR element (11) and said con-

ductor element (12) are omitted.

2. A switch as claimed in claim 1 wherein the body portion (20) of the switch is formed to define a recess (9) for accommodating said PTCR element (11) in electrical and thermal contact with said second terminal part (2) and the push-fit conductor element (12) is adapted when fitted to serve as a retainer for holding said PTCR element (11) in said recess (9) under spring pressure and additionally to make electrical contact between said PTCR element (11) and said first terminal part (1).

3. A switch as claimed in claim 2 wherein the moulded plastics body portion (20) of the switch is generally rectangular and defines spaced-apart end surfaces from which the first and second metal terminal parts (1,2) project for enabling electrical connections to be made to the switch, an upper surface whereat the first terminal part (1) of the switch is exposed and has affixed thereto the first electrical contact (3) of the switch and whereat the second terminal part (2) of the switch is exposed and has affixed thereto said cantilevered spring member (4), an under surface whereat said recess (9) is defined and exposes an under surface of the second metal terminal part (2) to contact by said PTCR element (11) when fitted, whereat said mounting (10) is provided for said push-fit conductor element (12), and whereat an under surface of said first metal terminal part (1) is exposed for being contacted by said conductor element (12) when fitted, and two plain side surfaces.

4. A switch as claimed in claim 2 or 3 wherein the cantilevered spring member (4) comprises a leaf spring and the bimetallic element (7) comprises a dished snap-acting blade mounted on top of the cantilevered leaf spring by virtue of the leaf spring having released therefrom a pair of opposed attachment tabs (6) between which the bimetallic blade is adapted to fit.

5. A switch as claimed in any of claims 2 to 4 wherein the push-fit conductor element (12) comprises a conductor spring retained to the moulded plastics body portion (20) by virtue of the conductor spring being formed with one or more X-shaped, H-shaped, star-shaped or otherwise shaped cut-outs (13) adapted to fit tightly over one or more studs (10) moulded integrally with the body portion (20) of the switch, the cut-out(s) (13) of the conductor spring (12) being designed to make an interference fit over the stud(s) (10) and to dig into the stud(s) (10) when put under load thereby ensuring that high spring forces are developed to hold the PTCR element (11) immobile and ensure good electrical contact.

6. A switch as claimed in any of the preceding claims when configured as an auto-reset switch, there being no PTCR element (11) in said switch.

7. A switch as claimed in any of claims 1 to 5 when configured as a PTCR switch, a PTCR element (11) being accommodated and retained by said body portion (20) by means of a said conductor element (12).

8. A switch as claimed in any of claims 1 to 5 when configured as a manual reset switch, there being a push rod (25) accommodated in an accommodating part of the switch body (20) for enabling a bistable bimetallic element (7) and/or a bistable spring member (4) to be manually reset.

9. A switch as claimed in claim 8 wherein the bimetallic element (7) is automatically resetting and the spring member (4) is bistable, the bimetallic element (7) being capable of operating the switch in one sense by imparting its movement to the spring member (4), but being incapable of imparting its opposite movement to effect opposite movement of the spring member (4).

10. A switch as claimed in claim 9 wherein the spring member (4) comprises a spring blade having a central cut-out (15) defining spaced apart legs (16), and a region (17) of the spring blade is dished so as to render the blade bistable, movement of the blade between its two stable conditions being accompanied by a twisting movement of said legs (16), the push rod (25) operating on the legs (16) so as to cause them to reverse their twist direction and thereby cause the blade (4) to move to its opposite stable condition.

11. A switch as claimed in any of the preceding claims incorporating a manually-releasable latching element for holding the switch in an operated condition.

Patentansprüche

1. Thermisch ansprechender elektrischer Schalter mit einem Gehäuse (20), ersten und zweiten elektrisch leitenden Anschlußteilen (1, 2), wobei das erste Anschlußteil (1) zusätzlich als oder als eine Fassung für einen ersten elektrischen Kontakt (3) des Schalters dient und das zweite Anschlußteil (2) zusätzlich als Rahmen für ein freitragendes elektrisch leitendes Federelement (4), das an seinem freien Ende einen zweiten elektrischen Kontakt (5) des Schalters aufweist, dient, wobei die ersten und zweiten elektrischen Kontakte (3, 5) so angeordnet sind, um Schaltvorgänge beim Schalterbetrieb zu bewirken, einem Bimetallelement (7), das auf dem Federele-

ment (4) befestigt und so angeordnet ist, um dessen Bewegung beim Schaltvorgang zu bewirken, wenn es seinen Zustand in Reaktion auf eine Temperaturänderung ändert, dadurch **gekennzeichnet**, daß das Gehäuse (20) des Schalters darüber hinaus eine Einrichtung (9) zum Aufnehmen eines PTCR-Elements (11) in elektrischem Kontakt mit dem zweiten Anschlußteil (2) und eine Fassung (10) zum Aufnehmen eines Drucksitz-Leiterelements (12), das im befestigten Zustand elektrischen Kontakt zwischen dem PTCR-Element (11) und dem ersten Anschlußteil (1) herstellt, wobei der Schalter folglich selektiv als Schalter mit einem PTCR-Element für den Fall, daß das PTCR-Element (11) und das Leiterelement (12) im Schalter vorgesehen sind oder als ein Schalter ohne ein PTCR-Element, für den Fall, daß auf das PTCR-Element (11) und das Leiterelement (12) verzichtet wird, auslegbar ist.

2. Schalter gemäß Anspruch 1, wobei das Gehäuse (20) des Schalters so ausgebildet ist, daß eine Aussparung (9) zum Aufnehmen des PTCR-Elements (11) in elektrischem und thermischem Kontakt mit dem zweiten Anschlußteil (2) festgelegt ist, und das Drucksitz-Leiterelement (12) im befestigten Zustand als Befestigungsteil zum Halten des PTCR-Elements (11) in der Aussparung (9) unter Federdruck dient und zusätzlich elektrischen Kontakt zwischen dem PTCR-Element (11) und dem ersten Anschlußteil (1) herstellt.

3. Schalter gemäß Anspruch 2, wobei das Formplastik-Gehäuse (20) des Schalters im wesentlichen rechteckig ist und voneinander getrennt liegende Abschlußflächen, von denen die ersten und zweiten Metall-Anschlußteile (1, 2) zum Herstellen elektrischer Verbindungen für den Schalter hervorstehen, eine obere Fläche, auf der das erste Anschlußteil (1) des Schalters angeordnet ist und darauf den ersten elektrischen Kontakt (3) des Schalters befestigt und auf der das zweite Anschlußteil (2) des Schalters angeordnet ist und darauf das freistehende Federelement (4) befestigt, eine untere Fläche, auf der die Aussparung (9) festgelegt ist und sich eine untere Fläche des zweiten Metall-Anschlußteils (2) zum Kontaktieren des PTCR-Elements (11) im befestigten Zustand zeigt, auf der die Fassung (10) für das Drucksitz-Leiterelement (12) vorgesehen ist und auf der eine untere Fläche des ersten Metall-Anschlußteils (1) gezeigt ist, um durch das Leiterelement (12) im befestigten Zustand kontaktiert zu werden, und zwei ebene Seitenflächen festlegt.

4. Schalter gemäß einem der Ansprüche 2 oder 3, wobei das freistehende Federelement (4) eine Blattfeder aufweist und das Bimetallelement (7) ein einwärts gekrümmtes, wie ein Schnappverschluß arbeitendes Blatt aufweist, das auf der freitragenden Blattfeder mittels eines Paars sich gegenüberliegender, von der Blattfeder hervorspringender Befestigungszapfen (6), zwischen den das Bimetallblatt befestigt werden kann.

5. Schalter gemäß einem der Ansprüche 2 bis 4, wobei das Drucksitz-Leiterelement (12) eine Leiterfeder aufweist, die durch das Formplastik-Gehäuse (20) dadurch festgehalten wird, daß die Leiterfeder mit einem oder mehreren X-förmigen, H-förmigen, sternförmigen oder anders geformten Ausschnitten (13) ausgebildet ist, um über einen oder mehrere Zapfen (10), die integral mit dem Gehäuse (20) des Schalters ausgeformt sind, fest anzulegen, wobei der (die) Ausschnitt(e) (13) der Leiterfeder (12) so geformt ist, daß er einen Überschneidungssitz über dem Zapfen (10) bildet und in den Zapfen (10) unter Last eingedrückt wird, wodurch sichergestellt wird, daß hohe Federkräfte zum Unbeweglichhalten des PTCR-Elements (11) entwickelt werden und ein guter elektrischer Kontakt gewährleistet wird.

6. Schalter gemäß einem der vorstehenden Ansprüche, der, wenn er als sich selbst zurücksetzender Schalter ausgebildet ist, kein PTCR-Element (11) im Schalter aufweist.

7. Schalter gemäß einem der Ansprüche 1 bis 5, der, wenn als PTCR-Schalter ausgelegt, ein PTCR-Element (11) hat, das im Gehäuse (20) angeordnet und durch das Gehäuse (20) mittels einem genannten Leiterelement (12) festgehalten wird.

8. Schalter gemäß einem der Ansprüche 1 bis 5, der, wenn als manuell zurückzusetzender Schalter ausgelegt, eine Schubstange (25) aufweist, die in einem Anordnungsteil des Schaltergehäuses (20) zum manuellen Zurücksetzen eines bistabilen Bimetallelements (7) und/oder eines bistabilen Federelements (4) angeordnet ist.

9. Schalter gemäß Anspruch 8, wobei das Bimetallelement (7) sich automatisch zurücksetzt und das Federelement (4) bistabil ist, wobei das Bimetallelement (7) zum Betreiben des Schalters in einer Richtung durch Übertragen seiner Bewegung auf das Federelement (4) geeignet ist, jedoch ungeeignet zum Übertragen seiner Gegenbewegung, um eine Gegenbewegung des Federelements (4) zu ermöglichen.

10. Schalter gemäß Anspruch 9, wobei das Federelement (4) ein Federblatt mit einem zentralen Ausschnitt (15) der voneinander entfernten Arme (16) festlegt, aufweist, und ein Bereich (17) des Federblattes nach innen gewölbt ist, um das Blatt bistabil zu halten, wobei die Bewegung des Blattes zwi-

schen zwei stabilen Zuständen von einer Verdrillbewegung der Arme (16) begleitet wird, wobei die Schubstange (25) so auf die Arme (16) wirkt, daß ihre Verdrillrichtung umgekehrt wird und dadurch das Blatt (4) in seinen entgegengesetzten stabilen Zustand bewegt wird.

11. Schalter gemäß einem der vorstehenden Ansprüche, der ein manuell betätigbares Verriegelungselement zum Halten des Schalters unter Betriebsbedingung aufweist.

Revendications

1. Interrupteur électrique sensible thermiquement, comprenant une partie formant corps (20), des première et seconde parties formant bornes électriquement conductrices (1,2), la première partie formant borne (1) servant en outre de premier contact électrique (3) de l'interrupteur ou en tant que support pour un premier contact électrique (3) de l'interrupteur et la seconde partie formant borne (2) servant en outre de support pour un élément de ressort électriquement conducteur en porte-à-faux (4), possédant à son extrémité libre un second contact électrique (5) de l'interrupteur, lesdits premier et second contacts électriques (3,5) étant disposés de manière à exécuter des opérations de commutation lors du fonctionnement de l'interrupteur, un élément bimétallique (7) étant monté sur ledit élément de ressort (4) et étant agencé de manière à exécuter un déplacement d'actionnement de l'interrupteur lorsqu'il change d'état en réponse à une variation de température, caractérisé en ce que la partie formant corps (20) de l'interrupteur comprend en outre des moyens (9) pour recevoir un élément RCTP (à résistance à coefficient de température positif) (11) en contact électrique avec ladite seconde partie formant borne (2), et un support (10) pour loger un élément conducteur monté à force (12) apte, lorsqu'il est monté, à établir un contact électrique entre ledit élément RCTP (11) et ladite première partie formant borne (1), l'interrupteur pouvant être ainsi configuré de façon sélective en tant qu'interrupteur possédant un élément RCTP, auquel cas ledit élément RCTP (11) et ledit élément conducteur (12) sont prévus dans l'interrupteur, ou en tant qu'interrupteur sans élément RCTP, auquel cas ledit élément RCTP (11) et ledit élément conducteur (12) sont supprimés.

2. Interrupteur selon la revendication 1, dans lequel la partie formant corps (20) de l'interrupteur est formée de manière à définir un renfoncement (9) pour loger ledit élément RCTP (11) de manière qu'il soit en contact électrique et thermique avec ladite seconde partie formant borne (2), et l'élément conducteur monté à force (12) est adapté, lorsqu'il est monté, pour servir d'élément de retenue pour retenir ledit élément RCTP (11) dans ledit renfoncement (9) sous la pression d'un ressort et en outre pour établir un contact électrique entre ledit élément RCTP (11) et ladite première partie formant borne (1).

3. Interrupteur selon la revendication 2, dans lequel la partie formant corps en matière plastique moulée (20) de l'interrupteur possède une forme générale rectangulaire et définit des surfaces d'extrémité espacées, à partir desquelles les première et seconde parties formant bornes métalliques (1,2) font saillie pour permettre l'établissement de connexions électriques avec l'interrupteur, une surface supérieure, au niveau de laquelle la première partie formant borne (1) de l'interrupteur est exposée et à laquelle est fixé le premier contact électrique (3) de l'interrupteur, et au niveau de laquelle la seconde partie formant borne (2) de l'interrupteur est exposée et à laquelle est fixé ledit élément de ressort en porte-à-faux (4), une surface inférieure, au niveau de laquelle ledit renfoncement (9) est défini et dégage une surface inférieure de la seconde partie formant borne métallique (2) pour l'établissement du contact avec ledit élément RCTP (11), lorsqu'il est monté, et au niveau de laquelle ledit support (10) est prévu pour ledit élément conducteur inséré à force (12), et au niveau de laquelle une surface inférieure de ladite première partie formant borne métallique (1) est exposée de manière à être en contact avec ledit élément conducteur (12) lorsqu'il est monté et deux surfaces latérales planes.

4. Interrupteur selon la revendication 2 ou 3, dans lequel l'élément de ressort en porte-à-faux (4) comprend un ressort à lame, et l'élément bimétallique (7) comprend une lame incurvée à action brusque montée à la partie supérieure du ressort à lame en porte-à-faux, par le fait qu'un couple de pattes opposées de fixation (6), entre lesquelles la lame bimétallique peut être insérée, sont dégagées à partir du ressort à lame.

5. Interrupteur selon l'une quelconque des revendications 2 à 4, dans lequel l'élément conducteur inséré à force (12) comprend un ressort conducteur retenu sur la partie formant corps en matière plastique moulée (20) par le fait que le ressort conducteur comporte une ou plusieurs découpes (13) en forme de X, en forme de H, en forme d'étoile ou possédant une autre forme, qui sont prévus pour s'adapter étroitement sur un ou plusieurs tétons (10) moulés d'un seul tenant sur la partie formant corps (20) de l'interrupteur, la ou les découpes (13) du ressort conducteur (12) étant conçues de manière à être montées selon un ajustement serré sur le ou les tétons (10) et de manière à s'accrocher sur le ou les tétons (10) lorsqu'elles sont placées sous charge,

de manière à garantir que des forces élastiques intenses sont développées pour maintenir l'élément RCTP (11) immobile et garantir un bon contact électrique.

6. Interrupteur selon l'une quelconque des revendications précédentes, lorsqu'il est conformé sous la forme d'un interrupteur à enclenchement automatique, aucun élément RCTP (11) n'étant prévu dans ledit interrupteur.

7. Interrupteur selon l'une quelconque des revendications 1 à 5, lorsqu'il est agencé sous la forme d'un interrupteur RCTP, un élément RCTP (11) étant logé et retenu dans ladite partie formant corps (20) au moyen dudit élément conducteur (12).

8. Interrupteur selon l'une quelconque des revendications 1 à 5, lorsqu'il est agencé sous la forme d'un interrupteur à réenclenchement manuel, un poussoir (25) étant disposé dans une partie de logement du corps de l'interrupteur (20) pour permettre une remise manuelle à l'état initial d'un élément bimétallique bistable (7) et/ou d'un élément de ressort bistable.

9. Interrupteur selon l'une quelconque des revendications 8, dans lequel l'élément bimétallique (7) est à réenclenchement automatique et l'élément de ressort (4) est bistable, l'élément bimétallique (7) étant à même d'actionner l'interrupteur dans un sens en imprimant son déplacement à l'élément de ressort (4), mais étant incapable de lui imprimer son déplacement opposé pour obtenir un déplacement opposé de l'élément de ressort (4).

10. Interrupteur selon la revendication 9, dans lequel l'élément de ressort (4) comprend une lame de ressort possédant une découpe centrale (15) définissant des branches espacées (16), et une partie (17) de la lame de ressort est incurvée de manière à rendre cette lame bistable, un déplacement de la lame entre ses deux états stables s'accompagnant d'un mouvement de torsion desdites branches (16), le poussoir (25) agissant sur les branches (16) de manière à les amener à inverser leur sens de torsion, et amener de ce fait la lame (4) à venir dans son état stable opposé.

11. Interrupteur selon l'une quelconque des revendications précédentes, comprenant un élément de verrouillage libérable manuellement, servant à retenir l'interrupteur dans un état actionné.

FIG.1A.

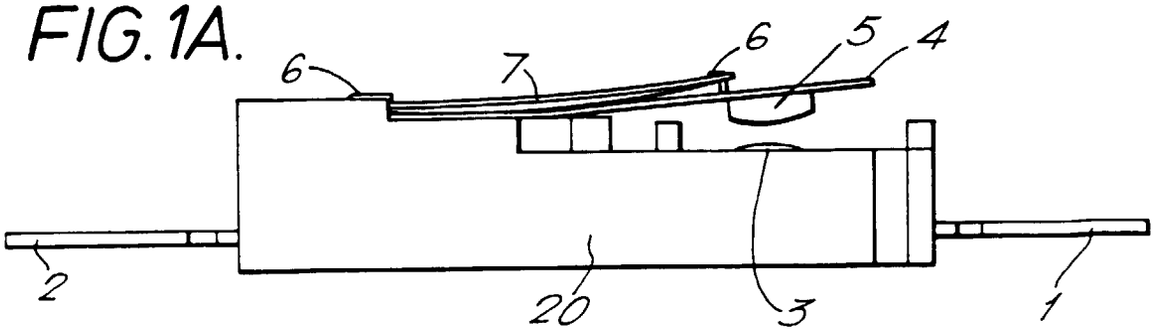
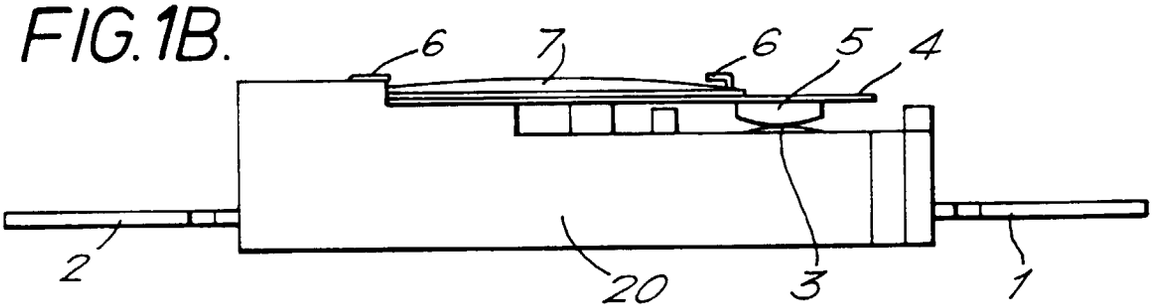


FIG.1B.



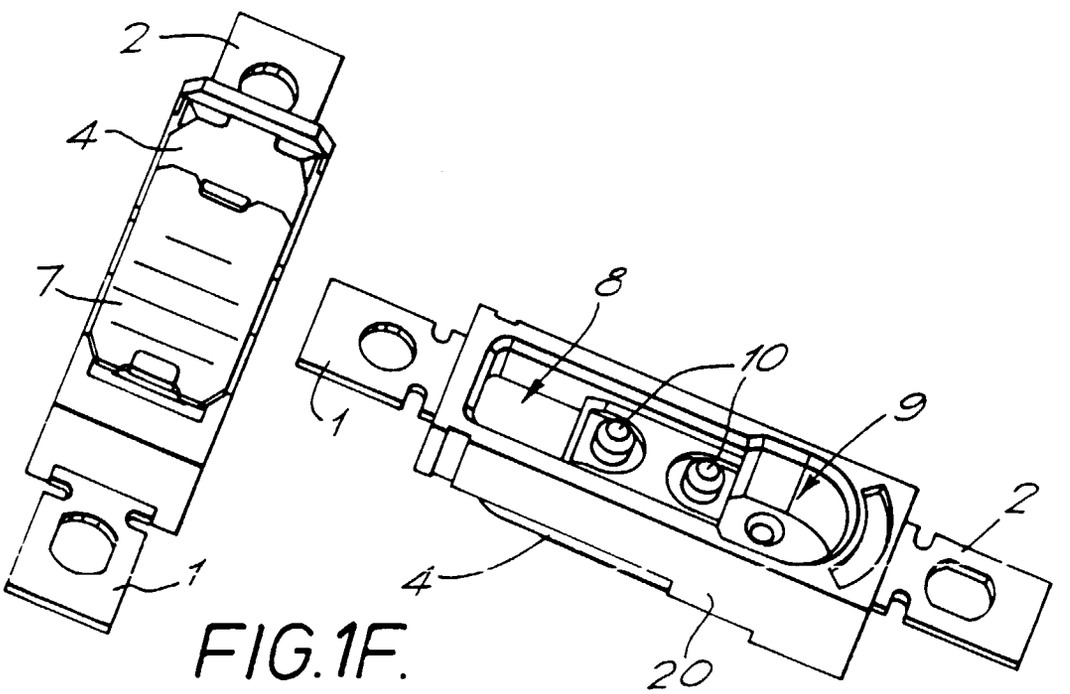


FIG.1F.

FIG.1C.

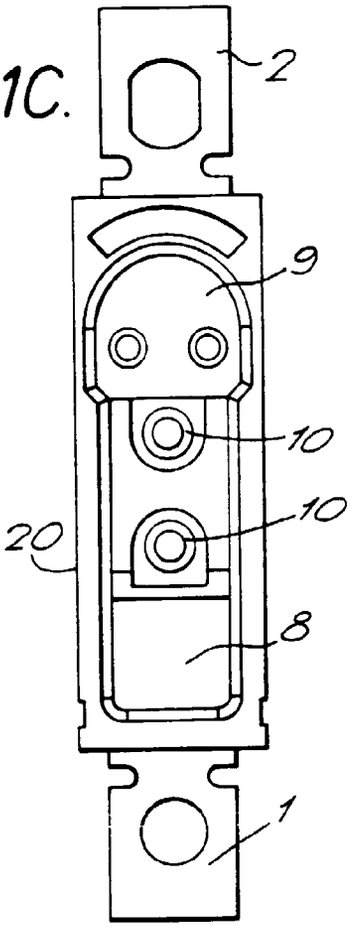


FIG.1D.

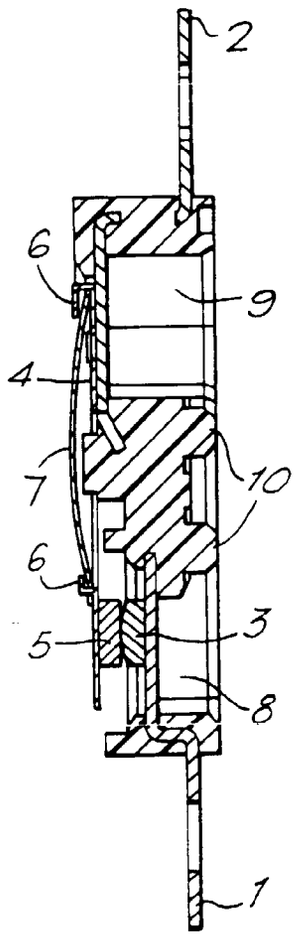


FIG.1E.

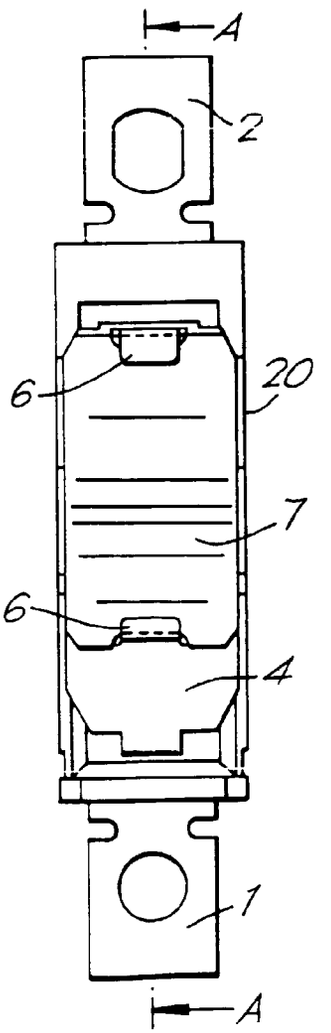


FIG.2A.

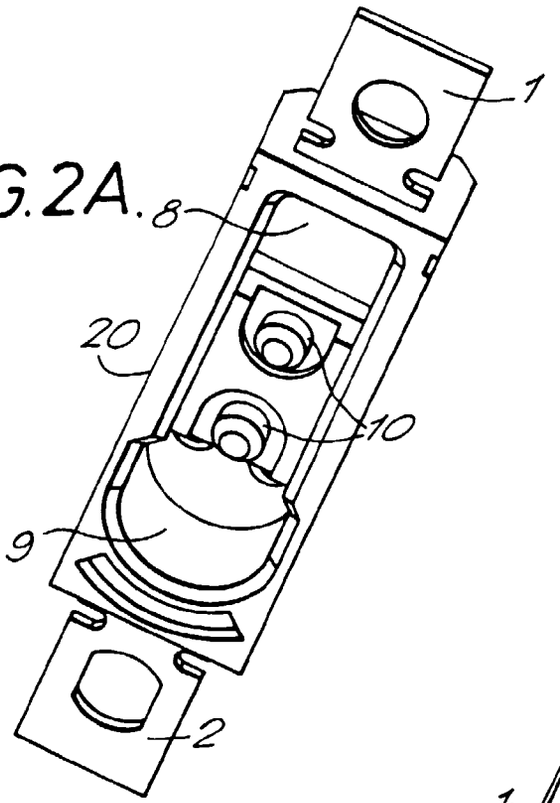
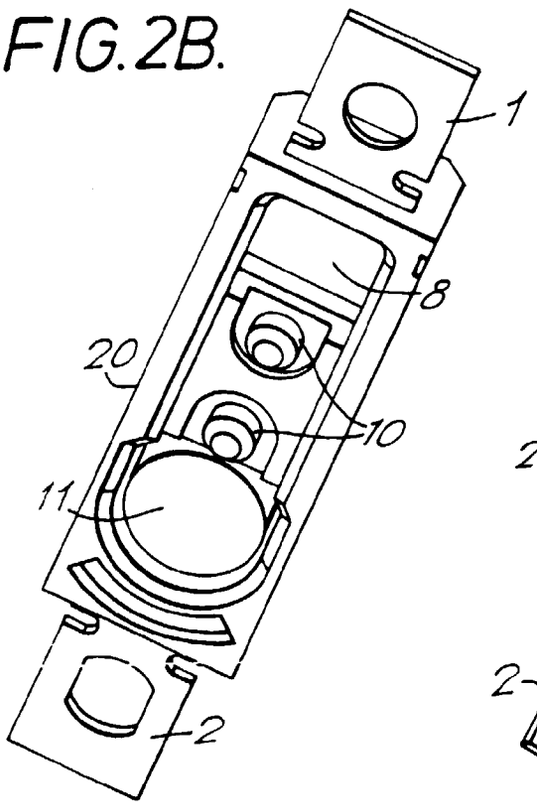


FIG.2B.



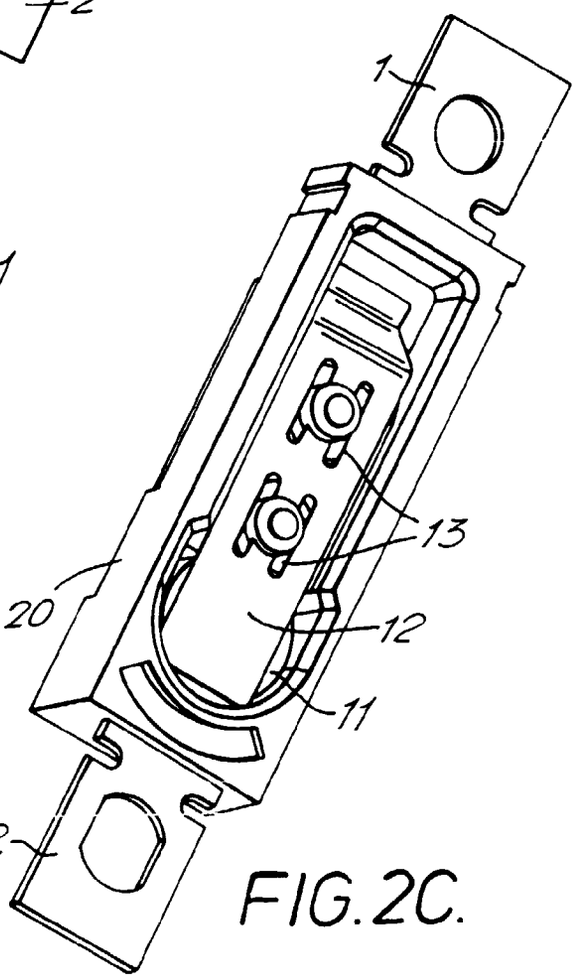


FIG.2C.

FIG. 2D.

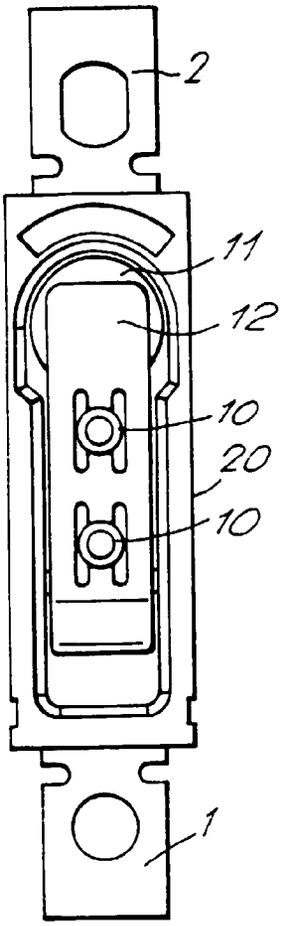


FIG. 2E

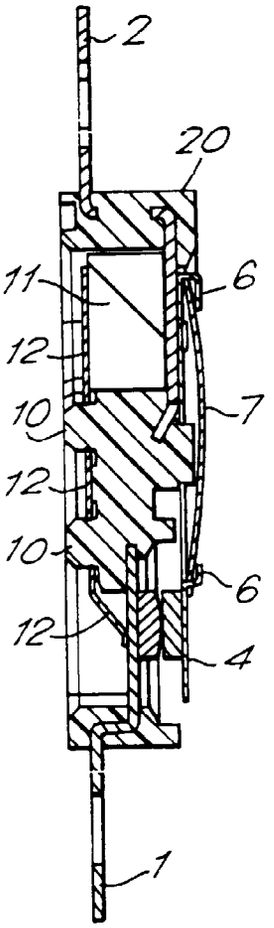
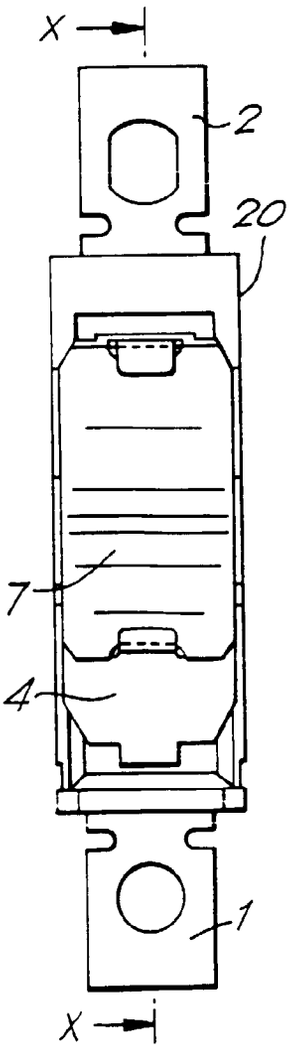


FIG. 2F.



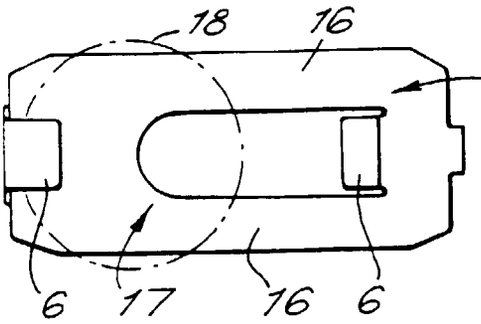


FIG.3A.

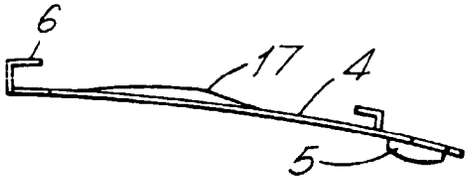


FIG.3B.

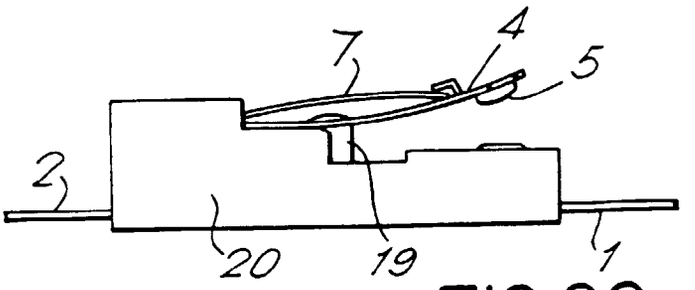


FIG.3C.

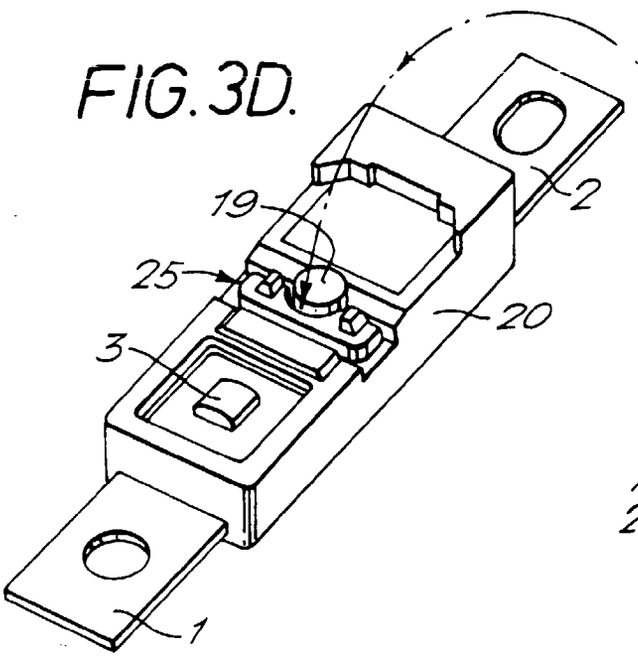
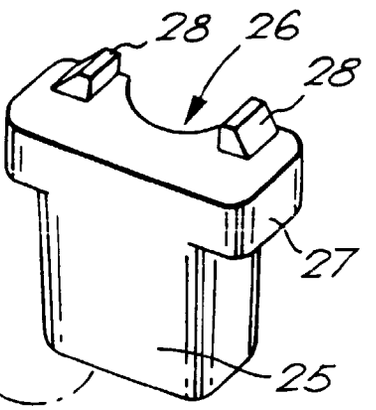


FIG.3D.



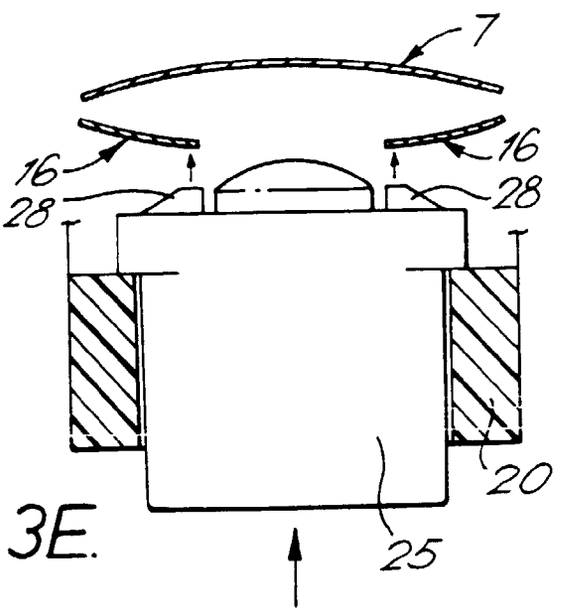


FIG.3E.