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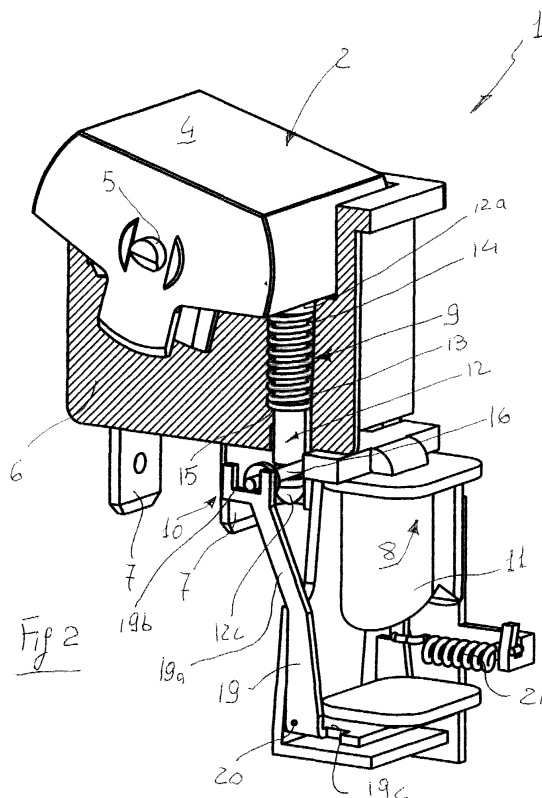
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(54) **Self-opening electric switch**

(57) It is disclosed a self-acting electric switch comprising a manually-actuated mechanism (2) and an electromagnetically-actuated device (8) in turn comprising control means (9) for opening of the contacts (3), hooking means (10) movable between a first position in which it does not interfere with the opening control means (9)

and a second position, corresponding to the closed position of the contacts (3), in which said control means (9) is operatively inhibited, and an electromagnet (11) active, when in a powered condition, on the hooking means (10) to keep the latter in the position inhibiting the opening control means (9).



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Description

[0001] The present invention relates to a self-opening electric switch of the type comprising a manually-actuated mechanism adapted to selectively dispose the electric contacts of the switch in a closed and open position and an electromagnetically-actuated device which is adapted, when in a powered condition, to keep the contacts in a closed position, provided the latter have been manually closed and, when in a condition of power absence, to automatically move said contacts to an open position.

[0002] It is known that for some electrically operated appliances for domestic use or to be employed in commercial stores or concerns or also in other fields, the presence of self-opening electric switches is required, i.e. switches in which the electric contacts can be brought to an open position not only manually, but also automatically if given conditions occur, such as a lack of mains voltage or reaching of a given physical parameter, which can be a temperature, pressure or time parameter, for example.

[0003] It is to be pointed out that practically these self-opening switches must ensure that, if passage of electric contacts from the closed position to the open position has occurred, an automatic reverse passage, i.e. a new closure of said contacts, will be absolutely impossible, unless a voluntary manual intervention is carried out by an operator.

[0004] For instance, if a stop due to power failure has occurred in a slicer apparatus, a switch of the self-opening type avoids an undesired starting of the apparatus itself taking place when power comes back. Likewise, if operation of an apparatus is interrupted by tripping of a pressure switch or a thermostat, because a maximum pressure or a preestablished temperature has been for example overcome, a self-opening switch avoids occurrence of an automatic restarting of the apparatus to which it is connected when the intervention conditions of the pressure switch or thermostat are no longer present.

[0005] The self-opening electric switches of known type comprise, in addition to a manually-actuated mechanism adapted to dispose the electric contacts in a closed or open position, an electromagnetically-actuated device adapted, when in a powered condition, to keep said contacts in a closed position, provided the latter have been previously manually closed, and to automatically move the same contacts to an open position, when in a condition of power absence.

[0006] In said known electric switches the contact closure force is provided to be directly maintained by the electromagnet the coil of which must be therefore conveniently sized.

[0007] In other words, the contact closure initially carried out manually by pressing an operation key for example, in the known art is ensured by the action directly carried out on the contacts by the electromagnetic force

generated by the electromagnet coil against the action of spring means that would tend to bring the contacts themselves back to the open position.

[0008] The known art briefly described above has some limits and drawbacks.

[0009] First of all, the required electromagnet for keeping the contacts to the closed position takes up space and therefore causes a non-negligible bulkiness of the electric switch on the whole, making it difficult to insert it in particular types of appliances.

[0010] In addition, costs of the self-opening switches of known type are high due both to the intrinsic cost of the electromagnet which must necessarily have big sizes, and to the fact that a self-opening switch has a complex construction quite different from that of a standard switch, i.e. not provided with a self-opening function.

[0011] Under this situation, the technical task underlying the present invention is to devise a self-opening electric switch capable of substantially eliminating the above mentioned drawbacks.

[0012] Within the scope of this technical task it is an important aim of the invention to devise a self-opening switch of limited bulkiness and reduced cost.

[0013] Another important aim of the invention is to devise a self-opening switch of easy construction starting from structures of standard single-pole or double-pole switches with the addition of few components.

[0014] The technical task mentioned and the aims specified are substantially achieved by a self-opening electric switch which is characterized in that it comprises one or more of the technical solutions claimed in the appended claims.

[0015] Description of a preferred but not exclusive embodiment of a self-opening switch in accordance with the invention is now given hereinafter by way of non-limiting example with the aid of the accompanying drawings, in which:

- Fig. 1 is a perspective view partly interrupted and in section of a switch in accordance with the invention, with the electric contacts in an open position;
- Fig. 2 is a perspective view partly interrupted and in section of the switch in Fig. 1 with the electric contacts in a closed position;
- Fig. 3 is a partly sectional view of the switch of the invention with the electric contacts in an open position;
- Fig. 4 is a partly sectional view of the switch of the invention, with the electric contacts in a closed position.

[0016] With reference to the drawings, the self-opening switch in accordance with the invention has been generally identified by reference numeral 1.

[0017] Switch 1 comprises a manually-actuated mechanism 2, of known type, adapted to selectively dispose the electric contacts 3 to an open position (see Figs. 1 and 3) and to a closed position (see Figs. 2 and

4).

[0018] The manually-actuated mechanism 2, in turn, comprises an oscillating key 4 rotatably in engagement, at a hinging pin 5, with a base body 6 with which fixed electrical terminals 7 are made integral. The oscillating key 4 is capable by itself, as in any switch not of the self-opening type, to allow the necessary thrust to be reached so as to dispose the electric contacts that have been correctly pressed to a closed and/or open position.

[0019] Switch 1 further comprises an electromagnetically-actuated device 8 which, when in a powered condition, is intended to keep contacts 3 to a closed position, provided these contacts have been manually closed by the oscillating key 4 and, when in a condition of power absence, is intended to automatically bring said contacts to an open position.

[0020] In an original manner, the electromagnetically-actuated device 8 comprises control means 9 for switch opening adapted to exert on the manually-actuated mechanism 2 and more specifically on the oscillating key 4, a force capable of causing rotation of the oscillating key around the hinging pin 5 in a direction corresponding to opening of the contacts.

[0021] In addition, the electromagnetically-actuated device comprises hooking means 10 movable between a first position, corresponding to the open-contact position (see Figs. 1 and 3), in which said means does not interfere with the opening control means 9, and a second position corresponding to the closed-contact position, in which the operating efficiency of the control means 9 is inhibited (see Figs. 2 and 4). This second position of the hooking means 10 is maintained by an electromagnet 11 in a powered condition.

[0022] More specifically the opening control means 9 comprises a pusher defined by a thrust pin 12, in working contact with the oscillating key 4 and a first spring element 13 defined by a cylindrical spiral pressure spring wound around the thrust pin itself.

[0023] The thrust pin 12 and spring 13 are slidably fitted in a through hole 14 formed in the base body 6; spring 13 is retained at a first end thereof by an end protuberance 12a of the thrust pin 12 and at a second end thereof by a portion 15 jutting out into the through hole 14. Practically, spring 13 is interposed between the thrust pin 12 and the base body 6 and causes a tendency of the former to push the oscillating key 4 towards a position corresponding to opening of the contacts.

[0024] The hooking means 10 comprises a locking element 16 movable transversely of the translation direction of the thrust pin 12 from said first position in which it interferes with the thrust pin and said second position in which it locks translation of the latter, thereby inhibiting the operating efficiency of the opening control means 9.

[0025] Practically, the locking element 16 consists of a bar hinged at one end thereof on an oscillation axis, not shown, parallel to the translation direction of the thrust pin 12, and insertable in a stop seating 12b of said

pin defined by an annular recess disposed at an end 12c opposite to the end protuberance 12a. The end 12c and annular recess 12b come out of the through hole 14 when the oscillating key 4 is in a position corresponding to closure of the contacts (see Figs. 2 and 4).

[0026] Advantageously, rotation of bar 16 around its oscillation axis is delimited by a recess 17 disposed at a plate-shaped portion 18 rigid with the base body 6.

[0027] The locking bar 16 is operatively connected with a lever control member 17 hinged on the base body 6 around a rotation axis 20 substantially parallel to the axial direction of the bar itself.

[0028] The lever control member 19 comprises a first arm 19a having an end 19b in engagement with the locking bar 16 and a second arm 19c intended to be attracted by the electromagnet 11.

[0029] Finally, a second spring element 21 is interposed between the base body 6a and the lever control member 19 and it consists of a pull or compression spring for example, which is adapted to keep the lever control member 19, and the locking bar 16 connected thereto, in said first position of non-interference with the thrust pin 12.

[0030] Operation of a self-opening electric switch described above mainly as regards structure, is as follows.

[0031] When the oscillating key 4 is in the open-contact position (see Figs. 1 and 3), electromagnet 11 is not powered and the locking bar 16 of the hooking means 10 is maintained in a position of non-interference with the end 12c of the thrust pin 12 by the lever control member 19, under the action of the second spring 21; said thrust pin 12, due to the thrust of the first spring 13, is disposed completely inside the through hole 14.

[0032] If the oscillating key 4 is manually switched over to the closed-contact position, the thrust pin 12 is pressed, against the action of the first spring 13 which is thus compressed, by the oscillating key 4 itself that makes the end 12c and the stop seating 12b come out of the through hole 14. When closure of the contacts has been reached, the electromagnet 11 is powered and, by attracting the second arm 19c of the lever control member 19, it overcomes the force of the second spring 21 and causes rotation of said second arm, which will give rise to displacement of the locking bar 16 that is inserted into the stop seating 12b of the thrust pin 12. In this way the thrust pin 12 is locked and the first spring 13 is prevented from exerting its spring action tending to bring the oscillating key 4 back to the open position (see Figs. 2 and 4).

[0033] If the oscillating key 4 is manually pressed to the open position because the apparatus in which the switch is inserted is wished to be turned off, as soon as separation between the electric contacts occurs the electromagnet 11 is no longer powered, the second spring 21 brings the lever control member 19 and the locking bar 16 back to the position of non-interference with the thrust pin 12 that therefore, being free to slide in the through hole 14, follows displacement of the os-

cillating key 4 against which it is pressed by the first spring 13.

[0034] If a mains voltage failure occurs or if for any other reason the electromagnet 11 is no longer power-supplied, for example due to the fact that this electro-
magnet is also connected to a circuit in which passage
of current is linked to a physical parameter such as a
pressure, temperature or time parameter, the locking
bar 16, which is no longer retained in the stop seating
12b by the electromagnet force, moves and releases the
thrust pin 12 that, under the action of the first spring 13,
exerts pressure against the oscillating key 4 bringing it
back to the open position.

[0035] Should the conditions that had caused power
failure at the electromagnet 11 be restored, the switch
contacts will at all events remain in an open position,
and they will be able to go back to the closed position
only by a new manual intervention on the oscillating key
4.

[0036] The invention achieves important advantages.

[0037] In fact, first of all, contacts are maintained to a
closed position by hooking means acting transversely
of the direction of the spring force tending to bring said
contacts back to an open position, for the purpose of
carrying into effect the intrinsic safety condition typical
of self-opening switches. The operating force coming
from the electromagnet and necessary for intervention
on the hooking means having the above mentioned fea-
tures is therefore much more limited as compared with
that of the known art where, on the contrary, the elec-
tromagnet must develop a force suitable to directly over-
come said spring force provided for automatically open-
ing the electric contacts.

[0038] The electromagnet of the switch of the inven-
tion can therefore be of smaller bulkiness and lower cost
as compared with the switches of the known art.

[0039] It should be also recognized that the con-
cerned self-opening switch is practically made up of a
standard single-pole or double-pole switch to which the
above disclosed electromagnetically-actuated device is
added.

[0040] Therefore strong reductions in the production
costs can be obtained since the self-opening switch
made in accordance with the invention can merely con-
stitute a modified construction version of the already
planned and tested devices.

Claims

1. A self-opening electric switch of the type compris-
ing:

- a manually-operated mechanism (2) adapted
to selectively dispose the electric contacts (3)
of the switch (1) in a closed and open position;
and
- an electromagnetically-actuated device (8)

adapted, when in a powered condition, to keep
said contacts (3) in a closed position provided
the latter have been manually closed and, when
in a condition of power absence, to automati-
cally bring said contacts (3) to an open position,

characterized in that said electromagnetically-
actuated device (8) comprises:

- control means (9) for switch opening adapted
to exert an operating force on said manually-
actuated mechanism (2) to open said contacts
(3),
- hooking means (10) movable between a first
position, corresponding to the open-contact po-
sition, in which no interference occurs with said
opening control means (9), and a second posi-
tion corresponding to the closed-contact posi-
tion, in which the operating efficiency of the
opening control means (9) is inhibited, and
- an electromagnet (11) active, when in a pow-
ered condition, on said hooking means (10) to
keep the latter in said second position inhibiting
the opening control means (9).

2. A switch as claimed in claim 1, **characterized in
that** said manually-actuated mechanism (2) com-
prises an oscillating key (4) hinged on a base body
(6) of the switch, and **in that** said opening control
means (9) comprises a pusher (12) in operating
contact with said oscillating key (4) and at least one
first spring element (13) interposed between said
pusher (12) and the base body (6) of the switch, said
pusher (12) being capable, under the action of said
first spring element (13), to make said oscillating
key (4) rotate in a direction corresponding to open-
ing of the contacts.

3. A switch as claimed in claim 2, **characterized in
that** said pusher (12) is defined by a thrust pin sli-
dably inserted in a through hole (14) formed in said
base body (6), and said first spring element (13) is
defined by a cylindrical spiral pressure spring
wound around said thrust pin 12 and retained at a
first end thereof by an end protuberance (12a) of
said thrust pin and at a second end thereof by a por-
tion (15) jutting out into said through hole (14).

4. A switch as claimed in claim 3, **characterized in
that** said hooking means (10) comprises:

- a locking element (16) movable transversely of
said thrust pin (12) from said first non-interfer-
ence position to said second position in which
said opening control means (9) is inhibited, said
thrust pin (12) having a stop seating (12b)
adapted to house said locking element (16) in
said second position;

- a lever control member (19) hinged on the base body (6) and operatively connected with said locking element (16), and
- at least one second spring element (21) interposed between the base body (6) and said lever control member (19) and adapted to keep the lever control member and the locking element (16) connected therewith to said first position,

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and **characterised in that** said electromagnet (11) is active on said lever control member (19) to keep the latter and said locking element to said second position, against the action of said second spring element (21).

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5. A switch as claimed in claim 4, **characterized in that** said locking element (16) is defined by a bar hinged at an end thereof around an oscillation axis parallel to the translation direction of said thrust pin (12), and **in that** said thrust pin (12) has an annular recess (12b) defining said stop seating which is disposed at an end (12) of the pin itself designed to emerge from said through hole (14) at a position of the oscillating key (4) corresponding to the closed position of the electric contacts (3).

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6. A switch as claimed in claim 5, **characterized in that** said lever control member (19) comprises a first arm (19a) having an end (19b) in engagement with said locking bar (16) and a second arm (19c) designed to be attracted by said electromagnet (11).

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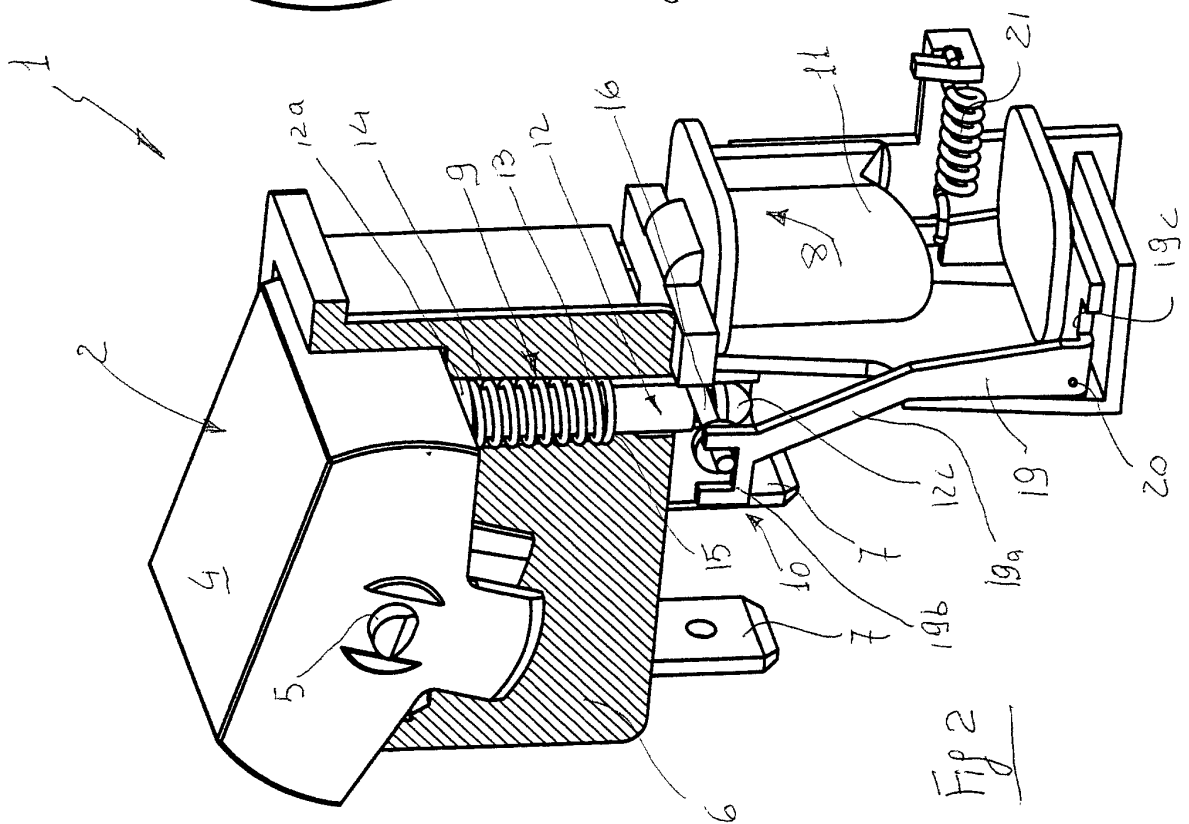
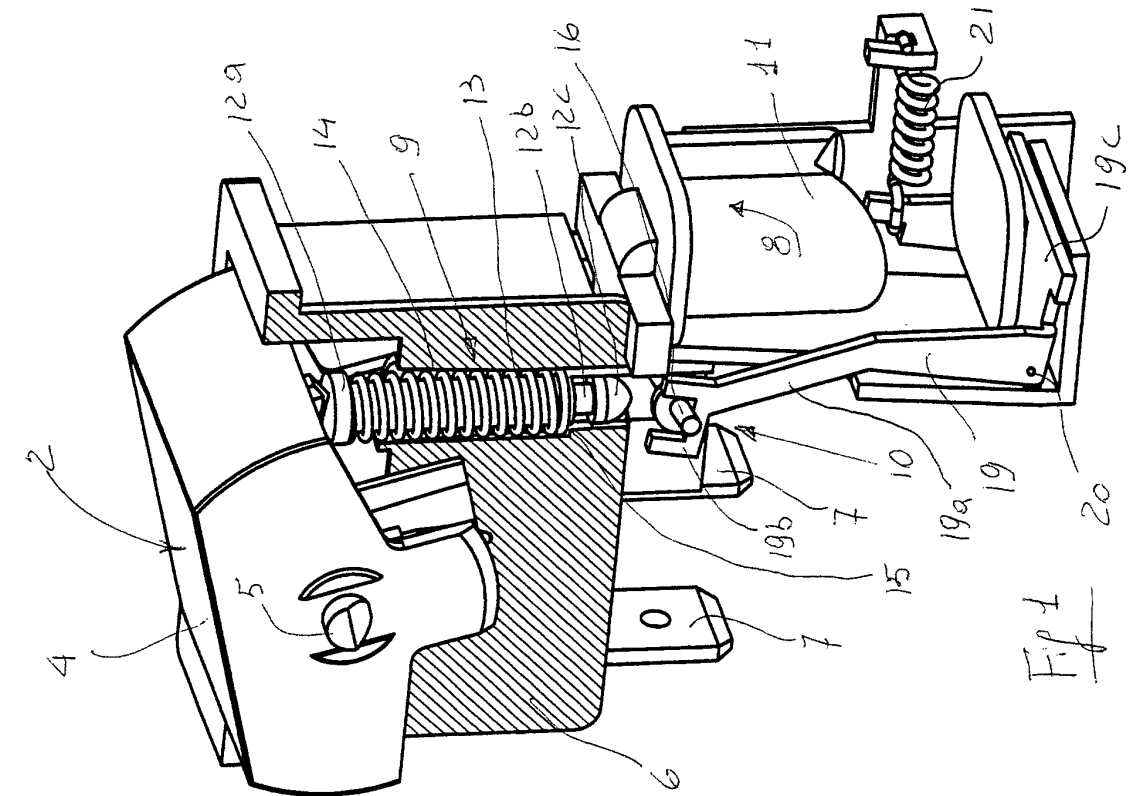
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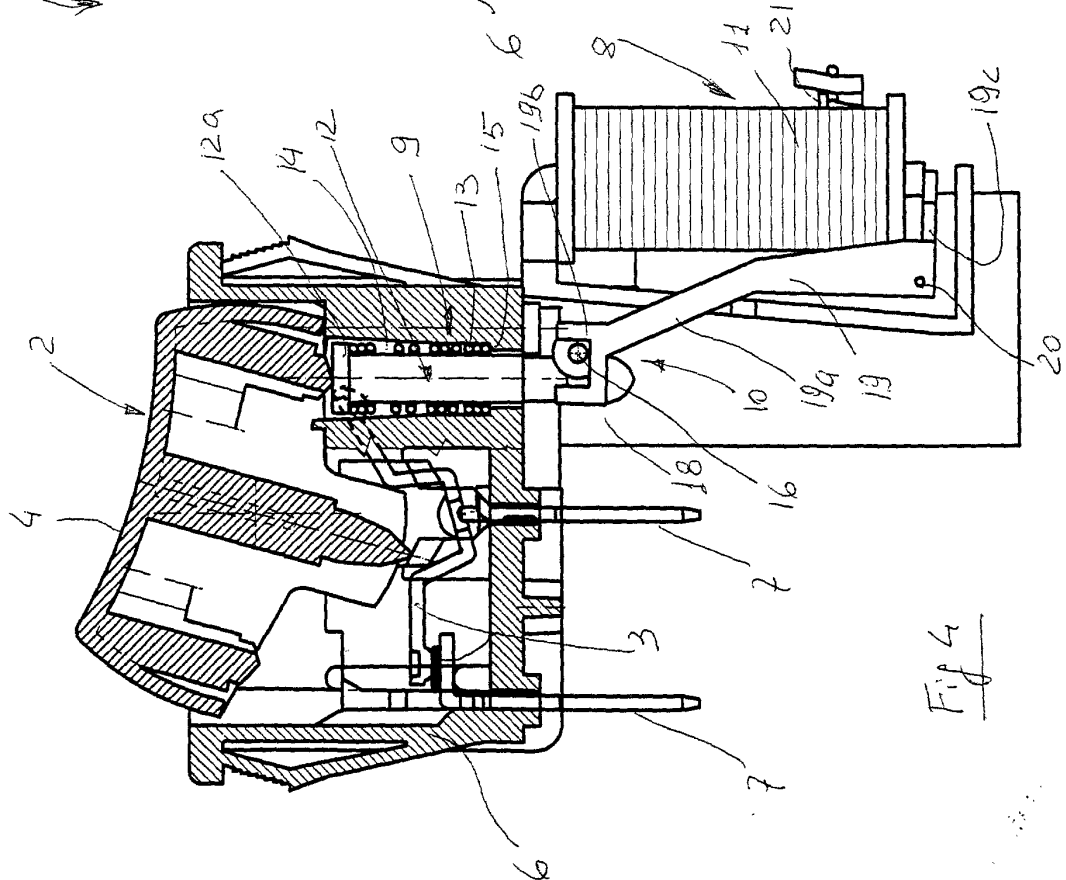
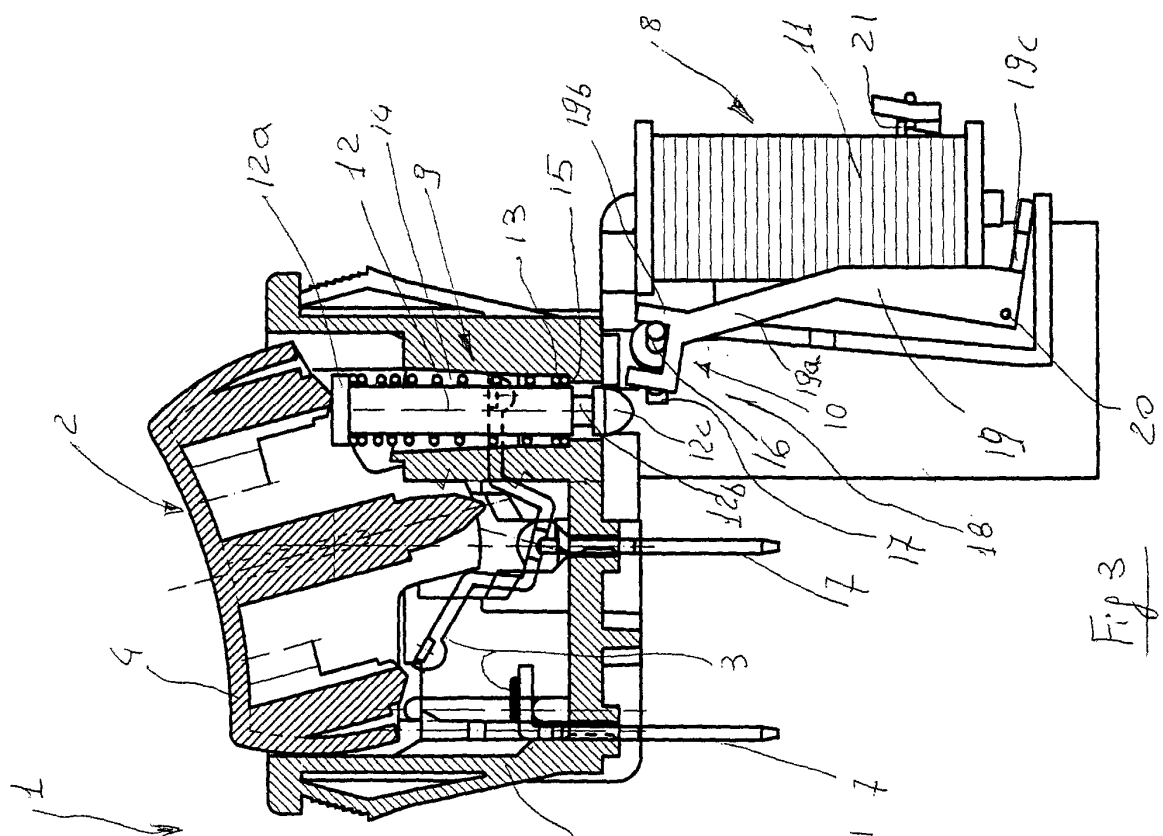
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EUROPEAN SEARCH REPORT

Application Number
EP 00 83 0459

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	EP 0 591 679 A (SCHULTE ELEKTROTECH) 13 April 1994 (1994-04-13) * column 4, line 53 - column 5, line 7 * ----	1	H01H3/50 H01H83/12
A	FR 2 342 184 A (SEIMA) 23 September 1977 (1977-09-23) * page 4, line 4 - line 22 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H01H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 26 October 2000	Examiner Libberecht, L
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 83 0459

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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