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(71) Applicant: **Imper S.p.A.**
10100 Torino (IT)

(72) Inventor: **Pagano, Gaetano**
50100 Firenze (IT)

(74) Representative: **Gonella, Mario et al**
Propria S.r.l.
Via della Colonna, 35
33170 Pordenone (IT)

(54) **Device, preferably for a dishwasher, with door-locking mechanism**

(57) The problem addressed by the invention consists in the fact that, in a cabinet and particularly in a dishwasher, during the closure of the door provided with a normal toggle-latch, it may happen that the holding hook places itself incorrectly in a way that corresponds to the closed-door position, when on the contrary the door is still open and the connecting means normally projecting from the dishwasher cabinet is not engaged with the hook of the toggle-latch. To solve this problem, the toggle-latch of the invention includes a support frame (1) solidly applied on said door, a mobile hook element (2), rotating on said frame (1), and provided with a suitable engaging hollow (3), a toggle arm (10) with an extremity

on which a pivot point is engaged rotatably to the support frame (1), a spring (9) having a first end applied to a point (8) of the hook element (2) and the opposite end applied to the other end (7) of the toggle arm (10), in which the hook element (2) includes a protruding appendage (20) and the support frame (1) is provided with a lodging portion (21) suitable to rotatably receive, on a definite axis of rotation (X), said protruding appendage (20). Said hook element (2) has an outwardly convex surface suitable to be pushed by the connecting means when the door is being closed, so as to push the hook (2) to rotate around said rotatable protruding appendage (20) inside said lodging portion (21).

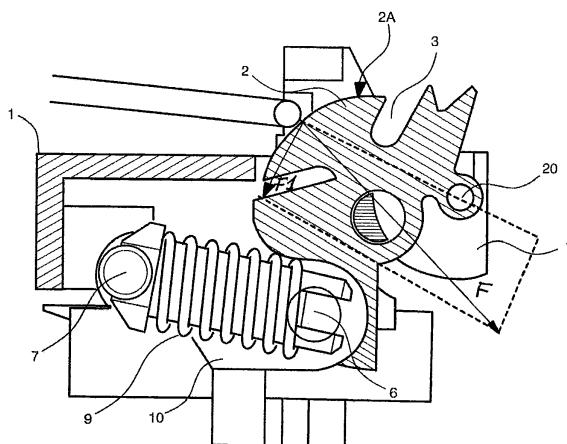


Fig.11

Description

[0001] The present invention refers to a mechanical device, in particular for a domestic dishwasher, provided with a front door for closing/opening the internal compartment.

[0002] These appliances are universally known, and therefore they will not be illustrated further.

[0003] Hereunder, the present description will refer to one of said dishwashing appliances, but it remains understood that the invention may find other advantageous fields of application.

[0004] As is well known, said door is closed against the cabinet with a mechanism generally of toggle type that can also be operated manually to unlock the door.

[0005] The toggle mechanisms are capable of exerting a substantial locking force on the door, when it is in closed position, ensuring a good watertight seal of the door gasket.

[0006] Normally, the unlocking of the toggle mechanism is achieved by pulling the door firmly toward the open position, bringing the mechanism past a dead stop position that disengages it from a coupling pin fastened to the cabinet. In other words, the opening of the door is of the so-called "tug-open" type, which has the advantage of not requiring a handle to open the door and of also allowing such opening from inside the machine, with consequent greater safety in the use of the appliance in the home.

[0007] The technology of the toggle-type closing devices, which hereunder will be referred to as toggle-latch devices (a well-known term for keying means in the technical field), which are used particularly on dishwasher doors, is well known to experts in the field and is widely disclosed, for example in Patent EP 0917 853 B1 and in Italian Patent Application PN93U000021, which are referred to here.

[0008] Although many problems related to said toggle-type devices have been tackled and solved, the growing demand for safer devices imposes a continuous improvement of said devices.

[0009] In particular, it has been noted that current dishwashers retain a drawback that is increasingly seen as undesirable and badly tolerated. This drawback consists of the fact that during the closing of a door provided with a normal toggle-latch device it may happen - for any cause or reason, including a negative mechanical allowance - that the latch device normally arranged in the door and that protrudes from it with a hook element, interferes in a manner corresponding with the door closing position, when on the contrary the door is not yet closed and the prong normally projecting from the dishwasher cabinet is not engaged on said toggle latch.

[0010] For greater clarity, the following should be observed:

- Fig. 1, which shows the reciprocal position of the prong (which is the connecting means fastened to

the appliance) and the hook element provided with the relative engaging recess, in the door-open and thus disengagement condition between these elements;

- Fig. 2, which shows the same elements but with the door closed, and therefore with said elements correctly engaged with each other;
- Fig. 3, which shows again the same elements, but in the condition of hook element in a closed position, as in Fig. 2, but with the toggle latch not engaged with this, and thus as is shown in Fig. 1.

[0011] In these conditions various problems can occur, the main ones being that the operator tries in vain to close the door, with the consequence of breaking the device, and therefore of having to resort to external repairs in this costly case.

[0012] It may also happen that the operator, noticing this problem, still tries to close the door or approach it to the cabinet carefully but with a necessary force, hoping for a correct operation of the appliance; but this caution does not work in this case either, because one of the purposes of the toggle-latch is also to hold the door against the cabinet in an elastic manner and with a predetermined force to achieve the watertightness of the door against the cabinet and avoid water leaks from the vertical side gaskets between the door and the cabinet, and if the toggle-latch is not properly engaged on the prong-like connecting means there will be unwanted and hazardous water leaks and a risk of flooding.

[0013] Thus, a main objective of the present invention is to provide a closing device of the toggle-latch type, to be applied to the door, in particular for dishwashers, provided with a prong holding system that does not have the drawback described above and that is capable of allowing the resetting of the hook or holding system, even if arranged incorrectly, without requiring any particular or additional operation on the part of the user.

[0014] In addition, such resetting must be carried out automatically, so that even if the user does not notice the incorrectly arranged hook, nothing happens because the toggle-latch must immediately reset itself simply by the closing of the door.

[0015] Further objectives of the invention are:

- to miniaturize the dimensions of such device, so that it can be mounted inside the thickness of dishwasher doors;
- to make the components of such device, which will be described later, by the simple moulding of a plastic material;
- the possibility of opening and closing of the door with the described device with a simple handle or with a tug.

[0016] These objectives are achieved by the closing device made and operating according to the accompanying claims.

[0017] Characteristics and advantages of the invention will be evident from the following description, presented by way of example but without limitations, with reference to the enclosed drawings, wherein:

- Figures 4, 5 and 6 illustrate in a simplified and completely symbolic way the structure and the connections of the main components of a door toggle-latch on a cabinet according to the invention, in three respective and distinct states of operation;
- Figures 7 and 8 show two plane, schematic side views of the toggle-latch of the invention in normal conditions of operation, respectively before and after its closure.
- Figure 9 illustrates a side view similar to Fig. 7 but with the toggle-latch in anomalous conditions of operation;
- Figure 10 shows the toggle-latch of Fig. 9 in a subsequent condition of operation according to the invention;
- Fig. 11 shows an enlargement of Fig. 9, with the addition of some further elements and details;
- Fig. 12 illustrates a view in diagonal perspective (and from below) of a toggle-latch according to the invention in a defined state of operation;
- Fig. 13 illustrates a simplified schematic, in plane and side view, of the toggle-latch of Fig. 12, in a defined state of operation, corresponding to Fig. 9;
- Fig. 14 illustrates a simplified schematic, in plane and side view, of the toggle-latch of Fig. 12, in a different state of operation, corresponding to Fig. 10;
- Fig. 15 shown a view in diagonal perspective of a toggle-latch according to the invention, as seen from a point diagonally opposite to the point of view of Fig. 12;
- Fig. 16 illustrates a schematic plane, front view of the toggle-latch according to the invention, as seen from the position of the prong connection to the same toggle-latch.

[0018] Hereinafter in the present description reference will be made to a type of toggle-latch provided with a toggle device which, only in its principle of operation, is similar to the one described in the cited patent EP 0917 853 B1.

[0019] To simplify as much as possible the present description, so as to help the reader to focus prevalently on the contents of the present invention, Figures 4, 5 and 6 illustrate the operating principle of said type of toggle-latch, and in particular of the relative toggle mechanism.

[0020] Said figures are shown as plane cross sections on a plane orthogonal to the anchoring means, normally a connecting means 4, projecting from the cabinet itself; as is known, such a connecting means is usually made up of a semi-annular element, with a flattened or rectilinear external side, projecting from the cabinet and arranged on a horizontal plane; therefore, with the previous conventions, the planes of the cross sections of Figures

4, 5 and 6 are vertical planes.

[0021] Thus, in Fig. 4 we can see:

- the toggle-latch support framework 1, shown only in a symbolic manner and suitably fastened to the door, not shown;
- the hook element 2 provided with a relative engaging hollow 3 designed to engage with and disengage from an anchoring means integral with the cabinet, here represented by the connecting means 4;
- the pivot pin 5 which shows the point of rotation of said hook element 2 with respect to said support frame 1; naturally, said pivot point 5 is made materially from relative suitable pins and pivoting seats, but as said above, for the sake of clarity the present disclosure omits the details of the material aspects of the embodiments of the described components;
- a toggle arm 10, rotating on a relative pivot point 6 with respect to said support frame 1;
- an elastic means, preferably a spiral spring 9 as shown here, extended and thus stretched between a point 7 on the toggle arm and a point 8 on the hook element 2.

[0022] The elements described are reciprocally dimensioned and positioned so that, for example in the door open position, that is, with the connecting means 4 not engaged with the hollow 3, are symbolically represented in Figure 4.

[0023] Although this form of operation has been described in a more articulated manner in the above-mentioned EP 0917 853 B1, an extremely simplified description is given here to make it easier to understand the present invention.

[0024] It should be noted that in the arrangement of the toggle-latch in Fig. 4, the straight line "r" that joins points 6 and 7 of the toggle arm is set at an angle "a" with respect to the straight line "d" joining points 7 and 8; the straight line "d" thus traces the direction of the force acting on the spring 9.

[0025] If the hook element 2 is rotated counterclockwise (arrow "A") around its pivot point 5, thus simulating the closing of the door that causes the contact and consequent push of the connecting means 4 into the hollow 3, which leads to an unstable position in which the toggle arm 10 maintains its position, while the rotation of the hook element 2 reaches a point of instability in which the two straight lines "r" and "d" overlap, as shown in Fig. 5.

[0026] Continuing the counterclockwise rotation of the hook element 2, as in Fig. 6, the straight line "d" moves in a counterclockwise direction past the straight line "r", that is, point 8 passes over to the opposite half plane with respect to the line "r" and thus instantly the spring generates a force on point 7 which creates a rotation torque in a clockwise direction on the toggle arm 10 with respect to its pivot point 6.

[0027] And thus instantly the toggle arm trips, in the

sense that it immediately turns to the position of Fig. 6.

[0028] Obviously, the configurations of Figures 4 and 6 become stable due to the effect of the stop means of elements 2 and 10, not shown nor discussed, as they are entirely obvious.

[0029] On the basis of a cabinet and of a toggle latch working in the manners just described, and with reference to Figures 7 to 10, a cabinet according to the known art includes:

- a connecting means 4 solidly engaged on the stationary part of the cabinet and turned toward said door;
- a spring latch or toggle-latch device, preferably installed in the thickness of said door, designed to engage with and disengage from said connecting means 4, and including an articulated toggle mechanism with:
 - a) a support frame 1 solidly applied on said door;
 - b) a hook element 2 hinged and rotating on a first pivot point 5 applied, in a non-fixed manner and with means that will be better specified later, on said cabinet 1 and provided with a suitable engaging hollow 3 turned toward said connecting means 4;
 - c) a toggle arm 10 in which a first end is rotatably engaged around a second pivot point 6 mounted integral to said support frame 1;
 - d) an elastic means, preferably made and shaped like a spiral spring 9, suitable to be extended from its idle position, and one end of which is applied to a portion 8 of said hook element 2, and whose opposite end is suitable to be applied to the second end 7 of said toggle arm 10.

[0030] According to the present invention, this type of toggle latch is modified and improved as follows:

- said hook element 2 is provided with a projecting appendage 20 located on the side opposite the position of said connecting means 4, with respect to the hollow 3 of the hook element 2;
- and said support frame 1 is provided with a lodging portion 21 (see detail in Fig. 7) suitable to rotatably receive, on a definite rotation axis "X", said projecting appendage 20.

[0031] In addition, said hook element is provided, on its sector oriented toward said connecting means 4, with an outer portion 2A:

- suitable to be engaged, during the closing movement of said door, by said connecting means 4 or prong;
- and provided with a profile such that, during said closing movement, said hook element 2 is forced to rotate around said protruding appendage 20 that

turns inside said lodging portion 21.

[0032] With reference to Figures 7, 8 and 9, said invention works essentially as follows: when the hook element 2 is normally arranged as in Fig. 7, and thus it is suitable to receive the connecting means 4, it works exactly as in the known art and thus it receives the connecting means which pushes it so as to make it trip and move to the position of Fig. 8.

[0033] On the other hand, when the hook element 2 is in the irregular position, that is, already tripped, described in Fig. 3, the connecting means 4 inevitably meets the outer portion 2A of the hook element 2, as in Fig. 9, and, as the door closing movement proceeds, it pushes this hook element 2 inward with a counterclockwise rotation (Fig. 10).

[0034] Due to the fact that said hook element 2 is in practice hinged, with said projecting appendage 20 working as a pivot pin, inside the relative lodging portion 21, there is the obvious consequence that the thrust exerted by the connecting means 4 against said portion 2A generates a rotation torque that tends to make the entire hook element 2 rotate around the pin consisting of said rotatable appendage 20 in the lodging portion 21.

[0035] The dimensions and the reciprocal positioning and orientation of the devices described above must naturally be chosen so that said thrust of the connecting means 4 against said portion 2A effectively generates a torque on said appendage 20 that works as a pin, but this requirement is easily understood by the expert in the field, and therefore it will not be treated further here; with reference to Fig. 11, it is sufficient in fact to ensure that the thrust "F" that acts on said pin has a direction that does not pass through the centre of said appendage 20, but passes underneath it (as shown in the figures), so as to ensure a counterclockwise rotation.

[0036] In practice, this means that said force "F" must include a component "F1" orthogonal to the line that connects the thrust point of the connecting means 4 with the axis of rotation "X" of the appendage 20, making it rotate counterclockwise.

[0037] And this thrust should continue and remain for the whole desired and necessary angle of rotation; for this purpose, the profile of the surface of said portion 2A must have an outwardly convex curved shape, as will be immediately appreciated when considering the fact that different profiles would not cause a regular rotation of the hook element 2, but instead, at a certain point of the rotation, this hook element would stop.

[0038] In order to enable said rotation of the hook element 2 around the appendage 20, which works as a rotating pin in the lodging portion 21, it is also necessary that the pivot point 5, which allows the rotation of the hook element 2 with respect to the support frame 1, be able to rotate around the same appendage 20.

[0039] In fact, it must be made clear that said hook 2 must be capable of rotating in two different modes and with respect to two different pivot pins;

- in a first mode (Figures 7 and 8), which corresponds to the closure of the door with the toggle-latch operating properly, the hook must rotate around the pivot point 5 with respect to the frame 1 when the connecting means 4 touches one side of the hollow 3 and pushes against it, thus generating a rotation torque generated on said hollow 3 with respect to said pivot point 5;
- in the second mode (Figures 9 and 10), which corresponds again to the closing movement of the door but with an incorrect operation of the toggle-latch, since the hook in this condition is already turned in an engaging position without however being engaged by the connecting means, the whole hook is forced by the connecting means to rotate, but this time the thrust of the connecting means acts not in the hollow 3, but on the outer portion 2A of the hook 2.

[0040] As explained above, by the effect of said thrust and of the position of said thrust acting on the hook 2, the whole body of the hook element 2 is forced to rotate around the appendage 20 and its axis "X" inside the lodging portion 21; consequently, the pivot point 5, too, must turn around said axis "X".

[0041] Thus it is necessary to ensure that such rotation can really take place.

[0042] For this purpose, and with reference to Figures 12, 13 and 14, said hook element is provided with sliding pivots 30, and said support frame is provided with corresponding pivoting means, preferably pivoting seats 31.

[0043] On the basis of the considerations made earlier, said devices must meet the following conditions:

- 1) when the hook element 2 rotates around the pivot point 5, the sliding pivots 30 must be able to turn smoothly and stably in the respective pivoting seats 31 in the frame 1, because in this case both the pivots 30 and the seats 31 are arranged in the same position, that is, in the pivot point 5, as explained above;
- 2) when, on the other hand, the hook element 2 rotates with its appendage 20 in the lodging portion 21, "X" axis, the sliding pivots 30 too must be able to rotate around the same axis "X" and therefore it must be possible to move them with respect to the frame itself.

[0044] Evidently, said two conditions are apparently conflicting, because in one case the pivot pins 30 are stable, even if rotating, with respect to the frame 1, while in the second case they too must rotate with respect to this frame.

[0045] In order to resolve this situation, the frame 1 is also provided with one or two open grooves 32 on said pivot seat 31, which have the shape of an arc of a circle centred on the axis "X".

[0046] These grooves must naturally be continuous with the seats 31, so as to make it possible for the pivot pins 30 to move out of these seats and to enter into and

slide along said grooves 32.

[0047] However, it is also necessary that:

- with a certain position of the hook element 2, said sliding pivots 30 rotate in the respective pivoting seats 31, but without coming out of them;
- with different positions of the hook element 2, shown in Figures 9 and 10, that is, during the phase of rotation around the axis "X", said sliding pivots must be able to come out of the respective seats 31 and slide along the respective grooves 32, so as to allow the whole hook element 2 to rotate around the appendage 2, on the axis "X".

[0048] For this purpose, the head portion of the sliding pivots 30 must be shaped as shown in Figures 12, 13 and 14, that is, in the shape of an extended semicircumference, the minimum transversal dimension "t" of which is substantially smaller than the width "l" of the passage along said grooves 32, but whose diameter "m" is larger than said width, so that when said head portions abut toward the groove 32 with the respective diameter, as in Figures 12 and 13, then, logically, said head portions are prevented from entering into the respective grooves, while when they abut with their minimum dimension "t", as in Fig. 14, then said head portions can move out of the respective grooves 31, thus allowing the rotation of the whole hook element 2 around the axis "X", including the sliding pivot pins 31.

[0049] And summarizing, with a suitable reciprocal configuration of the dimensions, the arrangement and the reciprocal orientation of the described elements, as is also exemplified in the figures, it becomes immediately evident that the proposed embodiment meets abundantly the purposes of the invention.

[0050] However, even with the solution described above, it is still possible that the connecting means 4, during the approach phase to the hook element 2, remains at a position that is still too far from the hook, or that it may never even meet it.

[0051] This situation can occur for various causes, typically due to the lowering of the door caused by external loads or simply by the natural loosening of the hinge supports through their extended use; however, such causes are not relevant to the present part of the invention.

[0052] Thus, to prevent the connecting means 4 from escaping its engagement with the hollow 3 of the hook element 2, and with reference to Figures 9, 10, 12, 15 and 16 on the upper part of said support frame 1, which lies above the hook 2, a bridging element 40 is provided which substantially spans the portion of said hook element 2 at a predefined distance without touching it. The width "c" of the "clearance" of said bridging element 40 from the upper edge 41 of the hollow 3 must be such as to allow, when the hook element is in the open position, a connecting means 4 that comes close to the hook without touching it, to be intercepted by said bridging element 40 so that it automatically enters into said "clearance"

and is then pushed, by the effect of the obstacle represented by the same bridging element, toward the adjacent surface of the hook element 2 so that, in the end, the connecting means is automatically pushed toward and against the hollow 3 of the hook element 2, thus guaranteeing that in such circumstances too the toggle-latch closes properly when the door is closed.

[0053] A further improvement is provided by the fact that said hook element 2 is provided, in the rear area with respect to its engaging hollow 3, with a protruding part 50, as shown in Figures 8-10, of such a size and position that, when the hook element 2 is in the "open" position, as shown in Fig. 7, it comes into contact with and rests against the back face 51 of said bridging element 40, which thus also has the function of "stop" for the rotation of the hook element 2.

[0054] It is here specified that this condition of hook element "open" occurs when the hollow 3 of the hook element 2 is detached from the connecting means 4, and the hollow 3 of the hook element 2 is completely turned toward the connecting means.

Claims

1. Door locking mechanism, preferably mounted in the thickness of the front door of a dish-washing machine, and able to be selectively engaged/disengaged to connecting means preferably arranged on the stationary part of said machine, and comprising a knee-toggle articulated mechanism with:

- a supporting frame (1) solidly arranged on said door,
- an hook element (2) pivoted and rotating on a first pin (5) with respect to said support frame (1), and provided with a suitable engaging hollow (3) oriented towards said connecting means (4),
- a knee-toggle arm (10) provided with a first end on which a second pin (6) is rotatably engaged to said supporting frame,
- an elastic means (9), preferably implemented as a spiral spring, able to be stretched from its resting status, and whose first end is mounted to a point (8) of said hook element (2), and whose opposed end is able to be connected to the second end (7) of said knee-toggle arm (10),

characterized in that said hook element (2) is provided with a protruding appendix (20) arranged in the portion, with respect to said engaging hollow (3) of said hook element (2), which is situated on the opposite part of the position of said connecting means (4),

- and **in that** said supporting frame (1) is provided with a lodging portion (21) able of lodging on a definite rotation axis (Z) said protruding appendix (20).

2. Door locking mechanism according to claim 1, **characterized in that** said hook element (2) is provided, on its side to said engaging means (4), and arranged closer to it than the related engaging hollow (3), of an outer portion (2A):

- able to be engaged, during the closing motion of said door, by said engaging means (4),
- and provided with a shape as, while said closing motion, said hook element (2) is forced to rotate about said protruding appendix (20) which rotates inside said lodging (21).

3. Door locking mechanism according to claim 2, **characterized in that** said outer portion (2A) shows a shape which is arched and mainly convex to said engaging means (4).

4. Door locking mechanism according to claim 3, **characterized in that**

- said hook element (2) is provided with sliding pivots (30),
- and **in that** said support frame is provided with pivoting means, preferably pivoting seats (31) and with one or more grooves (32) open on said pivoting means and able of allowing, under pre-defined conditions, the rotation of said sliding pivots (30) inside said cavities, or selectively the slipping of said sliding pivots (30) along said grooves (32).-

5. Door locking mechanism according to claim 4, **characterized in that** said sliding pins (30) are so shaped that:

- in a first definite position of said knee-toggle, they are rotatable with respect to said pivoting seats (31), but remain engaged inside them,
- in further definite and different positions of said hook element (2), they are able of running inside said grooves (32).

6. Door locking mechanism according to claim 4, **characterized in that** said sliding pivots are provided with respective heads formed as a cylinder having a semi-circular cross section whose minimum cross size (t) is basically smaller than the width (l) of the passage along said grooves (32), but whose diameter (m) is larger than said width.

7. Door locking mechanism according to claim 5, **characterized in that** said different and definite positions of said hook element (2) correspond to those wherein said engaging means (4) touches and forces said outer portion (2A) of said hook element (2).

8. Door locking mechanism according to any of the pre-

vious claims, **characterized in that** said hook element (2), said knee-toggle arm (10) and said elastic means are able of taking two end positions, wherein

- in the first position, the line connecting said first pin (5) of said hook element (2) with said second pin (6) of said knee-toggle, crosses the line connecting said point (8) of said hook element (2), on which an end of said elastic means is secured, to said second end (7) of said knee-toggle to which the other end of said elastic means (9) is secured, 5
- and, in the second position, the line connecting said first pin (5) of said hook element (2) with said second pin (6) of said knee-toggle, rests outside, without touching it, of the line connecting said portion (8) of said hook element (2) on which an end of said elastic means is fastened, to said second end (7) of said knee-toggle. 10

9. Door locking mechanism according to any previous claim, **characterized in that**, solidly to said support frame (1), a bridging element (40) is arranged, which substantially covers at a pre-defined distance, without touching it the portion of said hook element (2) comprising said engaging hollow (3). 15

10. Door locking mechanism according to any previous claim, **characterized in that** said hook element (2) is provided, in its rear side with respect to said engaging hollow, with a protruding part (50) able of being pushed by the back side (51) of said bridging element when said engaging hollow (3) of said hook element (2) and said connecting means (4) are disengaged and said appendix (20) is extracted from the respective said lodging (21). 20

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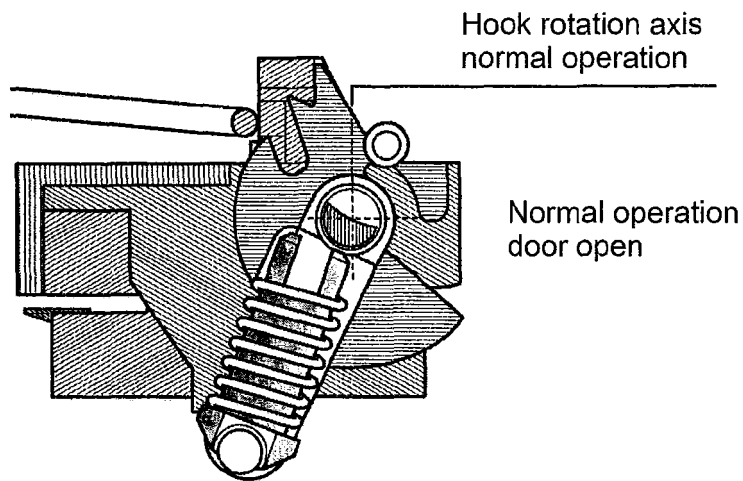


Fig.1

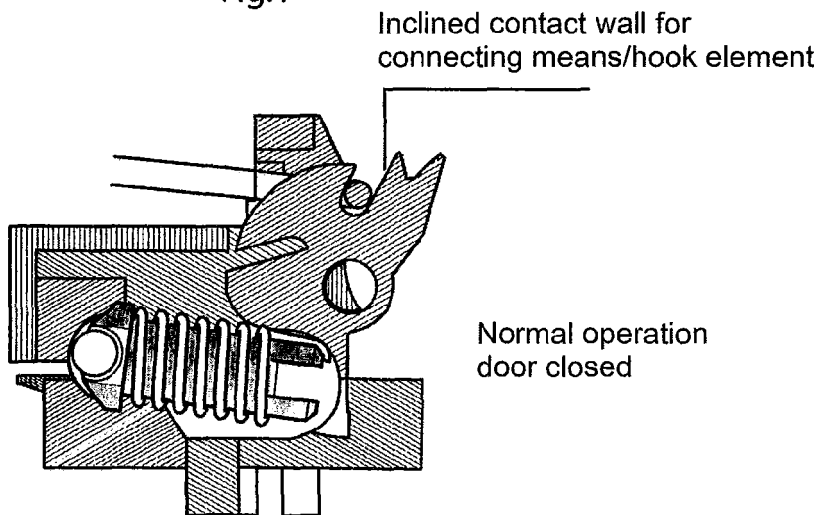


Fig.2

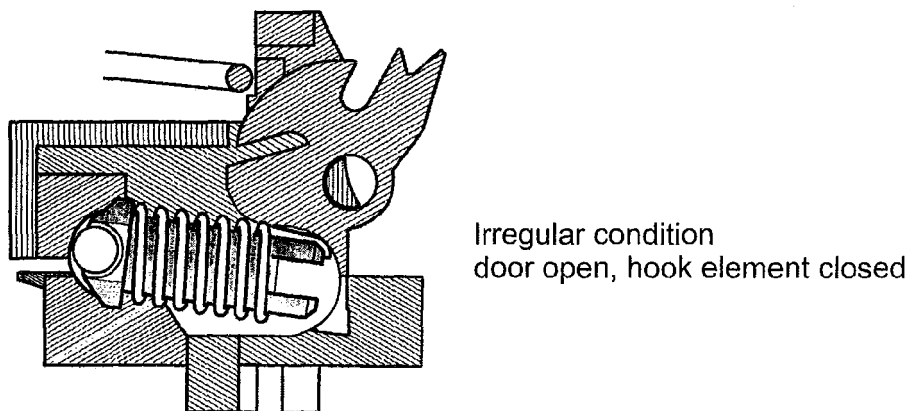


Fig.3

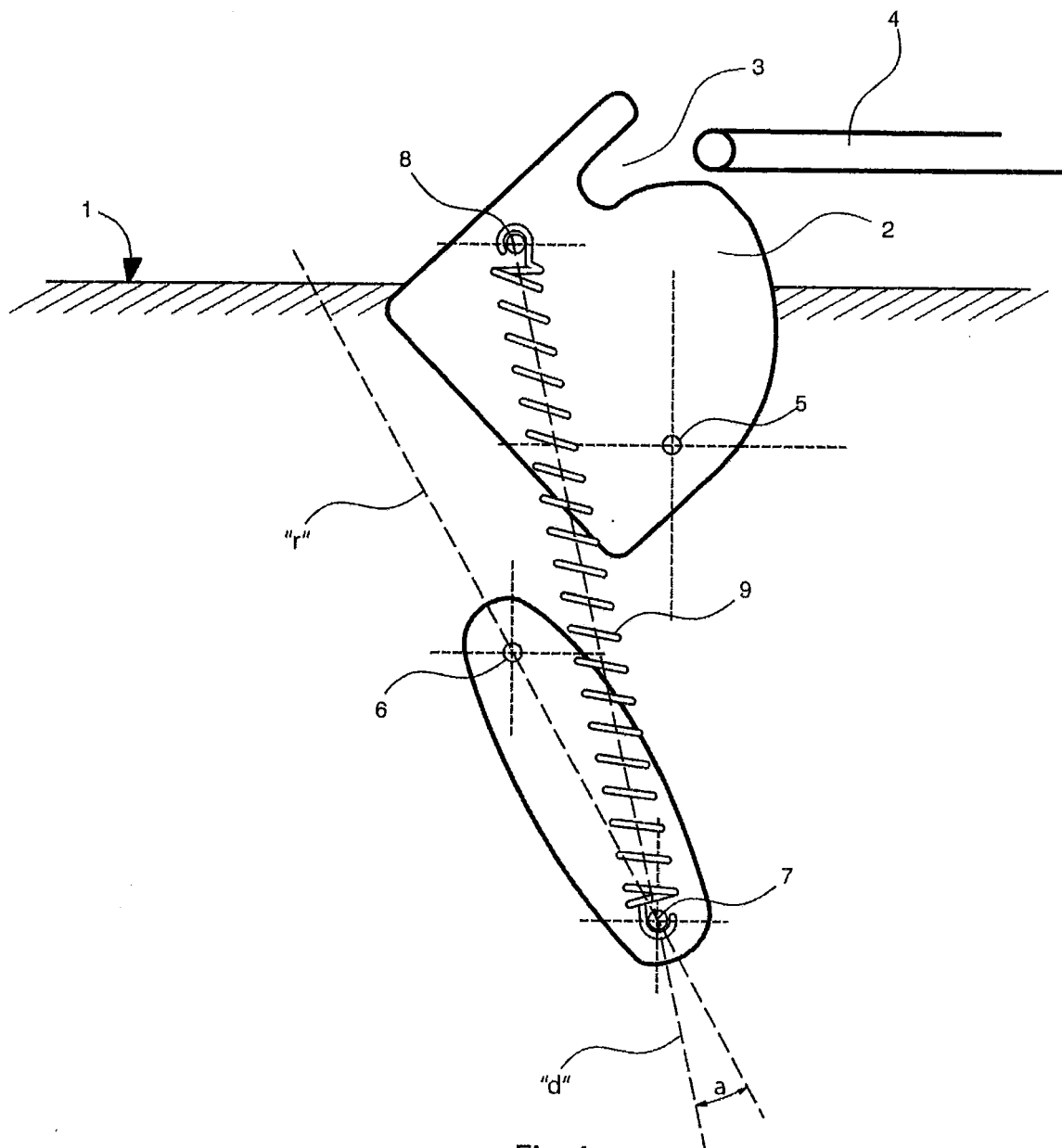


Fig.4

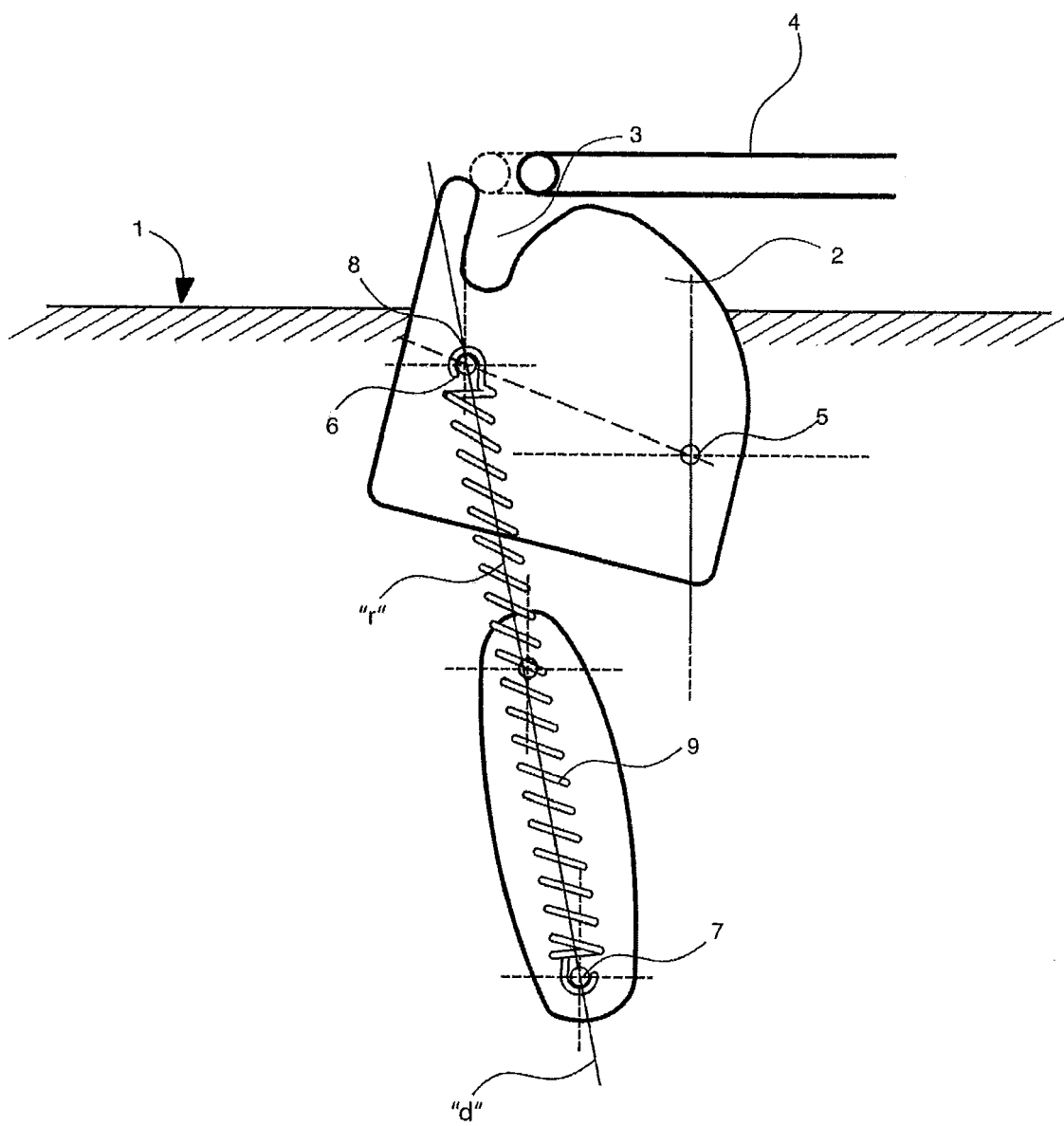


Fig.5

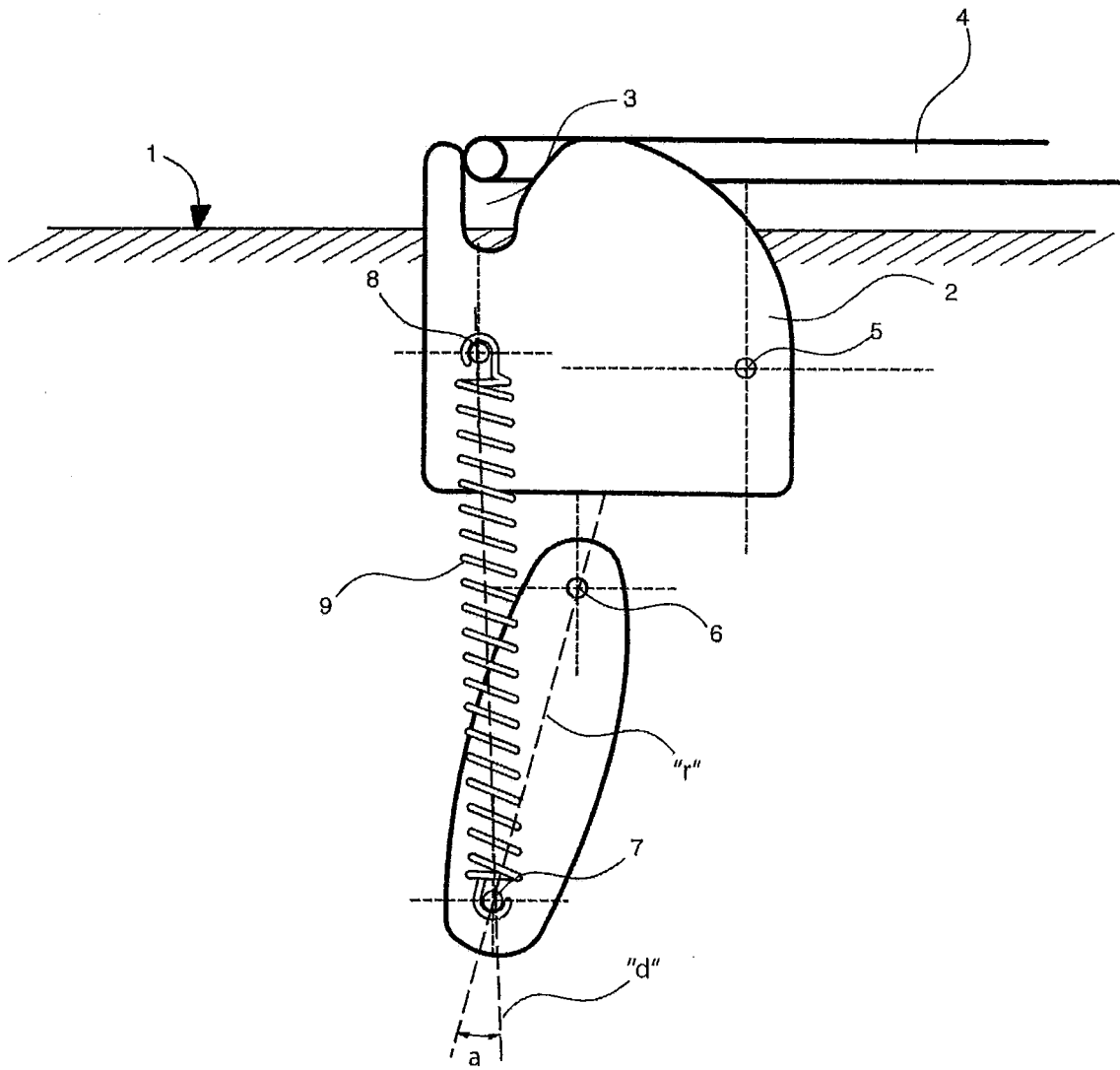


Fig.6

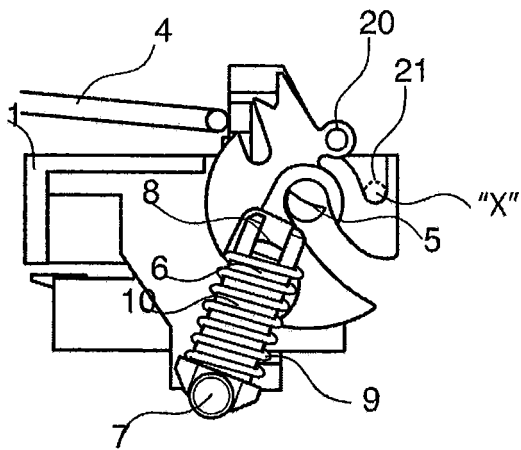


Fig.7

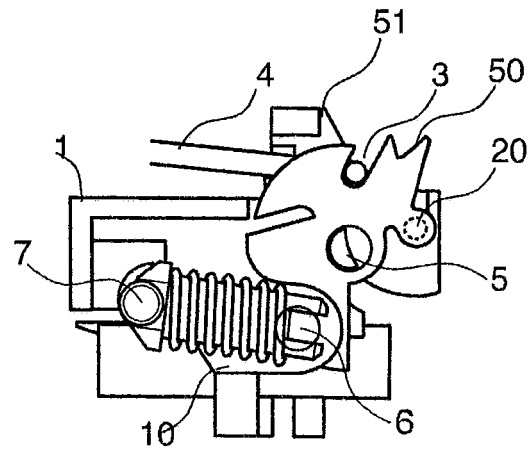


Fig.8

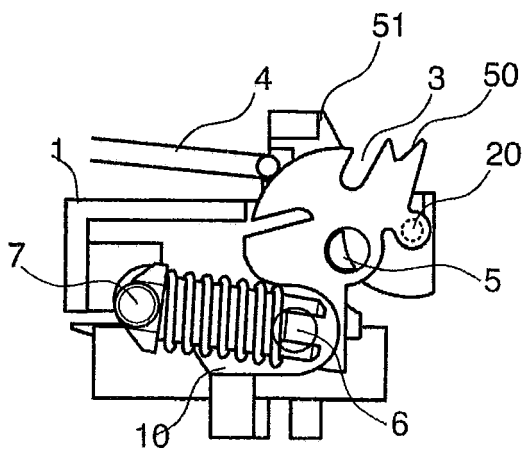


Fig.9

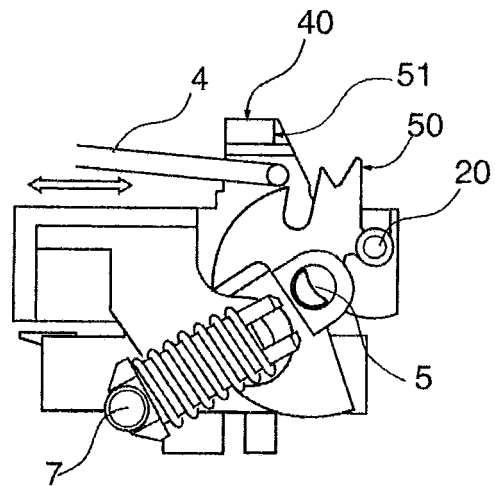


Fig.10

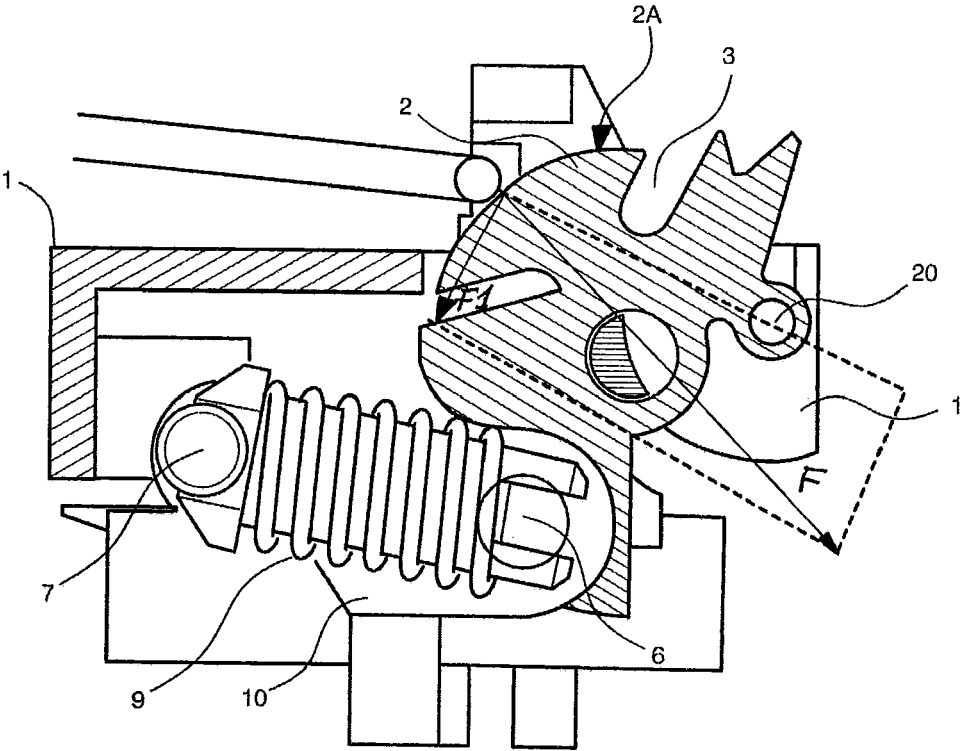


Fig.11

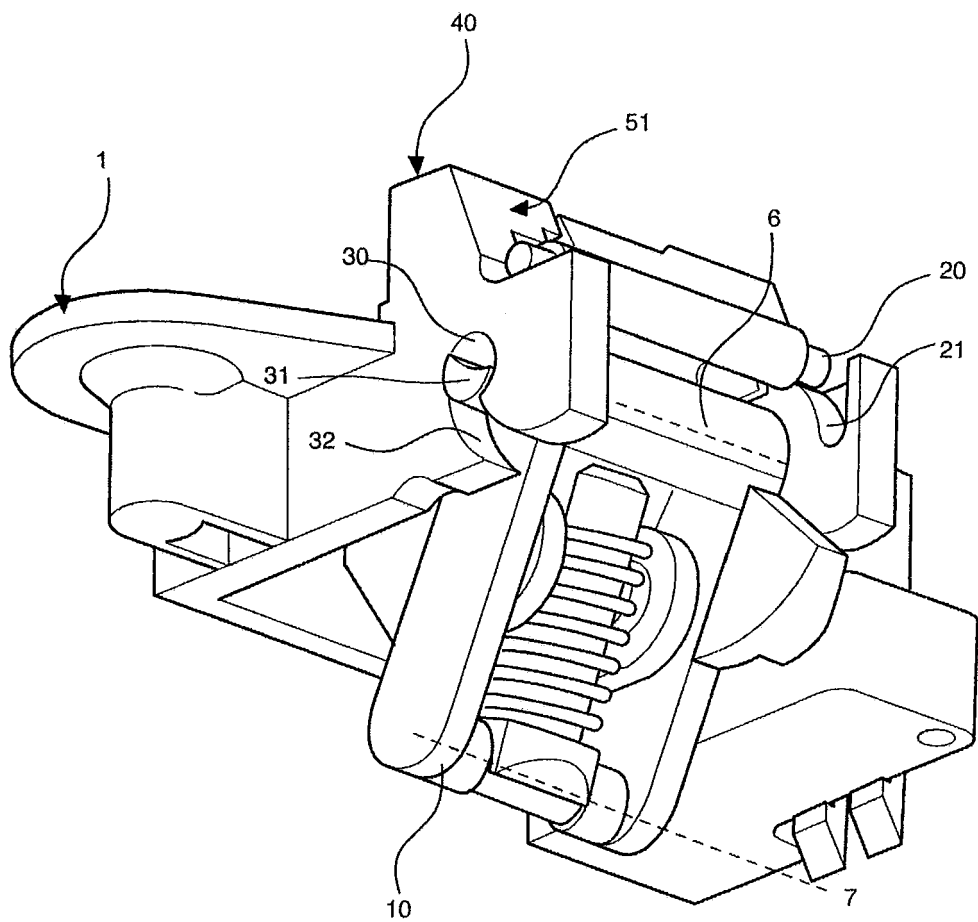


Fig. 12

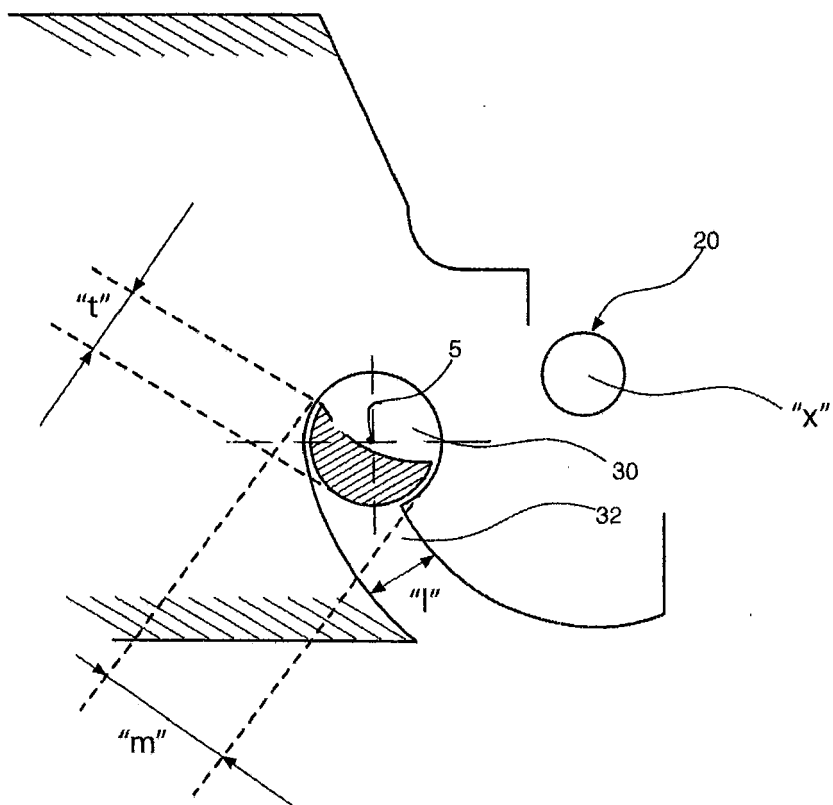


Fig.13

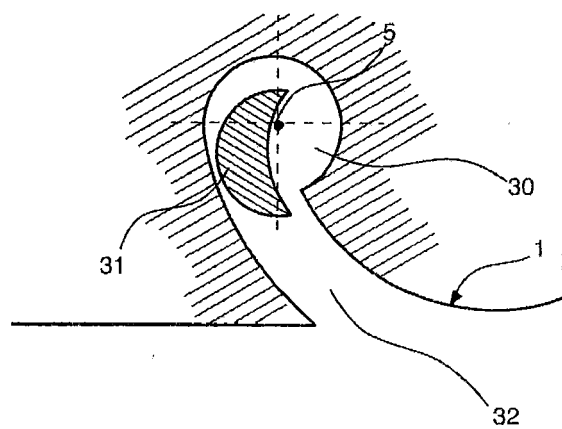


Fig.14

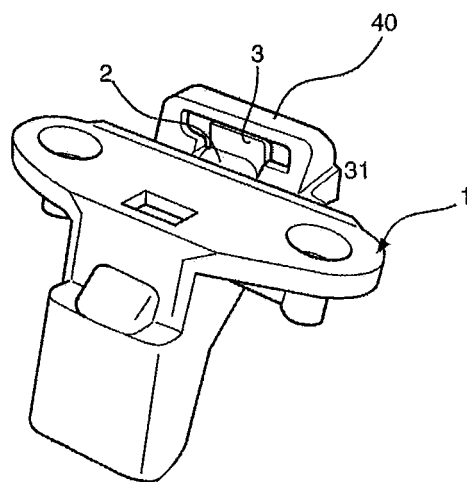


Fig.15

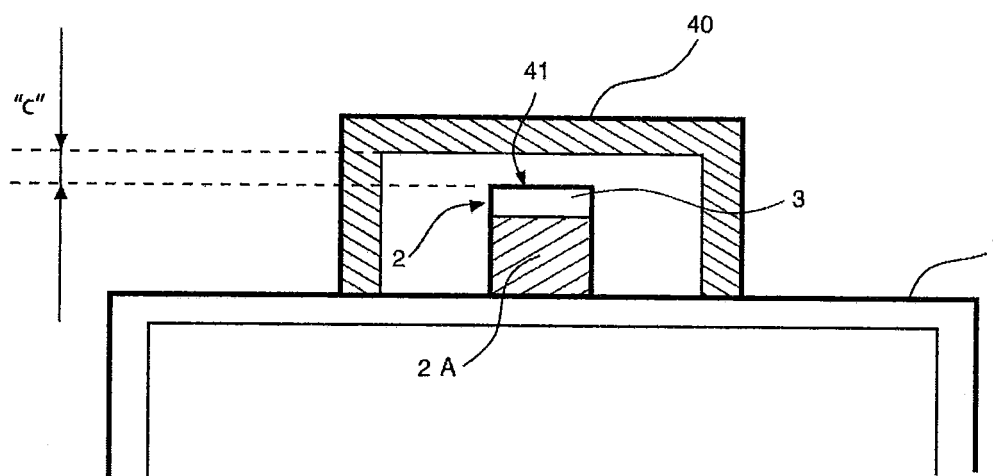


Fig.16



EUROPEAN SEARCH REPORT

Application Number
EP 11 19 5484

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 3 506 292 A (HAGENDOORN WILLEM J ET AL) 14 April 1970 (1970-04-14)	1-4,8-10	INV. A47L15/42 E05C19/02
A	* the whole document *	5-7	
A	DE 11 27 748 B (SIEVERS FA CARL) 12 April 1962 (1962-04-12)	1-10	
A	GB 942 906 A (LEWIN GUNNAR ERIK WERNER) 27 November 1963 (1963-11-27)	1-10	
A	EP 1 597 998 A2 (LG ELECTRONICS INC [KR]) 23 November 2005 (2005-11-23)	1-10	
	* paragraphs [0019] - [0027] *		
			TECHNICAL FIELDS SEARCHED (IPC)
			A47L E05C D06F F24C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 February 2012	Examiner Martin Gonzalez, G
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			

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EPO FORM 1503 03.82 (P04C01)

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

EP 11 19 5484

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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03-02-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3506292	A	14-04-1970	NONE
DE 1127748	B	12-04-1962	NONE
GB 942906	A	27-11-1963	GB 942906 A 27-11-1963
		SE 310854 B	12-05-1969
EP 1597998	A2	23-11-2005	EP 1597998 A2 23-11-2005
		KR 20050110921 A	24-11-2005
		US 2005285412 A1	29-12-2005

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 0917853 B1 [0007] [0018] [0023]
- IT PN930021 U [0007]