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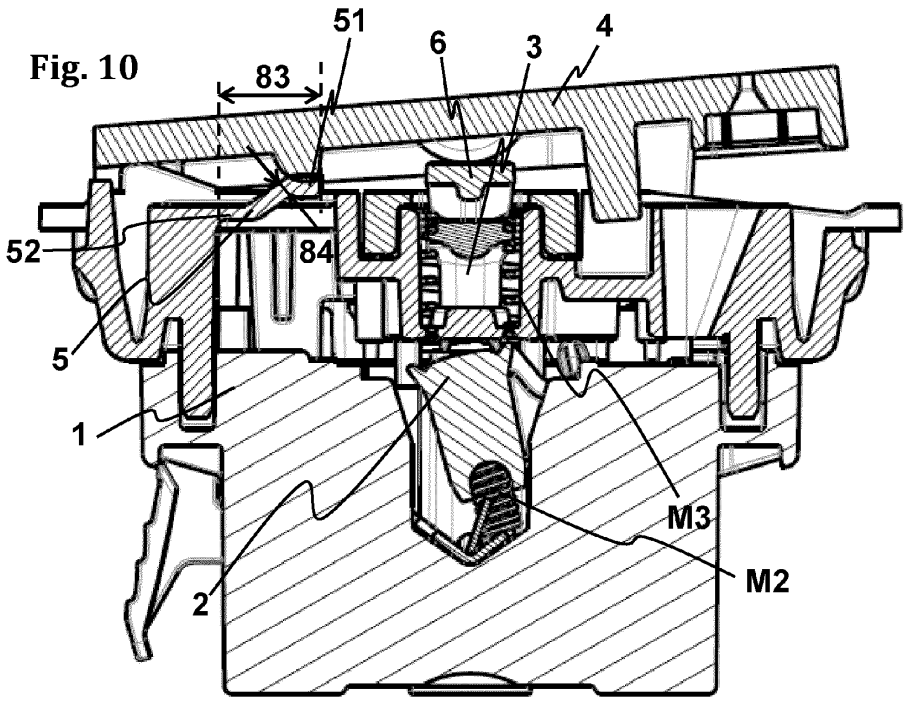
(54) **SWITCH**

(57) The present invention relates to a switch (S), comprising a base (1), a rocker arm (2) provided with a spring (M2), a striker (3) sliding with respect to the base (1) and also provided with a spring (M3), a button (4) for pressing the striker (3), such that the following intervals are defined:
a) a first interval (11) wherein the button (4) presses and moves the striker (3) such that the spring (M3) of the striker (3) is compressed;
b) a second interval (12) wherein the button (4) presses and causes the striker (3) to move such that the spring (M3) of the striker (3) is compressed and the rocker arm (2) rotates, causing the spring (M2) to be compressed;
the switch comprising an elastic element (5) arranged between the base (1) and the button (4), the elastic force of which is added to the forces exerted by the spring (M3) increasing the force applied to the button (4).

Fig. 10



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Description

TECHNICAL FIELD

[0001] The present invention relates to a switch, which may comprise a push button, the technical features of which provide an optimal sensation of progressive actuation force for the user.

BACKGROUND

[0002] Switches are known that are provided with:

- a base;
- a rocker arm articulated according to an axis with the base, the rocker arm being provided with a spring;
- a striker sliding with respect to the base and arranged to act on the rocker arm, the striker being provided with a spring;
- a button arranged to press the striker;

such that the following actuation intervals are defined:

a) a first interval wherein the button presses and causes the striker to move such that the spring of the striker is compressed, the first interval ending at the moment in which the striker comes into contact with the rocker arm;
b) a second interval wherein the button presses and causes the striker to move such that the spring of the striker is compressed and the rocker arm rotates, causing the spring of the rocker arm to be compressed.

[0003] In these switches, when the button is actuated a rotation of the rocker arm is achieved which causes a change in the state of the electrical contact of the switch, for example, causes a change from an electrical disconnected state to an electrical connected state and/or vice versa.

[0004] Figure 2, notwithstanding that it illustrates parts of a switch in accordance with the present invention, illustrates a portion of a switch of the state of the art. In this figure, the button and actuation tab have been removed to show the upper portion of the base 1. In addition, in the upper central portion of the base 1, the position occupied by the striker 3 and the spring M3 of the striker 3 inside the base 1 has been highlighted. The button is arranged such that, when pressed by a user, it moves and simultaneously presses an actuation tab which in turn presses the striker 3, causing the striker 3 to lower so as to cause the rocker arm 2 to rotate.

[0005] Figures 3 and 4 illustrate the relative position between the striker 3 and the rocker arm 2. As explained below, the configuration illustrated in Figures 3 and 4 is common to a switch of the state of the art and to some embodiments of a switch according to the present invention. To cause the rocker arm to rotate, the button must be pressed, overcoming certain forces. Specifically, the button is subjected to one of the evolutions of force represented in Figure 5.

[0006] Figure 5 shows a graph representing two examples of the evolution of the actuation force 103, 104 to which the button 4 of a switch of the state of the art is subjected during an actuation of the switch. The vertical axis of the graphs in Figures 5, 6 and 8 represents the force in Newtons applied to the button 4. The horizontal axis of the graphs in Figures 5, 6 and 8 represents the advance in millimetres of the striker 3. In Figure 5, the first actuation interval 11, the second actuation interval 12 and the transition point P3 between the first actuation interval 11 and the second actuation interval 12 have been marked. In the first actuation interval 11, the striker 3 descends from the position illustrated in Figure 3 to the position illustrated in Figure 4. As shown in Figure 5, the evolution of the actuation force 103 shows a relatively small trend (i.e., variation of force per millimetre advanced or slope) until the end of the first actuation interval 11. The force is mainly due to the fact that the resistance to the compression of the spring M3 of the striker 3 must be overcome. As shown in Figure 5, the force in the first actuation interval 11 is much less than the force in the second actuation interval 12.

[0007] The end of the first actuation interval 11 of the striker 3, the position illustrated in Figure 4, occurs when the striker 3 comes into contact with the rocker arm 2. This contact takes place at the transition point P3. After this contact, if the button is pressed with sufficient force, the second actuation interval 12 takes place. In the second actuation interval 12, the descent of the striker 3 causes a rotational movement of the rocker arm 2 which causes the spring M2 of the rocker arm 2 to be compressed. In other words, in the second actuation interval it is necessary to overcome the compression force of the spring M2 of the rocker arm 2 in addition to the compression force of the spring M3 of the striker 3. Therefore, at the transition point P3, there is a sudden change in the trend of the evolution of the actuation force 103 due to the fact that the force required to compress the spring M2 of the rocker arm 2 is higher, and sometimes much higher, than the force required to compress the spring M3 of the striker 3. Figure 8 shows that, at the transition point P3 of the evolution of the actuation force 101, a slope of approximately 0.5 N/mm changes to a slope of approximately 7 N/mm, that is, suddenly the slope multiplies by approximately fourteen.

[0008] Figures 12 and 13, notwithstanding that they illustrate parts of a switch in accordance with the present invention, respectively illustrate a switch of the state of the art wherein the button has been removed and a cross section of the switch of the state of the art with the button mounted. The switch is provided with an actuation tab 6 arranged between the striker 3 and the button (not visible in Figure 12), such that when the button 4 is actuated, the button 4 presses the actuation tab 6. This pressure

is transferred by the actuation tab 6 to the striker 3, such that the striker 3 descends. The actuation tab 6 comprises a narrowing 63 that serves as an articulation, such that the actuation tab behaves like a hinge, the axis of rotation of which passes through the narrowing 63. Since the narrowing 63 is very pronounced, little force is required to bend the actuation tab 6 around the articulation, which enables the actuation tab 6 to bend with hardly any force when the button is actuated. Therefore, the force that opposes the actuation tongue 6 when the button is actuated both in the first actuation interval 11 and in the second actuation interval 12 is negligible with respect to the force offered by the spring M3 of the striker 3. In fact, once the button 4 is released after having been actuated, the actuation tongue 6 needs the elastic force of the spring M3 of the striker 3 to regain its position. That is to say, the force per se of the actuation tab 6 itself does not enable the actuation tab 6 to regain its original position, that is, the position thereof in which the button 4 is not actuated.

[0009] Due to this evolution of the actuation force, the user experiences the abrupt change in the trend of the evolution of the actuation force 103. In order to achieve a more ergonomic switch, it would be desirable to make the evolution of the actuation force 103 as close as possible to the force trend 0 represented in Figure 6.

DESCRIPTION OF THE INVENTION

[0010] To overcome the drawbacks of the state of the art, the present invention proposes a switch, comprising:

- a base;
- a rocker arm articulated according to an axis with the base, the rocker arm being provided with a spring;
- a striker sliding with respect to the base and arranged to act on the rocker arm, the striker being provided with a spring;
- a button arranged to press the striker;

such that the following actuation intervals are defined:

a) a first interval wherein the button presses and causes the striker to move such that the spring of the striker is compressed, the first interval ending at the moment in which the striker comes into contact with the rocker arm;

b) a second interval wherein the button presses and causes the striker to move such that the spring of the striker is compressed and the rocker arm rotates, causing the spring of the rocker arm to be compressed;

the switch comprising an elastic element arranged between the base and the button and in direct or indirect contact with both during the first and second intervals, such that the elastic force of the elastic element is added to the forces exerted by the spring of the striker and the spring of the rocker arm increasing the force applied to the button.

[0011] In this way, the elastic force of the elastic element is added to the forces exerted by the spring of the striker and by the spring of the rocker arm, reducing the abruptness of the change in slope produced in the transition from the first actuation interval to the second actuation interval. Figure 8 schematically represents a comparison between the evolution of the actuation force in a switch devoid of the elastic element and the evolution of the actuation force in a switch provided with the elastic element.

[0012] As shown in Figure 8, at the transition point of the evolution of the actuation force of the switch of the state of the art, a slope of approximately 0.5 N/mm changes to a slope of approximately 7 N/mm, that is, suddenly the slope multiplies by approximately fourteen. However, the evolution of the actuation force of the switch according to the present invention changes from a slope of approximately 1.5 N/mm to a slope of approximately 7 N/mm, that is, the slope is multiplied by approximately 4.8, thus minimising the suddenness of the change in trend of the force.

[0013] As indicated above, the elastic element is arranged between the base and the button and is in direct or indirect contact with the base and with the button during the first and second intervals. That is, the elastic element can be in direct contact with the button and with the base, in direct contact with the button and in indirect contact with the base, in indirect contact with the button and in direct contact with the base, or in indirect contact with the button and with the base. The expression indirect contact in the context of indirect contact between the button and the elastic element and in the context of indirect contact between the base and the elastic element is used in the present specification to indicate that there is no direct contact with the elastic element, but rather that there is an element other than the base and the button that transmits pressure from the base or the button to the elastic element. This element other than the base and the button can be an element integral with the base or integral with the button. Whether there is direct contact or indirect contact, the elastic element mechanically connects the base and the button during the first and second intervals.

[0014] In some embodiments, in the first actuation interval, a sum of an elastic force of the elastic element and an elastic force of the spring of the striker is applied to the button, wherein the elastic force of the elastic element is greater than the elastic force of the spring of the striker.

[0015] In some embodiments, the switch comprises an actuation tab having one end attached to the base and the free end of which is interposed between the button and the striker. In these embodiments, a sum of an elastic force of the spring of the striker, an elastic force of the elastic element and a force of the actuation tab is applied

to the button, wherein the force of the actuation tab is less than the elastic force of the spring of the striker and less than the elastic force of the elastic element. In some of these embodiments, the force of the actuation tab is negligible compared to the elastic force of the spring of the striker and the elastic force of the elastic element.

[0016] In some embodiments, the button is arranged such that it is provided with a first region for pressing the striker and with a second region different from the first region for pressing the elastic element. In some of these embodiments, the switch is provided with an actuation tab arranged between the first region of the button and the striker such that the actuation tab transfers pressure from the first region of the button to the striker, that is, the button presses the striker through an actuation tab.

[0017] In some embodiments, in the second actuation interval, a sum of an elastic force of the elastic element, an elastic force of the spring of the striker, and an elastic force of the spring of the rocker arm is applied to the button, wherein the elastic force of the spring of the rocker arm is greater than the elastic force of the spring of the striker and the elastic force of the elastic element.

[0018] In some embodiments, the elastic element is attached at one end to the base, such that the other end thereof is free and is in contact with the button. This elastic element is versatile because it adapts to different buttons. By having a free end not attached to the button, the button can be assembled to/disassembled from the switch without the need for specific assembly/disassembly of the elastic element. Furthermore, this elastic element enables the absorption of the compression force by deformation, mainly by deformation of the free end, thus minimising the force transferred to the base.

[0019] In some embodiments, the base has an upper surface, the elastic element being formed by a first section coplanar with the upper surface, a second section parallel to the first section and separated from the upper surface, and a third oblique section for connecting the first and second sections, such that the elastic element protrudes from the upper surface on the side of the latter that faces the button. The elastic element in these embodiments requires little material and is simple to manufacture. It can also be located in a clearance that exists between the button and the base. This clearance is commonly found in many switches of the state of the art, so the design of these switches can be easily adapted to couple with the elastic element without the need to increase the volume occupied by the switch. Furthermore, in this embodiment, the elastic element enables the absorption of considerable compression force by means of deformation of the second section and the oblique section of the elastic element, minimising the force transferred to the base.

[0020] In particular, it enables the gradual distribution of the absorption of force along the second section and the oblique section of the elastic element, such that the force reaching the first section is minimised. In some embodiments wherein the elastic element exerts a preferred elastic force, the angle between the third oblique section and the first section is at least 25° and at most 45°.

[0021] In some embodiments, the elastic element is a tab. The tab shape is particularly simple and easy to manufacture.

[0022] In some embodiments, the elastic element is made of metal or plastic. The material of the elastic element can be chosen to achieve the appropriate elastic force for actuating a particular switch.

[0023] In some embodiments, the tab is formed by moulding with the base itself. In this way, the tab can be easily manufactured. In addition, as the tab is moulded to the base, a specific assembly step is not necessary to attach the tab to the base, such that the manufacture of the switch is facilitated.

[0024] In some embodiments, the elastic element is attached at one end to the button, such that the other end thereof is free and is in contact with the base. Preferably in these embodiments, the elastic element is a tab. In this way, it is facilitated that, when the button is actuated, there is a greater deformation of the end in contact with the base than of the end connected to the button. In addition, this elastic element is versatile because it adapts to different bases. By having a free end not attached to the base, the button can be assembled to/disassembled from the base without the need for specific assembly/disassembly of the elastic element. Furthermore, this elastic element enables the absorption of the compression force by means of deformation, mainly by deformation of the free end, minimising the force transferred by the elastic element to the button.

[0025] In some embodiments wherein the elastic element is a tab, the length of the tab is at least 4 mm and at most 10 mm, the thickness of the tab is at least 0.5 mm and at most 2 mm, the width of the attachment end of the tab to the base is at least 2 mm and at most 7 mm, the width of the free end of the tab is at least 2.3 mm and at most 2.7 mm. The length of the tab refers to the length of the tab in a state in which the tab has not been elastically deformed due to the movement of the button. These dimensions of the tab are advantageous because they enable the tab to take up little space, require little manufacturing material, and provide the necessary force to reduce the abruptness of the change in trend of the force.

[0026] In some embodiments, wherein the elastic element is a tab, the length of the tab is at least 6.13 mm and at most 6.17 mm, the thickness of the tab is at least 0.8 mm and at most 1 mm, the width of the attachment end of the tab with the base is at least 4.3 mm and at most 4.7 mm and the width of the free end of the tongue is at least 2.3 mm and at most 2.7 mm. These dimensions of the tab are advantageous because they enable the tab to take up little space, require little manufacturing material, and provide the desired force to reduce the abruptness of the change in trend of the force.

[0027] In some embodiments, the relative movement between the button and the base is achieved by means

of an articulation such that the button rotates about an axis with respect to the base. In some of these embodiments, the button and the base are articulated by means of an articulation, such that the button is tiltable according to an axis, for example a lateral axis. In these embodiments, if a user presses the button to actuate it, it will generate a rotation torque that the elastic element opposes. The elastic element can be arranged such that it acts on the appropriate portion of the button to generate the desired torque. For example, by locating the elastic element at a greater distance from the tilt axis, it is possible to increase the torque generated by the elastic element and therefore the slope of the evolution of force increases according to the formula:

$$\bar{\tau} = \bar{F} x \bar{d}$$

wherein:

$\bar{\tau}$ is the resistance torque generated by the elastic element;
$\bar{F}$ is the elastic force of the elastic element, represented as a vector;
$\bar{d}$ is the distance between the elastic element and the tilt axis, represented as a vector.

[0028] In some embodiments, the relative movement between the button and the base is achieved by means of a one-way attachment, for example a guide, between the button and the base. For example, the button can rest on one or more points of the base while the button is not being pressed. This support is maintained by the action of an elastic element. By pressing the button, the button is separated from at least one of the support points, the entire button moving and/or rotating with respect to another of the support points.

[0029] In some embodiments, wherein the button is tiltable with respect to a lateral axis, the striker is arranged under a central area of the button, the elastic element being arranged between the lateral axis and the striker. This location of the elastic element is advantageous for minimising the deformation to which the elastic element is subjected upon actuation of the button. In the tilting of the button, portions of the button closer to the tilting axis move less than portions further away. Therefore, by locating the elastic element closer to the tilting axis, it facilitates the elastic element coming into contact and being pressed by a portion of the button closer to the tilting axis and therefore less deformed.

[0030] In some embodiments, the elastic element is arranged in a central third of the section running from the lateral axis to the striker.

[0031] In some embodiments, the elastic element is arranged such that in the first actuation interval it applies an increasing elastic force on the button and in the second actuation interval it applies an approximately constant force on the button. In this way, the growth of the elastic force of the elastic element is reduced in the second actuation interval, allowing the increase in force caused by the elastic element in the second actuation interval to be minimised. In particular, in the first actuation interval a mean growth rate of the elastic force of the elastic element can be achieved that is higher than the mean growth rate of the elastic force of the elastic element in the second actuation interval. In the context of these embodiments, the mean growth rate of the force in an actuation interval is understood to be the total increase of said force in said interval divided by the advance of the striker in said interval.

[0032] In some embodiments, the switch comprises a piece coupled to the base and arranged between the button and the base, the actuation tab being an integral part of this piece. In this way, the piece attaches one end of the tab to the base. In some of these embodiments, the piece is inserted into a hole in the base.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] As a complement to the description, and for the purpose of helping to make the features of the invention more readily understandable, in accordance with preferred practical exemplary embodiments of the switch of the invention, said description is accompanied by a set of figures which, by way of illustration and not limitation, represent the following:

Figure 1 is a perspective view of the switch, assembled.

Figure 2 shows the base of a switch of the state of the art, the striker that acts as an intermediate element between the button and the rocker arm (not visible in this view) and the spring of the striker, which stresses it in the direction of the button, in this case upwards.

Figure 3 shows an enlargement corresponding to the meeting area between the rocker arm and the striker, at a time when the striker is still far from the rocker arm, that is, it corresponds to the beginning of the first actuation interval.

Figure 4 is similar to Figure 3, but corresponds to the moment in which the striker comes into contact with the rocker arm.

Figure 5 shows real measurements of the resistance force offered by the switch (of the state of the art) to a user.

Figure 6 is similar to Figure 5, but the force-travel behaviour of the target or ideal button has been added.

Figures 7 and 8 show the effect of the claimed solu-

tion on the force-travel behaviour graph.

Figure 9 shows a switch according to a preferred embodiment of the invention.

Figure 10 shows a cross section of the switch according to an embodiment of the invention.

Figure 11 shows a portion of a switch according to a preferred embodiment of the invention.

Figure 12 shows a switch of the state of the art comprising an actuation tab.

Figure 13 shows a cross section of a cut of a switch of the state of the art comprising an actuation tab.

Figure 14 shows a perspective cross section of the inside of the switch.

Figure 15 shows a switch according to an embodiment of the invention.

Figure 16 shows the effect of the claimed solution on the force-travel behaviour graph.

DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

[0034] In the description of the possible preferred embodiments of the invention, it is necessary to give numerous details to enable a better understanding of the invention. Even so, it will be apparent to the person skilled in the art that the invention can be implemented without these specific details. Furthermore, the well-known features have not been described in detail to avoid unnecessarily complicating the description.

[0035] As shown in Figure 14, according to one embodiment, the invention relates to a switch S, comprising:

- a base 1;
- a rocker arm 2 articulated according to an axis with the base 1, the rocker arm 2 being provided with a spring M2 (not visible in Figure 14);
- a striker 3 sliding with respect to the base 1 and arranged to act on the rocker arm 2, the striker 3 being provided with a spring M3;
- a button 4 arranged to press the striker 3;

such that the following actuation intervals are defined:

a) a first actuation interval 11 wherein the button 4 presses and causes the striker 3 to move such that the spring M3 of the striker 3 is compressed, the first actuation interval ending at the moment in which the striker 3 comes into contact with the rocker arm 2;
b) a second actuation interval 12 wherein the button 4 presses and causes the striker 3 to move such that the spring M3 of the striker 3 is compressed and the rocker arm 2 rotates, causing the spring M2 of the rocker arm 2 to be compressed.

[0036] According to the invention, the switch comprises an elastic element 5 arranged between the base 1 and the button 4 and in direct or indirect contact with both during the first actuation interval 11 and second actuation interval 12, such that the elastic force of the elastic element 5 is added to the forces exerted by the spring M3 of the striker 3 and the spring M2 of the rocker arm 2 increasing the force applied to the button 4. In this way, as shown in Figure 8, the elastic element 5 enables an evolution of force similar to the evolution of force represented by the evolution of the actuation force 101 in the graph of Figure 8 to change to a more ergonomic evolution of force, similar to the evolution of force represented by the evolution of the actuation force 102.

[0037] In some embodiments (not shown in the figures), the elastic element 5 can be arranged between the button 4 and the striker 3, such that when the button 4 is actuated, the elastic element 5 presses the striker 3. However, it is preferable for the striker 3 not to be pressed by the elastic element 5. In this way, it enables, even if the elastic element 5 stops operating correctly (for example, due to a breakage of the elastic element 5), the actuation of the button 4 to cause the expected rotation of the rocker arm 2. As shown in Figures 9, 10, 14 and 15, the elastic element 5 is preferably arranged separated from the striker 3 so that it does not transmit force between the button 4 and the striker 3 during the first and second actuation intervals.

[0038] As shown in Figure 14, the button 4 can comprise a pusher 9 (for example, a projection of the button 4) arranged to come into contact with the free end 51 of the elastic element 5 upon actuation of the button 4. However, in some embodiments (not shown in the figures) wherein the elastic element 5 is attached at one end to the button 4, such that the other end thereof is free, the base 1 can comprise a pusher (for example, a projection of the base 1) that comes into contact with the free end of the elastic element 5.

[0039] Figure 14 illustrates a button 4 arranged on the elastic element 5 and on the striker 3. An actuation tab 6 can be arranged between the striker 3 and the button 4, such that upon actuating the button 4, a movement of the actuation tab 6 is caused which causes the striker 3 to move towards the rocker arm 2. Furthermore, the switch S comprises an electrical contact CM.

[0040] The first actuation interval 11 takes place in a first actuation stage of the button 4, wherein the striker 3 descends from the position illustrated in Figure 3 to the position illustrated in Figure 4. In the position illustrated in Figure 4, the striker 3 comes into contact with the rocker arm 2. In the first actuation stage, the striker 3 is subjected to the portion of the evolution of force 102 of the first actuation interval 11. The first actuation interval 11 ends at the contact between the striker 3 and the rocker arm

2 and gives way to a transition point P3 between the first actuation interval 11 and the second actuation interval 12. At this transition point P3 a change takes place in the trend of the evolution of the actuation force 102; however, this change is not as marked as in the switches of the state of the art.

[0041] In the particular example shown, the slope of the evolution of the actuation force 102 changes from being approximately 1.5 N/mm to approximately 7 N/mm, that is, the slope is multiplied by approximately 4.8, thus minimising the abruptness of the change in trend of the force. Furthermore, as shown in Figure 7, the switches of the state of the art require 87% of the force peak to be applied in the second actuation interval 12. However, the switches of the present invention require a smaller percentage to be carried out in the second actuation interval 12, for example 63% of the corresponding force peak. The vertical axis of the graphs in Figures 5, 6, 7, 8 and 16 represents the force in Newtons applied to the button 4. The horizontal axis of the graphs in Figures 5, 6, 7, 8 and 16 represents the advance in millimetres of the striker 3. As can be seen in these graphs, the second actuation interval ends at a force peak of the evolution of force.

[0042] This minimisation is a consequence of the fact that in the first actuation interval 11 not only must the resistance to compression of the spring M3 of the striker 3 have to be overcome, as in the case of switches of the state of the art, but also the elastic force of the elastic element 5. This can be seen, for example, in Figures 10 and 14, wherein it is shown that the elastic element 5 is arranged in such a way as to offer resistance to the actuation movement of the button 4 in the first actuation interval 11, since it is arranged such that when the button 4 is actuated (for example, it descends), it comes into contact with the elastic element 5 in the first actuation interval 11 causing an elastic deformation of the elastic element 5.

[0043] After starting contact with the rocker arm 2 and continuing to press the button 4 with sufficient force, the striker 3 pushes the rocker arm 2 causing the rocker arm 2 to pivot about the axis with the base 1, and this causes the spring M2 of the rocker arm 2 to compress. As shown in Figure 8, the evolution of the actuation force 102 maintains an approximately constant trend throughout the second actuation interval 12.

[0044] As shown in Figure 7, the slope in the second actuation interval 12 takes practically the same value for the evolution of the actuation force 102 and for the evolution of the actuation force 103 or 104. The reason is that in the second actuation interval 12, the force that the elastic element 5 applies on the button 4 is maintained practically constant, since the deformation of the elastic element 5 is zero or very small. On the contrary, the spring M2 of the rocker arm 2 is compressed as the rocker arm 2 rotates due to the thrust of the striker 3 and therefore the force increases following the illustrated slope.

[0045] In some embodiments, the elastic element 5 can be arranged such that the actuation of the button 4 causes pressure to be initiated on the elastic element 5 before the spring M3 of the striker 3. This embodiment can be advantageous in order to achieve a good adaptation of a large number of switches of the state of the art to the present invention. In particular, there are a large number of switches in which the elastic constant of the spring M3 is very low compared to the elastic constant of the spring M2. For this reason, it is appropriate to add an elastic element 5 with an elastic force much greater than that of the spring M3 and therefore it is advantageous to start the pressure on the elastic element 5 before the spring M3 to minimise or prevent a sudden change in slope within the first actuation interval 11. Furthermore, unlike the state of the art, a change from an actuation start in which hardly any force is exerted (i.e., only the force of the spring M3 of the striker 3 is exerted) to an immediately subsequent actuation stage which requires a much greater force (i.e., the force exerted by the spring M2 of the rocker arm 2) is prevented. Therefore, a change that the user would perceive as abrupt at the beginning of the actuation of the button 4 is prevented.

[0046] As can be seen for example in Figure 10, the elastic element 5 is attached at one end 52 to the base 1, such that the other end 51 thereof is free and is in contact with the button 4. The actuation of the button 4 causes the button 4 to press the elastic element 5, thereby causing the deformation of the elastic element 5. In particular, Figure 10 shows that, in the descent movement of the button 4, the button 4 presses an upper face of the elastic element 5.

[0047] As shown for example in Figure 11, the base 1 has an upper surface 11, the elastic element 5 being formed by a first section 53 coplanar with the upper surface 11, a second section 55 parallel to the first section and separated from the upper surface 11, and a third oblique section 54 for connecting the first section 53 and second section 55, such that the elastic element 5 protrudes from the upper surface 11 on the side of the latter that faces the button 4.

[0048] When the button 4 is actuated, the second section 55 is pressed causing a force on said section in the direction of the arrow 200. The elastic element 5 is subjected to a maximum tension in the second section 55. This tension progressively decreases along the third oblique section 54, reaching a minimum value in the first section 53. The elastic element 5 absorbs this tension by elastically deforming.

[0049] In the embodiments shown, the elastic element 5 is a tab formed by moulding with the base 1 itself. The length 83 of the tab 5 is 6.15 mm +- 0.2 mm, the thickness 84 of the tab 5 is 0.9 mm +- 0.1 mm, the attachment end thereof to the base has a width 82 of 4.5 mm +- 0.2 mm, the width 81 of the free end thereof is 2.5 mm +- 0.2 mm.

[0050] As shown for example in Figure 9, the button 4 (not shown) and the base 1 are articulated by means of an articulation, such that the button is tiltable according to a lateral axis $\Gamma 4$. When the button 4 is actuated causing the button 4 to tilt about the lateral axis $\Gamma 4$, the elastic

element 5 is pressed. In particular, as shown in Figure 11, the section of elastic element 5 subjected to greater tension is located further from the lateral axis Γ4.

[0051] As shown for example in Figure 10, the striker 3 is arranged under a central area of the button 4, the elastic element 5 being arranged between the lateral axis Γ4 and the striker 3.

[0052] As shown in Figure 15, the elastic element 5 is arranged in a central third of the section that goes from the lateral axis Γ4 to the striker 3.

[0053] As shown in Figure 14, the switch comprises a piece 7 coupled to the base and arranged between the button 4 and the base 1.

[0054] As shown in Figure 12, the switch comprises an actuation tab 6 which is arranged transversely with respect to the elastic element 5 and to the longitudinal direction of the base, it has an end 61 attached to the piece 7 and a free end 62 which is interposed between the button 4 and the striker 3.

[0055] As shown in Figure 13, the actuation tab 6 is an integral part of the piece 7 and projects the same through a narrowing 63 of the piece 7.

[0056] Figure 1 illustrates an example of the switch S with the button 4 mounted.

[0057] It can be deduced from Figure 16 that the elastic element 5, the spring M2 of the rocker arm and the spring M3 of the striker can be arranged such that the evolution of force of a switch according to the invention presents a non-zero slope from the start of the movement of the button when actuating the switch.

[0058] In light of this description and figures, the person skilled in the art may understand that the invention has been described according to some preferred embodiments thereof, but that multiple variations may be introduced in said preferred embodiments without detracting from the object of the invention as claimed.

[0059] In this text, the term "comprises" and its derivations (such as "comprising", etc.) should not be understood in an excluding sense. That is, these terms should not be interpreted as excluding the possibility that what is described and defined may include more elements, steps, etc.

Claims

1. A switch (S), comprising:

- a base (1);
- a rocker arm (2) articulated according to an axis with the base (1), the rocker arm (2) being provided with a spring (M2);
- a striker (3) sliding with respect to the base (1) and arranged to act on the rocker arm (2), the striker (3) being provided with a spring (M3);
- a button (4) arranged to press the striker (3);

such that the following actuation intervals are defined:

a) a first interval (11) wherein the button (4) presses and causes the striker (3) to move such that the spring (M3) of the striker (3) is compressed, the first interval ending at the moment in which the striker (3) comes into contact with the rocker arm (2);
b) a second interval (12) wherein the button (4) presses and causes the striker (3) to move such that the spring (M3) of the striker (3) is compressed and the rocker arm (2) rotates, causing the spring (M2) of the rocker arm (2) to be compressed;

characterised in that it comprises an elastic element (5) arranged between the base (1) and the button (4) and in direct or indirect contact with both during the first interval (11) and second interval (12), such that the elastic force of the elastic element (5) is added to the forces exerted by the spring (M3) of the striker (3) and the spring (M2) of the rocker arm (2) increasing the force applied to the button (4).

2. The switch (S) according to claim 1, wherein the elastic element (5) is attached at one end (52) to the base (1), such that the other end (51) thereof is free and is in contact with the button (4).

3. The switch according to claim 2, wherein the base (1) has an upper surface (11), the elastic element (5) being formed by a first section (53) coplanar with the upper surface (11), a second section (55) parallel to the first section and separated from the upper surface (11), and a third oblique section (54) for connecting the first section (53) and second section (55), such that the elastic element (5) protrudes from the upper surface (11) on the side of the latter that faces the button (4).

4. The switch (S) according to any of the preceding claims, wherein the elastic element (5) is a tab.

5. The switch (S) according to any of the preceding claims, wherein the elastic element (5) is made of metal or plastic.

6. The switch (S) according to claim 4 or 5, wherein the elastic element (5) is formed by moulding with the base (1) itself.

7. The switch (S) according to claim 1, wherein the elastic element (5) is attached at one end to the button (4), such that the other end thereof is free and is in contact with the base (1), wherein the elastic element (5) is a tab.

8. The switch according to claim 7, wherein the length

(83) of the tab is at least 4 mm and at most 10 mm, the thickness (84) of the tab is at least 0.5 mm and at most 2 mm, the width (82) of the end of the attachment tab to the base is at least 2 mm and at most 7 mm, the width (81) of the free end of the tab is at least 2.3 mm and at most 2.7 mm.

9. The switch according to claim 8, wherein the length (83) of the tab is 6.15 mm, the thickness (84) of which is 0.9 mm, the width (82) of which at the attachment end thereof to the base is 4.5 mm, the width (81) of which at the free end thereof is 2.5 mm.

10. The switch according to any of the preceding claims, wherein the button (4) and the base (1) are articulated by means of an articulation, such that the button is tiltable according to a lateral axis (Γ4).

11. The switch according to claim 10, wherein the striker (3) is arranged under a central area of the button (4), the elastic element (5) being arranged between the lateral axis (Γ4) and the striker (3).

12. The switch according to claim 10, wherein the elastic element (5) is arranged in a central third of the section that goes from the lateral axis (TT) to the striker (3).

13. The switch according to any of the preceding claims, comprising an actuation tab (6) having one end (61) attached to the base (1) and the free end (62) of which is interposed between the button (4) and the striker (3).

14. The switch according to claim 13, comprising a piece (7) coupled to the base and arranged between the button (4) and the base (1), the actuation tab (6) being an integral part of this piece (7).

15. The switch according to any of the preceding claims, wherein the elastic element (5) is arranged such that in the first actuation interval (11) it applies an increasing elastic force on the button (4) and in the second actuation interval (12) it applies an approximately constant force on the button (4).

Fig. 1

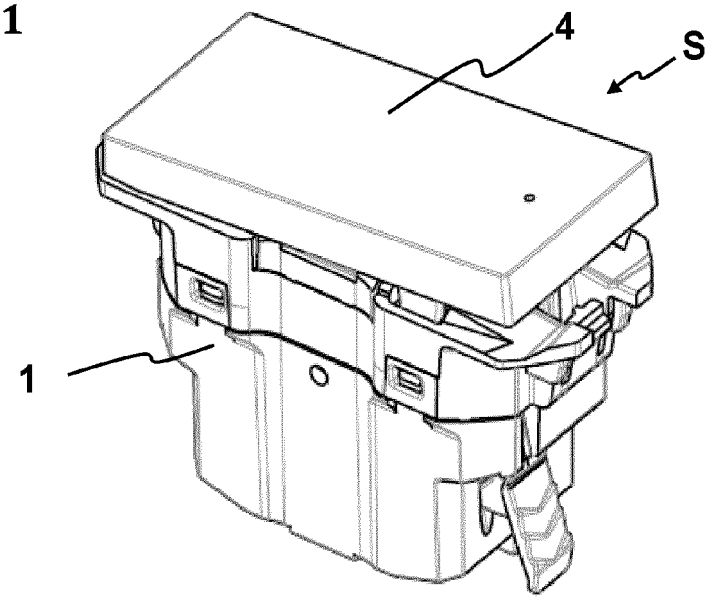


Fig. 2

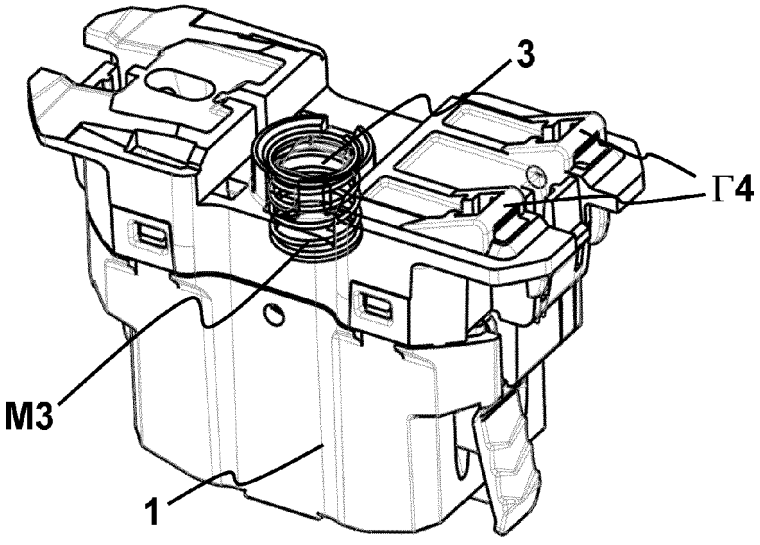


Fig. 3

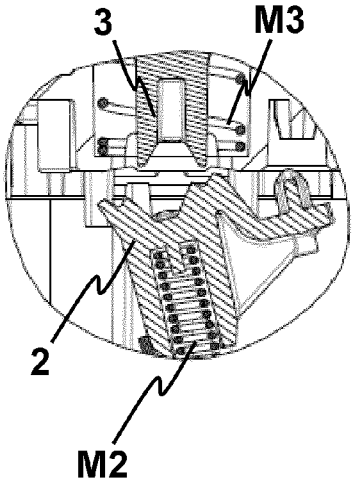


Fig. 4

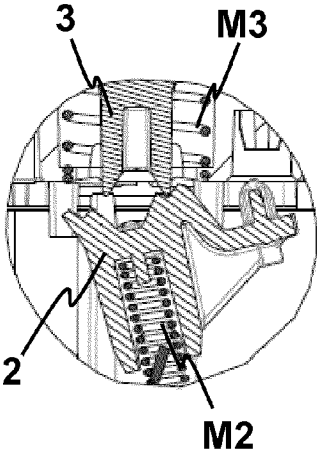


Fig. 5

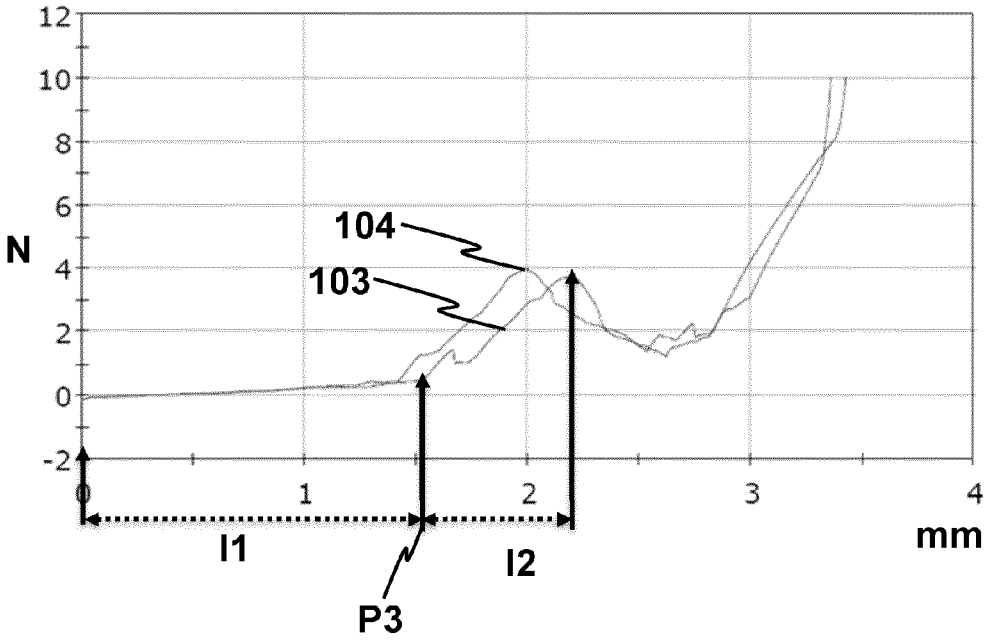
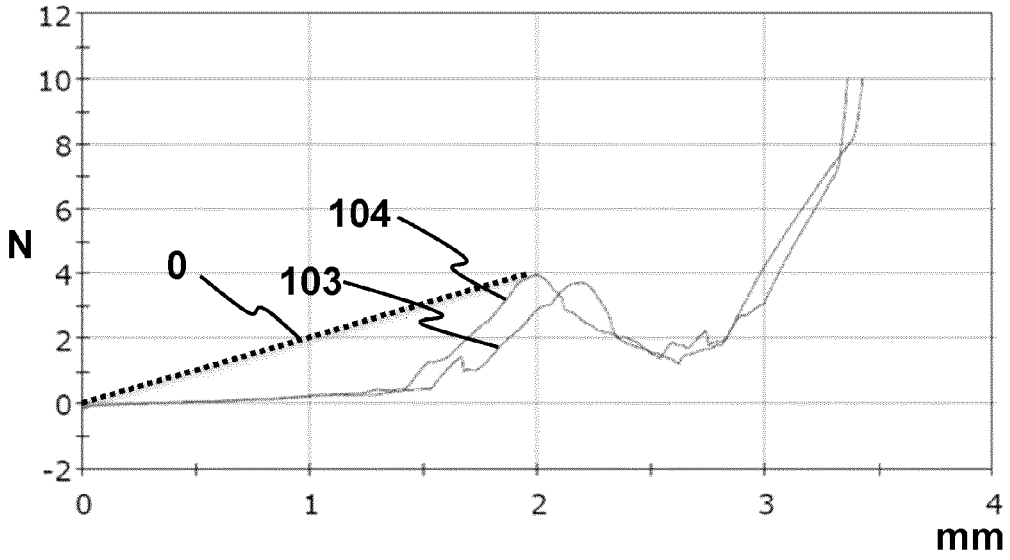


Fig. 6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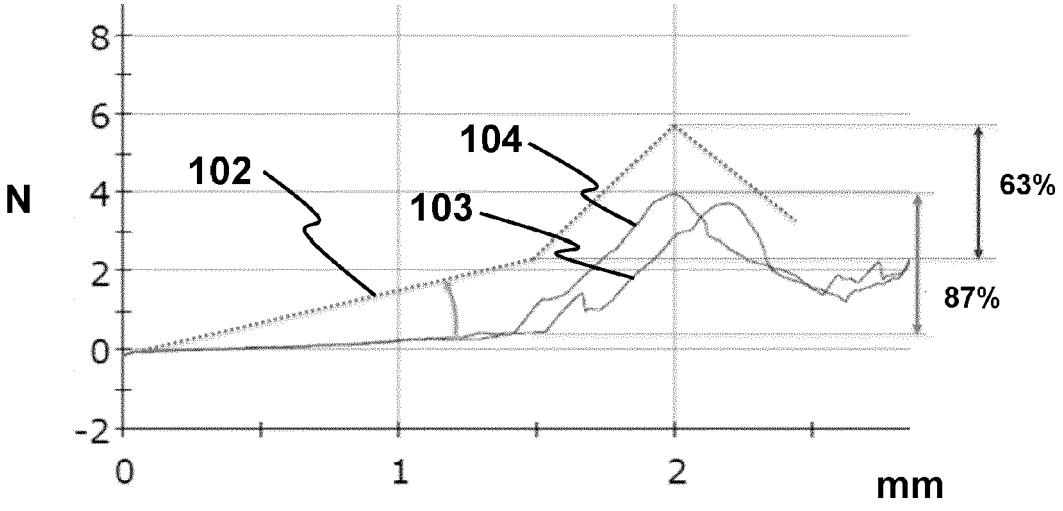
8
6
4
2
0
-2
N
0
1
2
3
4
mm
104
0
103

Fig. 7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4
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0
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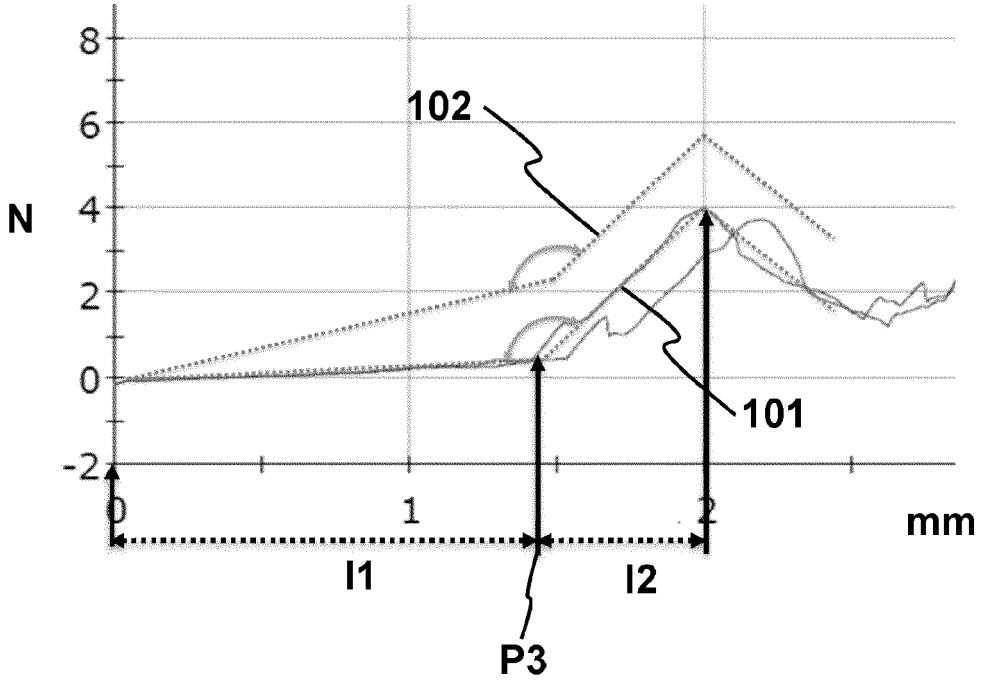
0
1
2
mm
104
102
103
63%
87%

Fig. 8



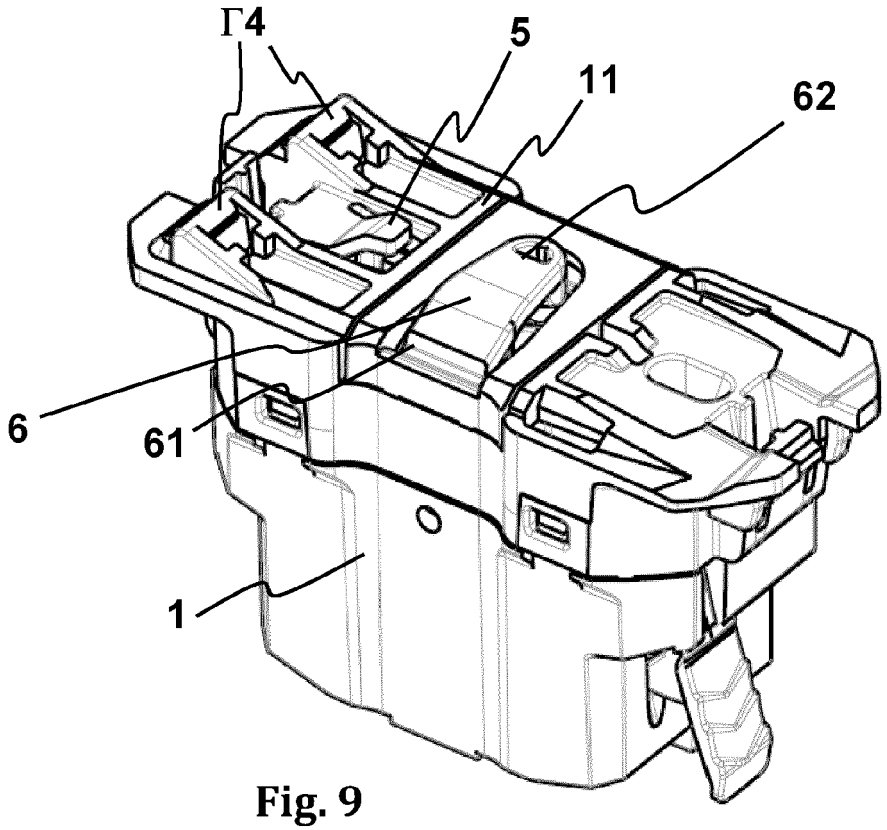


Fig. 9

Fig. 10

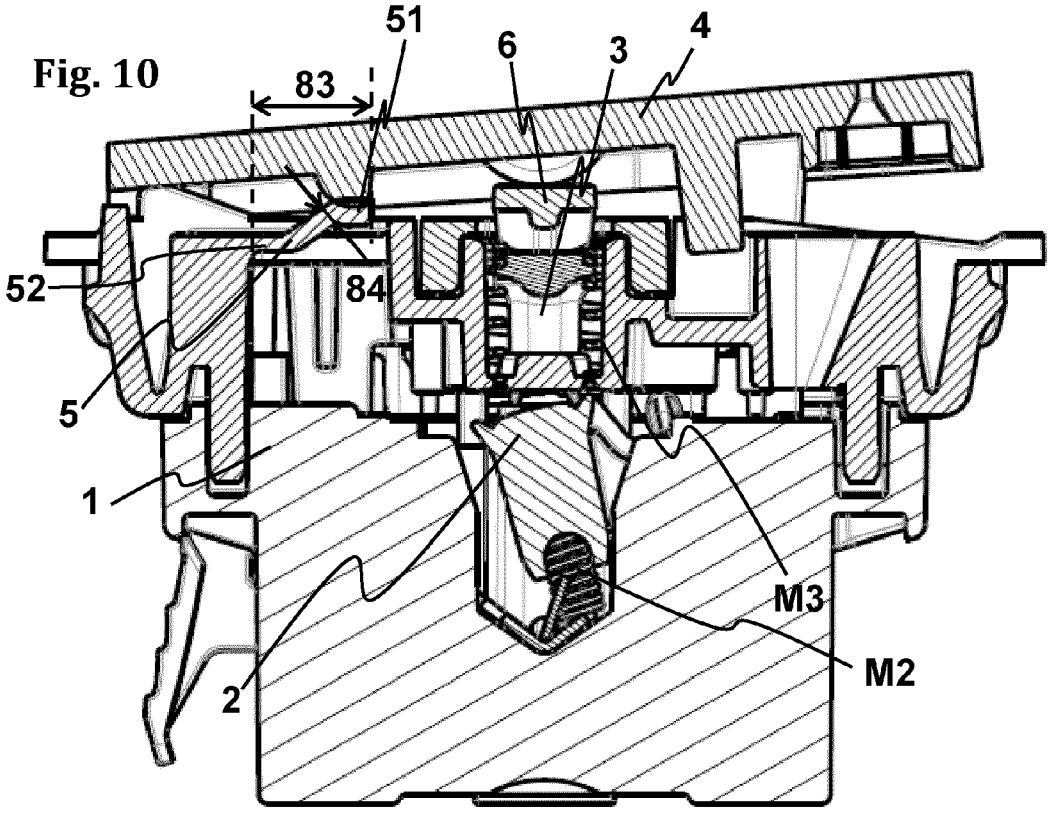
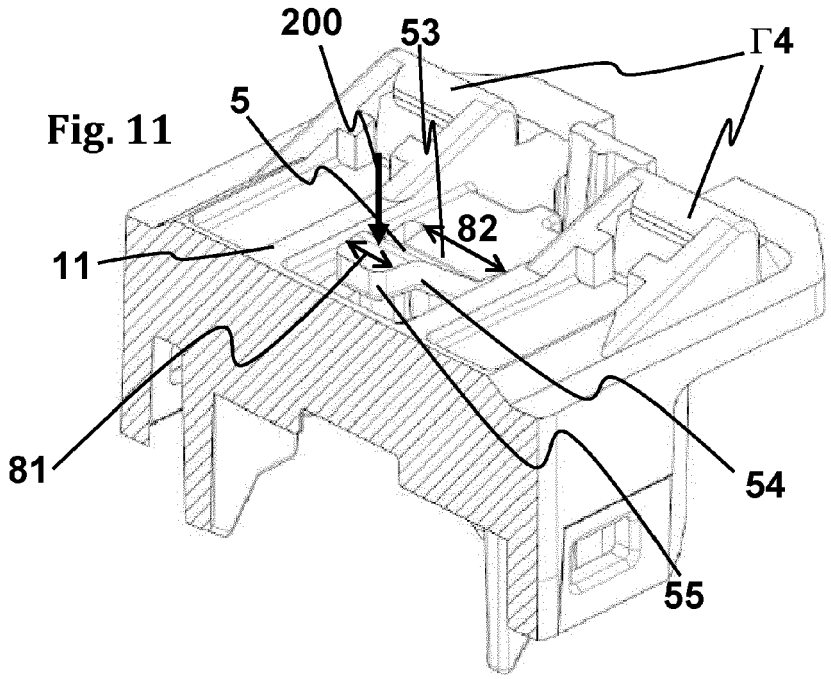


Fig. 11



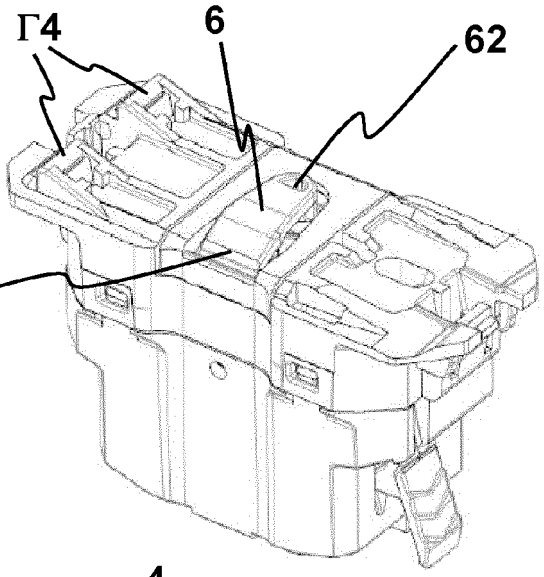


Fig. 12

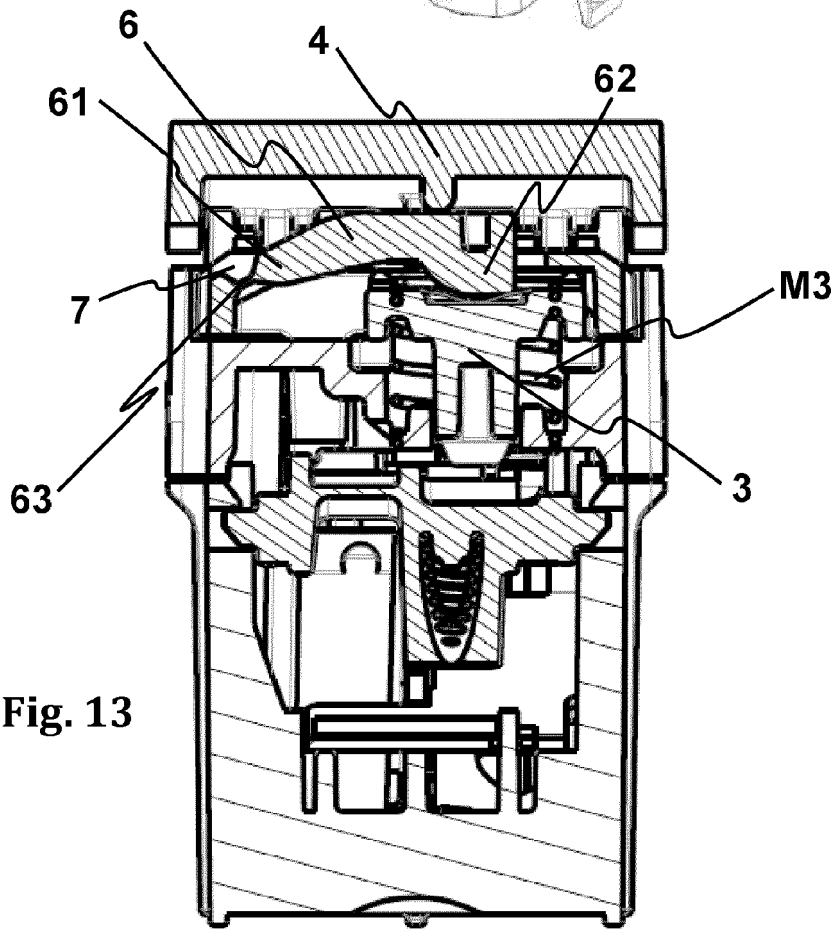


Fig. 13

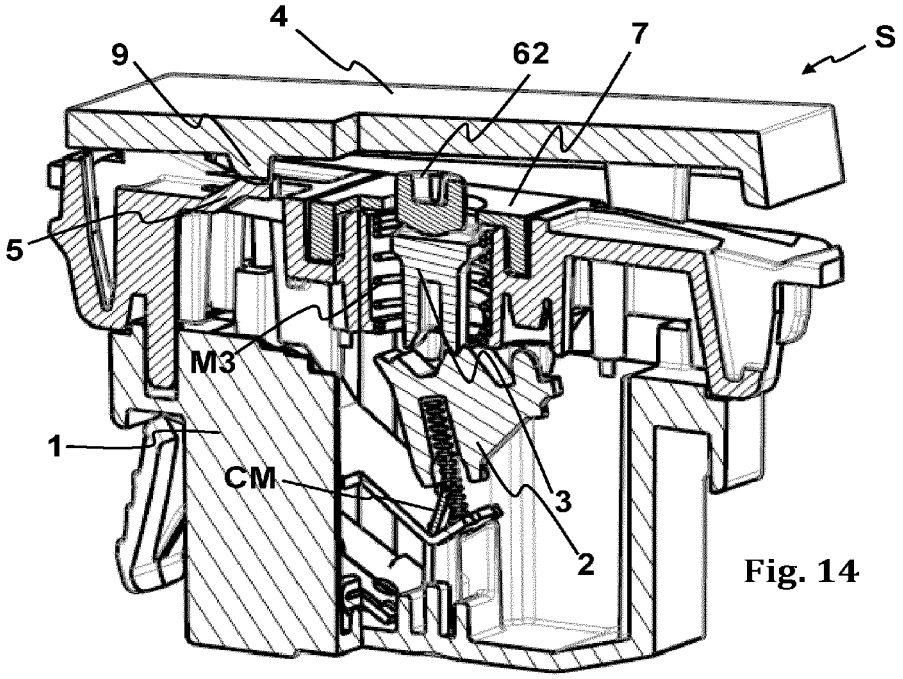


Fig. 14

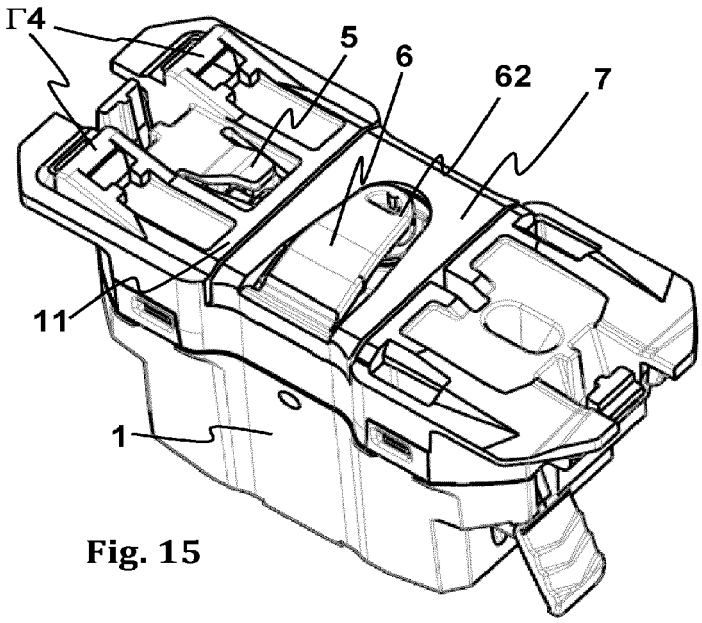
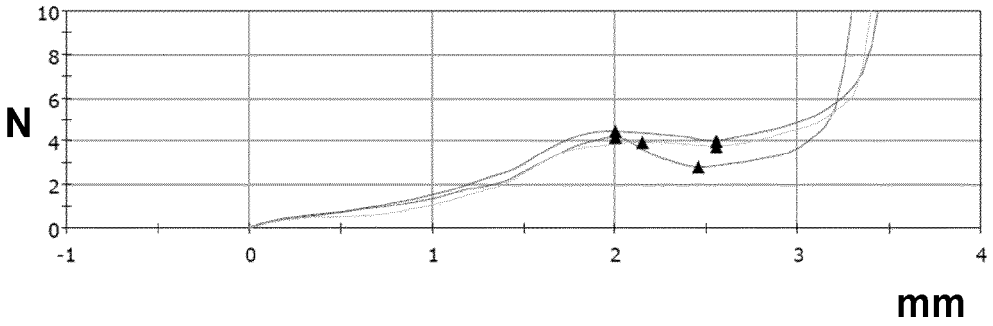


Fig. 15

Fig. 16



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EUROPEAN SEARCH REPORT

Application Number
EP 21 38 2094

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A	EP 3 540 751 A1 (SIMON S A U [ES]) 18 September 2019 (2019-09-18) * paragraph [0025] - paragraph [0027] * * figure 1 * -----	1-15	
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H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 July 2021	Fribert, Jan

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15-07-2021

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