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(54) **SPIKE MECHANISM FOR A SHOE AND A SHOE**

(57) The spike mechanism of a shoe comprises a body housing, which has a cavity and bottom wall (52) with an outer surface, and at least one anti-slipping element (12) extending through the bottom wall, the anti-slipping element (12) comprising a tip (14) and a base extending in the cavity. Inside the cavity there is a support element for moving the anti-slipping element to the first position, in which the said tip is at a first distance from the bottom wall, and to the second position, in which the

said tip is at a second distance from the bottom wall, protruding from the outer surface of the bottom wall. The second distance is substantially bigger than the first distance. The support element is arranged in the cavity immovably in the longitudinal direction of the cavity, the spike mechanism further comprising actuators (30) for rotating the support element in relation to the body housing.

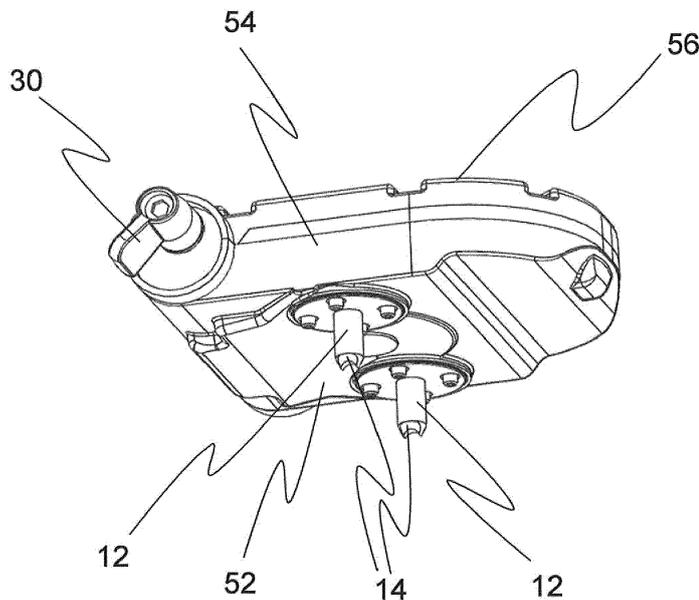


Fig. 1b

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Description

[0001] The invention relates to a spike mechanism for a shoe, comprising a body housing with a cavity and bottom wall, the bottom wall having an outer surface; at least one anti-slipping element extending through the bottom wall, the anti-slipping element comprising a tip and a base extending into the cavity; a support element inside the cavity for moving the anti-slipping element to a first position, in which said tip is at a first distance from the bottom wall, and to a second position, in which said tip is at a second distance from the bottom wall, protruding from the outer surface of the bottom wall, the second distance being substantially bigger than the first distance. The invention further relates to a shoe, which is provided with the spike mechanism according to the invention.

[0002] The grip of shoes meant for outdoor use on different grounds can be impacted by shoe sole embossing and sole material. In winter conditions, the surfaces of driveways are often covered with ice or packed snow so that sufficient grip cannot be achieved solely by changing the characteristics of the sole. In order to improve the grip of the shoe on slippery surfaces there have been developed different spike solutions integrated to the sole of the shoe, which are hidden inside the sole in the normal condition, but which can be moved from the sole to an extended position, when needed.

[0003] In document US2010/0199525 A1 there is disclosed a shoe sole, to which spikes movable in and out are integrated. The spikes are arranged into functional units, which have a support disk movable up and down by rotating. By moving the support disk, the spikes can be made to extend out from and retract back into the functional unit. Moving the spikes is achieved by manually rotating the handle arranged in the heel section of the shoe, which is connected to the support disk of the functional unit by a threaded rod mechanism. Such a transfer mechanism of spikes is of a complex structure and subject to malfunctions.

[0004] In documents US 7926205, US 2011/0126426, US 4375729, EP 1621093 and US 6256907 there are illustrated shoes, which have spikes protruding from the sole of the shoe. The transfer mechanism of spikes comprises a rigid movable disk, which is arranged in a cavity inside the shoe sole and extends substantially for the length of the entire sole, the lower surface of the disk meeting the base of the spikes. When the disk is transferred to the first position in the cavity, it pushes the tips of the spikes out from the shoe sole. Respectively, when the disk is transferred to the second position in the cavity, the spikes can retract back into the shoe sole without prevention of the disk. In these solutions considerably big force is required to move the disk inside the shoe sole for overcoming the friction between the disk and cavity. The disk inside the shoe sole also makes the sole more rigid and thus weakens the comfort of the shoe.

[0005] Documents US 6125556 and US 4873774 illustrate spike solutions, in which the spikes are arranged

into cylinders, into which liquid or air can be pumped by a manual pump. The air and liquid tight chambers belonging to these solutions rupture easily when the shoes are worn, causing the spike mechanism to lose its performance.

[0006] It is an object of the invention to introduce a spike mechanism for a shoe and a shoe, with which drawbacks and defects relating to the prior art can be reduced.

[0007] The objects of the invention are achieved by a spike mechanism and shoe, which are characterized in what is disclosed in the independent patent claims. Some advantageous embodiments of the invention are disclosed in the dependent patent claims.

[0008] The object of the invention is a spike mechanism, which comprises a body housing with a cavity and bottom wall, the bottom wall having an outer surface, and at least one anti-slipping element extending through the bottom wall, the anti-slipping element comprising a tip and a base extending into the cavity. Inside the cavity there is a support element for transferring the anti-slipping element to a first position, in which the said tip is at a first distance from the bottom wall, and to a second position, in which the said tip is at a second distance from the bottom wall, extracted from the outer surface of the bottom wall. The second distance is substantially bigger than the first distance. In the invention the support element is arranged into the cavity immovably in the longitudinal direction of the cavity, and the spike mechanism further comprises actuators for rotating the support piece in relation to the body housing.

[0009] The outer surface of the bottom wall refers to the surface, which in case of a shoe provided with the spike mechanism of the invention is located closest to the ground, on which one treads with the shoe. The tip of the anti-slipping element extends out from the cavity through a hole in the bottom wall. In the first position the anti-slipping element can remain entirely inside the body housing so that its tip does not extend to the outer surface of the bottom wall. Alternatively, in the first position, the tip of the anti-slipping element can extend substantially to the same level with the outer surface of the bottom wall or the tip of the anti-slipping element can protrude slightly outwards from the level of the outer surface of the bottom wall in the first position. It is essential that the tip of the anti-slipping element in the first position does not extend fast to the surface of the ground, when one walks along the ground wearing the shoe provided with a spike mechanism of the invention. It is sensible to set the anti-slipping element to the first position when the shoe is used on an antiskid ground outside, or on easily damaged surfaces inside buildings. When the anti-slipping element is in the second position, its tip protrudes clearly out from the outer surface of the bottom wall. The tip of an anti-slipping element in the second position extends to the ground surface, when one walks along the ground wearing a shoe provided with a spike mechanism of the invention. This position of the anti-slipping element is appropriate when walking along a slippery ground or

surface.

[0010] In an advantageous embodiment of the spike mechanism of the invention the support element has a first end, from which the support element is rotatably attached to the body housing. Thus the support element can rotate inside the cavity in relation to the first end within limits allowed by the volume of the cavity. Preferably, the support element has a second end, and the said actuators comprise elements for moving the second end of the support element towards the bottom wall. When the second end of the support element is moved towards the bottom wall, the anti-slipping element connected with the support element moves simultaneously in the direction of the bottom wall.

[0011] In a second advantageous embodiment of the spike mechanism of the invention the support element has a support surface setting against the base of the anti-slipping element. Preferably the support surface lies in the section between the first end and the second end of the support element.

[0012] In yet another advantageous embodiment of the spike mechanisms of the invention the said actuators comprise a shaft rotatable inside the cavity, the shaft including an abutment end so that the second end of the support element is between the abutment end and the bottom wall. The shaft is rotatable to a first position, in which the abutment end is at a first distance from the bottom wall, and to a second position, in which the abutment end is at a second distance from the bottom wall. The second distance is substantially smaller than the first distance. In this embodiment the abutment end of the shaft is pressed against the surface of the support element, and it forces the second end of the support element to move towards the bottom wall when the shaft is rotated to the second position. The abutment end may have at least one abutment roll, which sets against the surface of the support element. Thus no sliding friction is generated to the surface of the abutment end and support element when the shaft is rotated.

[0013] In yet another embodiment of the spike mechanism of the invention the actuators comprise a pivoted lever extending out from the body housing for rotating the shaft. The pivoted lever makes it possible to rotate the shaft to a desired position manually. Thus a person wearing a shoe provided with the spike mechanism of the invention can place the anti-slipping elements of the spike mechanism to a desired position.

[0014] Yet another advantageous embodiment of the spike mechanism of the invention comprises locking elements for locking the said at least one anti-slipping element to the second position. Because of the locking element, the anti-slipping element stays in a position extracted from the bottom wall, even though force pulling the anti-slipping element towards the cavity is applied to the tip of the locking element. The said locking elements preferably comprise a locking notch at the second end of the support element for receiving the abutment end of the shaft rotated to the second position. In this embodi-

ment the shaft locks to the second position by means of the locking elements, in which position the support element has moved towards the bottom wall, forced by the abutment end. The support element locking in place thus prevents the anti-slipping element from moving towards the cavity.

[0015] In yet another advantageous embodiment of the spike mechanism of the invention the said actuators further comprise a return element for moving the anti-slipping element from the second position to the first position. Preferably said anti-slipping element has an elongated shank, and said return element is a helical spring, which is fitted around the shank. Alternatively, the return element can be a piece made of elastic material, which is fitted between the support element and the bottom wall, or a leaf spring, which is arranged to the first end of the support element at the connection point of the support element and the body housing. It can also be thought that the support element is entirely or partly manufactured of an elastically behaving material and attached from its first end rigidly to the body housing. In this case the support element or part of it functions itself as the return element.

[0016] A further object of the invention is a shoe with a top part and a sole. In the shoe of the invention, the sole comprises one of the above described spike mechanisms. Preferably said spike mechanism is arranged to the heel section of the sole of the shoe. The heel section is generally the thickest part of the shoe sole so that it is easy to arrange in it a space for the spike mechanism. If the thickness of the ball section is sufficiently big, it is possible to alternatively arrange the spike mechanism to the ball section of the sole. It is further possible to arrange the spike mechanism to the sole so that the first part of its anti-slipping elements are located in the heel section and the second part in the ball section of the sole. It can also be thought that two separate spike mechanisms are arranged to the sole, the first one to the heel section and the second one to the ball section.

[0017] It is an advantage of the invention that it is structurally simple and reliable.

[0018] It is a further advantage of the invention that it does not stiffen the sole of the shoe so that the invention does not have an impact on the comfort of the shoe.

[0019] The invention is next explained in detail, referring to the enclosed drawings, in which

Figure 1a is an exemplary view of a spike mechanism of the invention, seen obliquely from above;

Figure 1b is an exemplary view of the spike mechanism of Figure 1a, seen obliquely from below;

Figures 2a and 2b are exemplary cross-sectional views of the spike mechanism of Figures 1 a and 1 b;

Figure 3 illustrates a spike mechanism of the invention seen from above; and

Figure 4 illustrates in an exemplary manner a shoe of the invention seen from the side.

[0020] In Figure 1 a there is illustrated in an exemplary manner a spike mechanism of the invention for a shoe, seen obliquely from above, and in Figure 1b the same spike mechanism is illustrated obliquely from below. Both figures are next explained simultaneously. The spike mechanism has a body housing 50 cast of plastic, comprising a bottom wall 52, a side wall 54, and a releasable lid 56. The lid 56 is attached to the side wall of the body housing by a screw fastening 58. The bottom wall 52 has two holes, both of which are provided with an anti-slipping element 12 in form of a rod-shaped spike. The anti-slipping element has a base extending into the body housing and a tip 14 extending outside the body housing, to which tip two sharp points is formed. The one edge of the body housing has a cylindrical section with a pivoted lever 30 at its one end. The position of the anti-slipping elements belonging to the spike mechanism is adjusted by the pivoted lever in a manner described later. The spike mechanism is intended to be cast into the heel section of the shoe sole so that the spike mechanism becomes substantially entirely surrounded by the manufacturing material of the sole.

[0021] Figures 2a and 2b illustrate in an exemplary manner the spike mechanism of Figures 1a and 1b as cross-sectional views. In Figure 3 the spike mechanism of Figures 2a and 2b is shown as a top view with the lid 56 of the body housing 50 removed. All these figures are next explained simultaneously. Inside the body housing there is a cavity 9 defined by the bottom wall 52, side wall 54 and lid 56. The longitudinal direction of the cavity is substantially identical with the direction of the lid and bottom wall of the body housing. Inside the cavity there is a support element 15, which has a first end 19 and a second end 20. At the first end of the bottom wall there are two fastening lugs 53, between which the first end of the support element is fitted. At the first end of the support element there is provided a rotation axis 55, the ends of which extend to loops formed for the rotation axis in the fastening lugs. The rotation axis can rotate around its longitudinal axis in the loops of the fastening lugs. On the side of the lid 56 of the body housing facing the cavity there are support necks 31, the slot of which with a curved wall surrounding the rotation axis, thus preventing the rotation axis from rising out from the loop of the fastening lug.

[0022] In the section between the first and second end of the support element there are two recesses, which open towards the bottom wall 52 of the body housing. In the bottom of the recesses there is a flat support surface 16. In the bottom wall, by the recesses, there are holes 57, in which an anti-slipping element 12 in form of a spike is fitted. The anti-slipping element has a rod-shaped shank with circular cross-section, the first end of which has a tip 14 and the second end a base 13. The anti-slipping element extends through the hole 57 so that its

base is inside the cavity and the tip outside the cavity. Two sharp points has been machined to the tip of the anti-slipping element. Around the hole, on the surface of the cavity facing the bottom wall 52 there is a support collar 59, which supports the anti-slipping element in the lateral direction and prevents it from tilting in the hole. The anti-slipping element can move in the hole 57 and support collar in the direction of its longitudinal axis between the first position shown in Figure 2a and the second position shown in Figure 2b. Around the shank of the anti-slipping element and the support collar there is a return element 22 in the form of a helical spring, the first end of which is supported to the bottom wall 52 and the second end to the support surface 16.

[0023] At the second end of the body housing there is a shaft 24, the first end of which extends through the side wall 54 on the first side of the body housing 50, the second end attaching in a rotatable manner to the side wall on the second side of the body housing. Outside the body housing, at the first end of the shaft there is a pivoted lever 30 for rotating the shaft. Inside the cavity, half-way of the length of the shaft there is a projection 26, the first edge of which connects rigidly to the shaft 24. The second free edge of the projection branches into two abutment ends 27 with an abutment roll 28 arranged to both ends. At the second end of the support element, on the surface facing the lid 56 there is shaped an abutment surface 61, against which the outer surfaces of the abutment rolls are set. At the free edge of the abutment surface there is a locking notch 29 in the form of a groove for receiving the abutment end 27 and the abutment roll 28 in the abutment end.

[0024] In Figure 2a two anti-slipping elements 12 of the spike mechanism of the invention are in the first position, in which the major part of the anti-slipping elements is mainly inside the cavity 9. Only the tip of the anti-slipping element and a very small part of the shank of the anti-slipping element extend outside the cavity. The tip of the anti-slipping element is at a first distance from the bottom wall 52. The support element inside the cavity is then in the first position, in which it is arranged as close as possible to the lid 56 of the body housing 50 within the limits allowed by the shape of the cavity 9, pushed by the return element 22. Between the support element 15 and the bottom wall 52, by the recess, there remains a space, into which the anti-slipping element 12 can retract. The anti-slipping element is supported from its base 13 to the support element or the second end of the return element so that the movement of the base of the anti-slipping element follows the movement of the support surface. The shaft 24 is in the first position, in which the projection 26 attaching to it is arranged against the lid substantially in the direction of the lid 56.

[0025] When it is desired to make the anti-slipping elements to protrude more from the inside of the body housing, the shaft 24 is rotated to the second position shown in Figure 2b by rotating the pivoted lever 30 so that the projection 26 is substantially in a vertical position in re-

lation to the lid 56. During the rotation of the shaft the abutment rolls 28 in the abutment end 27 of the projection roll along the abutment surface 61 of the support element and press the second end of the support element towards the bottom wall. Because of the hinged-type fastening realized by means of the rotating shaft 55 the support element 15 can rotate from the position of Figure 2a to the second position of Figure 2b. In this position the surface facing the bottom wall of the second end of the support element is set fast or at least very close to the bottom wall. The support surfaces 16 of the support element rotating to the second position press the bases 13 of the anti-slipping elements 12 and push the anti-slipping elements in the direction of the bottom wall so that the tips 14 of the anti-slipping elements protrude from the level of the outer surface of the bottom wall 52 and the return element 22 is compressed.

[0026] In Figure 2b the anti-slipping elements are in the second position, protruding as far out from the body housing as possible, their tips 14 being at a second distance from the bottom wall. The second distance is substantially bigger than the first distance shown in Figure 2a. The abutment rolls 28 in the projection connecting to the shaft are then arranged into the locking notch 29 in the abutment surface. The compressed return element 22 pushes the support element towards the lid 56 with its spring force, thus keeping the abutment rolls continuously and tightly pressed into the locking notch. This locks the abutment end of the projection in place and prevents the unintended rotation of the shaft 24.

[0027] When it is desired to move the anti-slipping elements back to the first position, the shaft 24 is rotated to the first position by rotating the pivoted lever 30 so that the return element 22 returns the support element and the anti-slipping element connected to it to the first position according to Figure 2a. The position of the anti-slipping elements can thus be adjusted simply by rotating the pivoted lever 30 outside the body housing to an appropriate position.

[0028] In Figure 4 there is illustrated in an exemplary manner a shoe of the invention seen from the side. The shoe has a sole 100 and a top section attached to the upper surface of the shoe. The sole is manufactured by casting of a suitable castable sole material, such as rubber, plastic, silicone or a combination of these materials. In the casting phase of the sole, a spike mechanism according to the invention is cast inside the heel section of the sole so that the mechanism remains substantially entirely surrounded by the manufacturing material of the sole. Of the spike mechanism the pivoted lever 30 remains visible outside the outer surface of the sole, and the anti-slipping element 12 can be rotated out from the surface of the sole or to be hidden into the sole.

[0029] The sole of the shoe can also be manufactured separately so that a suitable space is formed to the sole for a spike mechanism to be installed later. In this case the spike mechanism is placed into a space formed for it and fastened to the sole, for example, by gluing. Finally,

the sole equipped with the spike mechanism is attached to the top section of the shoe, after which the shoe is finished. The space in the sole can be made to open to the surface against the top part of the shoe so that the spike mechanism in the sole remains invisible inside the shoe parts in a finished shoe.

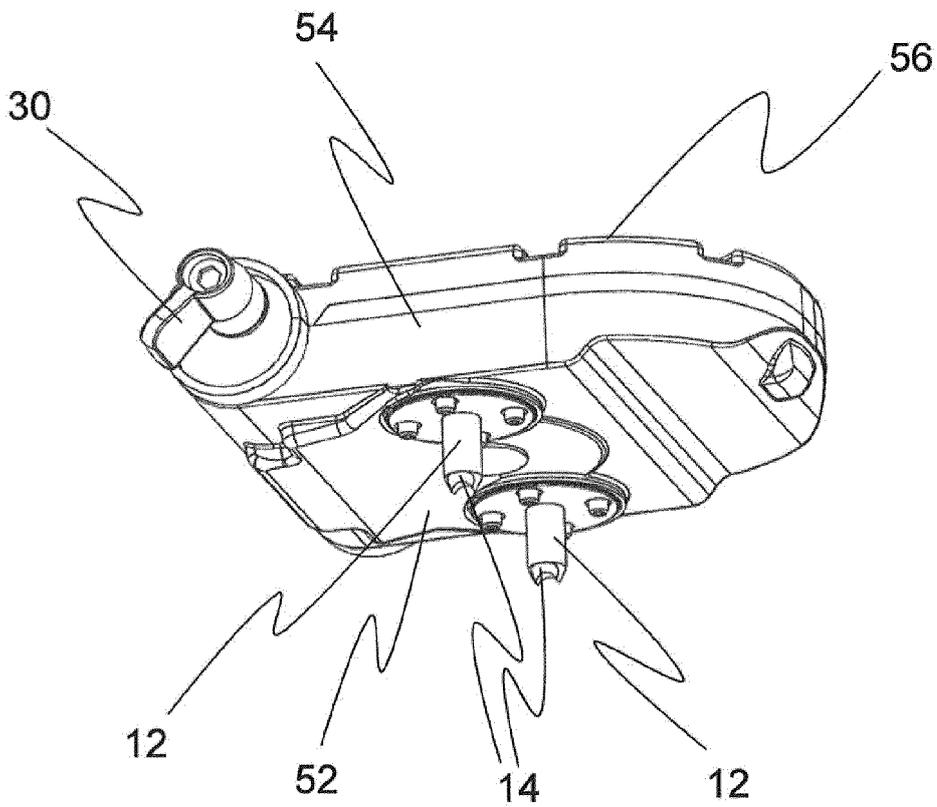
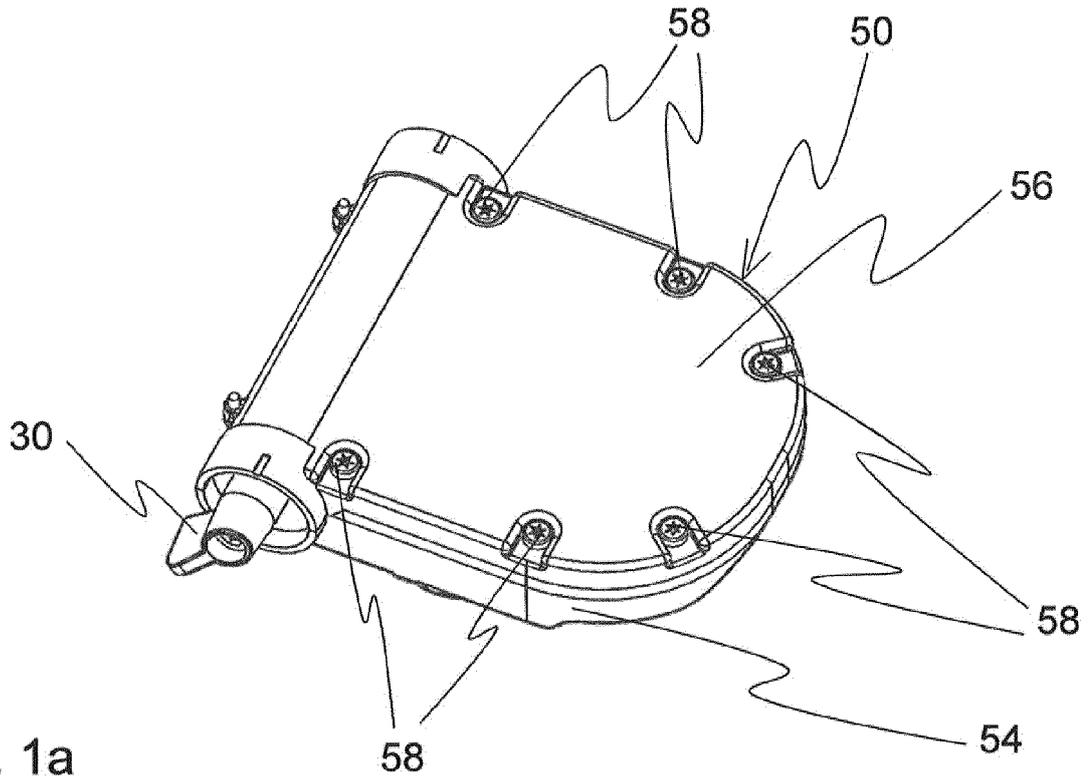
[0030] Some advantageous embodiments of a spike mechanism and shoe of the invention have been explained above. The invention is not limited to the solutions disclosed above, but the inventional idea can be applied in different ways within limits set by the patent claims.

Claims

1. Spike mechanism for a shoe comprising a body housing (50) with a cavity (9) and bottom wall (52), the bottom wall having an outer surface, at least one anti-slipping element (12) extending through the bottom wall (52) of the cavity, the anti-slipping element (12) having a tip (14) and a base (13) extending into the cavity (9), a support element (15) in the cavity (9) for moving the anti-slipping element (12) to the first position, in which the said tip (14) is at a first distance from the bottom wall (52), and to the second position, in which the said tip (14) is at a second distance from the bottom wall (52) protruded from the outer surface of the bottom wall (52), the second distance being substantially bigger than the first distance, **characterized in that** the support element (15) is arranged in the cavity (9) immovably in the longitudinal direction of the cavity, the spike mechanism further comprising actuators for rotating the support element (15) in relation to the body housing (50).
2. Spike mechanism according to claim 1, **characterized in that** the support element (15) has a first end (19), from which the support element (15) is rotatably attached to the body housing (50).
3. Spike mechanism according to claim 1 or 2, **characterized in that** the support element (15) has a second end (20) and that the said actuators comprise elements for moving the second end (20) of the support element (15) towards the bottom wall (52).
4. Spike mechanism according to any of the claims 1 - 3, **characterized in that** the support element (15) has a support surface (16) setting against the base (13) of the anti-slipping element (12).
5. Spike mechanism according to claim 4, **characterized in that** the support surface (16) is located in the section between the first end (19) and second end (20) of the support element (15).
6. Spike mechanism according to any of the claims 3 -

- 5, **characterized in that** the said actuators comprise a rotatable shaft (24) inside the cavity (9), the shaft having an abutment end (27) so that the second end (20) of the support element (15) is between the abutment end (27) and the bottom wall (52), and the shaft (24) is rotatable to the first position, in which the abutment end (27) is at a first distance from the bottom wall (52), and to the second position, in which the abutment end (27) is at a second distance from the bottom wall (52), the second distance being substantially smaller than the first distance. 5
7. Spike mechanism according to claim 6, **characterized in that** the abutment end (27) has at least one abutment roll (28). 10 15
8. Spike mechanism according to claim 6 or 7, **characterized in that** the said actuators comprise a pivoted lever (30) extending outside the body housing (50) for rotating the shaft (24). 20
9. Spike mechanism according to any of the claims 1 - 8, **characterized in that** it comprises locking elements for locking at least one anti-slipping element (12) to the second position. 25
10. Spike mechanism according to claim 9, **characterized in that** the said locking elements comprise a locking notch (29) at the second end of the support element (15) for receiving the abutment end (27) of the shaft (24) rotated to the second position. 30
11. Spike mechanism according to any of the claims 1 - 10, **characterized in that** the said actuators further comprise a return element (22) for moving the anti-slipping element (12) from the second position to the first position. 35
12. Spike mechanism according to claim 11, **characterized in that** the said anti-slipping element (12) has a longitudinal shank and that the said return element (22) is a helical spring, which is fitted around the shank. 40
13. Shoe with a top part (102) and sole (100), **characterized in that** the said sole (100) comprises the spike mechanism according to any of the claims 1 - 13. 45
14. Shoe according to claim 13, **characterized in that** the said spike mechanism is arranged to the heel part of the sole (100) of the shoe. 50

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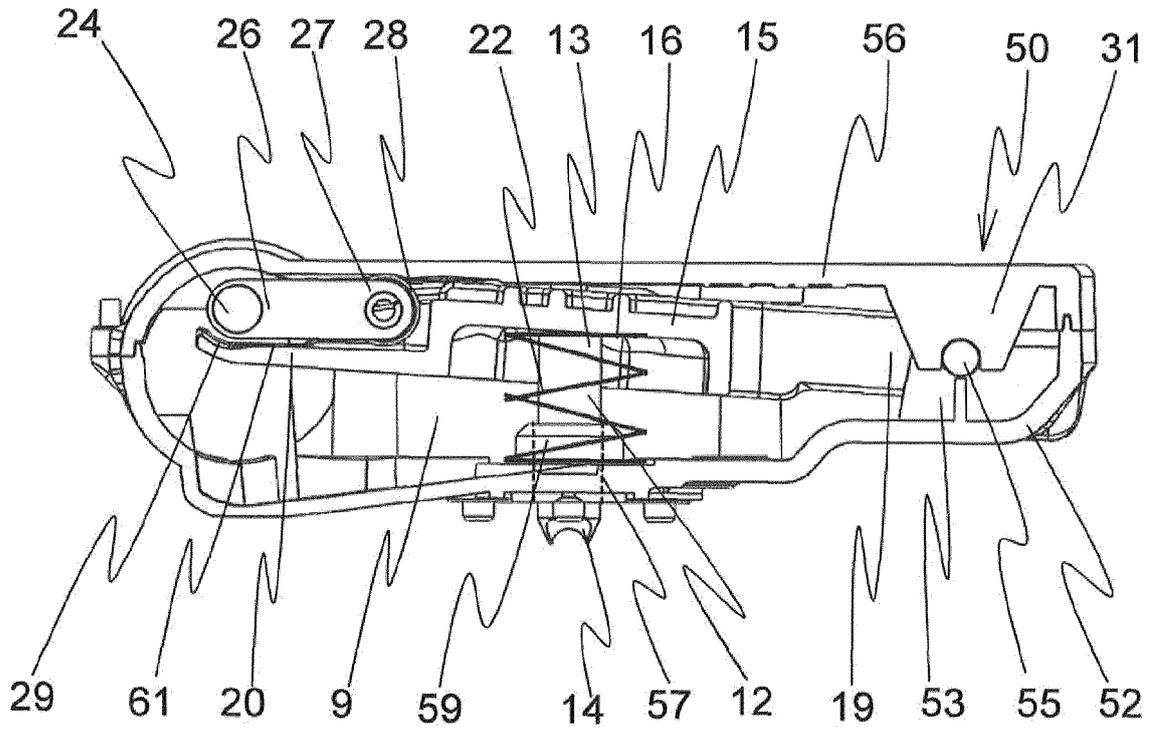


Fig. 2a

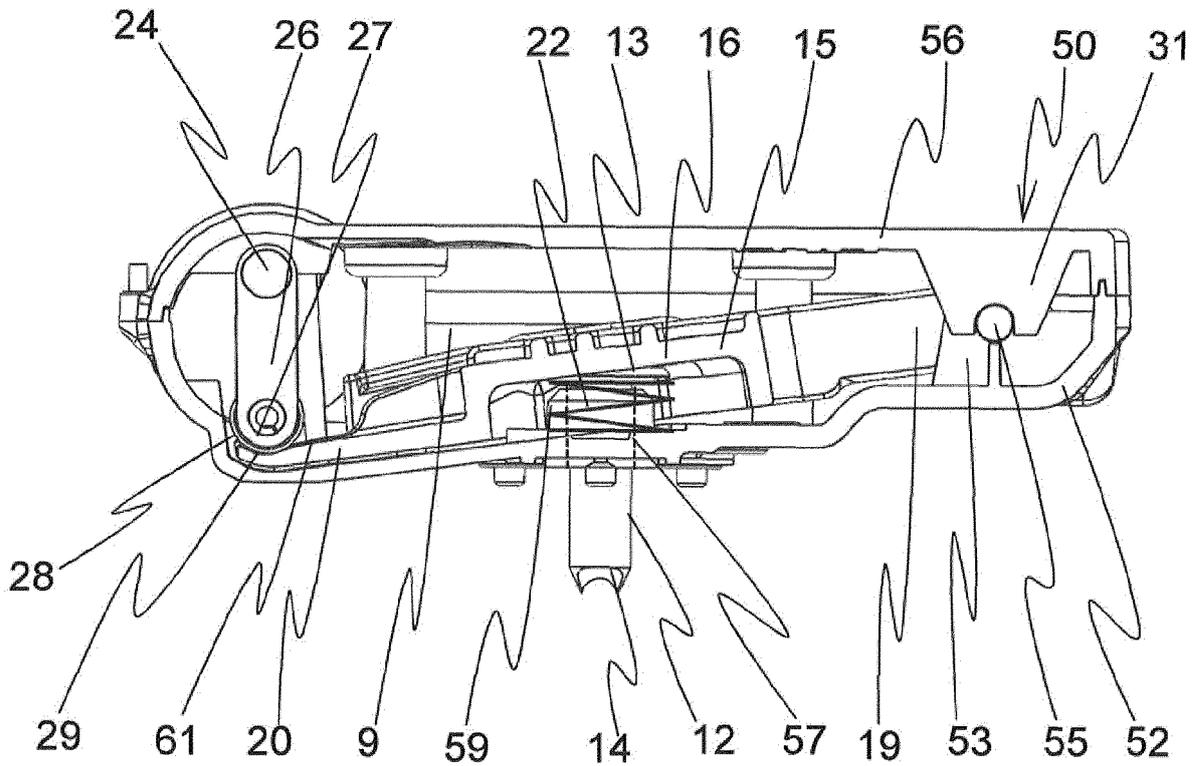


Fig. 2b

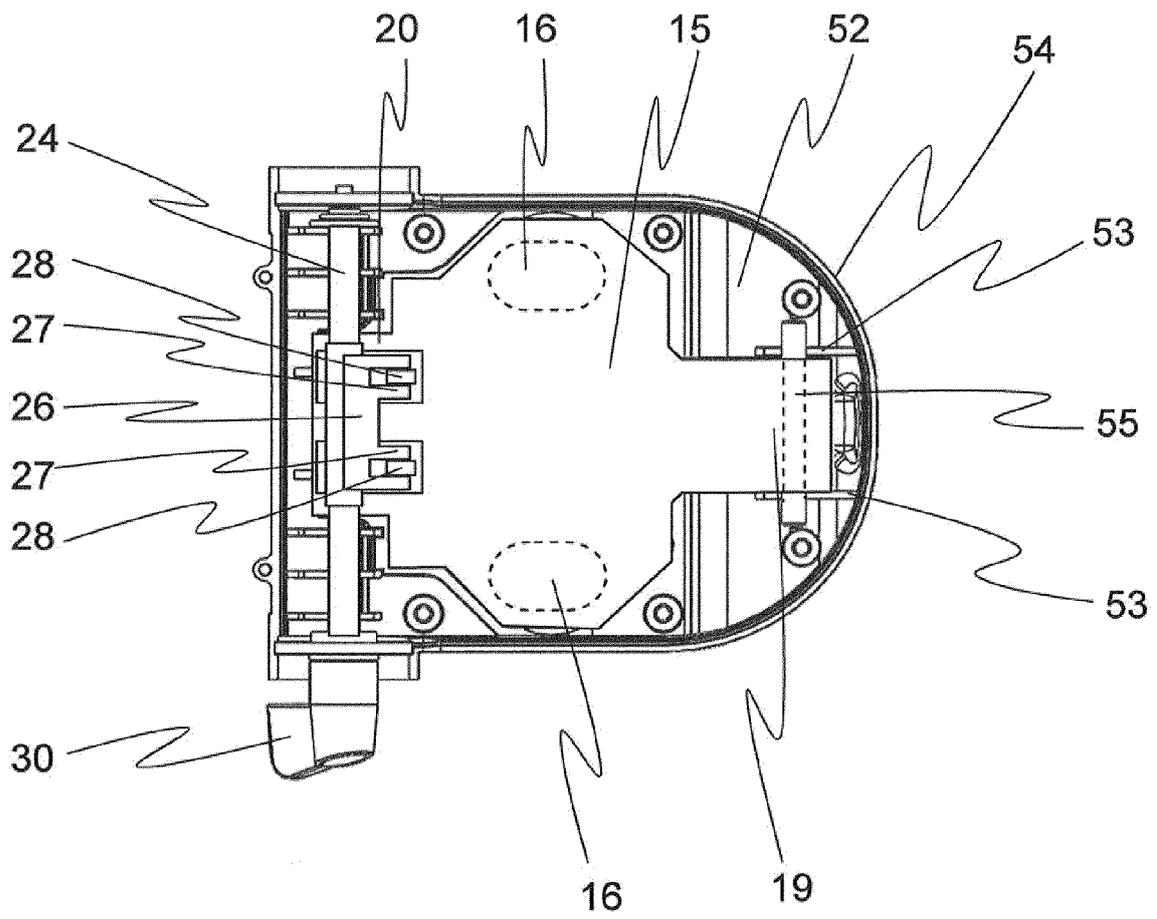


Fig. 3

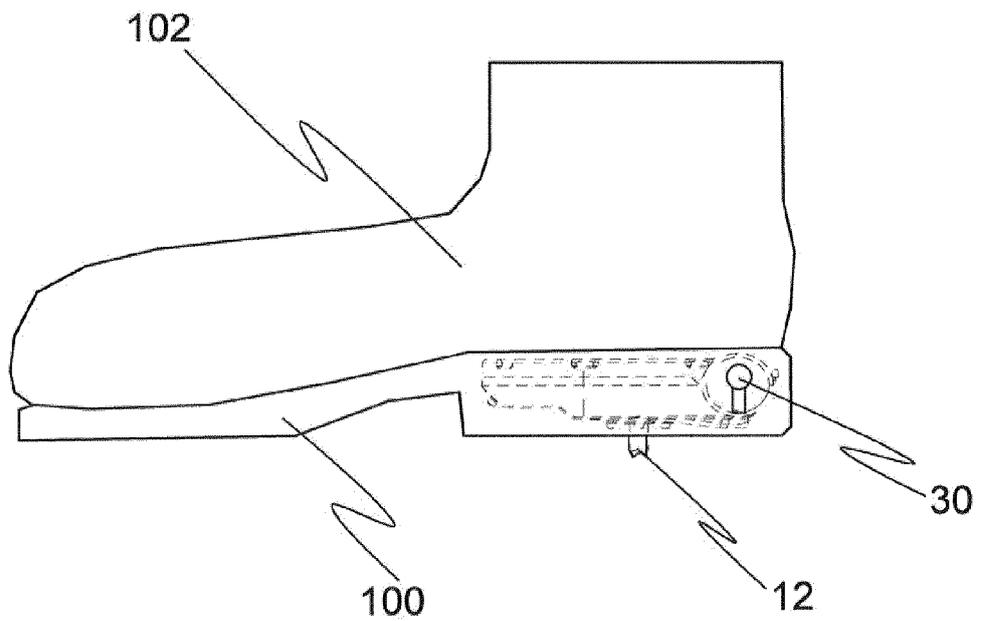


Fig. 4



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Application Number
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 March 2017	Examiner Chirvase, Lucian
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