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(54) **A safety switch mechanism for gardening tool**

(57) The present invention discloses a safety switch mechanism for a gardening tool, comprising a cover plate, a pin lock, and a pin component which is cooperated and connected with the pin lock; the safety switch mechanism also comprises a crank which is rotatably mounted in the cover plate, a first elastic element which is connected between the crank and the cover plate, a connecting rod which connects the crank and the pin component, and a second elastic element which is cooperated and connected with the pin component. Therefore, the safety switch mechanism for the gardening tool makes full use of the elastic element force and the swing angle of the connecting rod, so that the pin member is great in stability in positioning and can automatically reset; and because the safety switch mechanism for the gardening tool does not have the parts in relative abrasion, the good durability is realized.

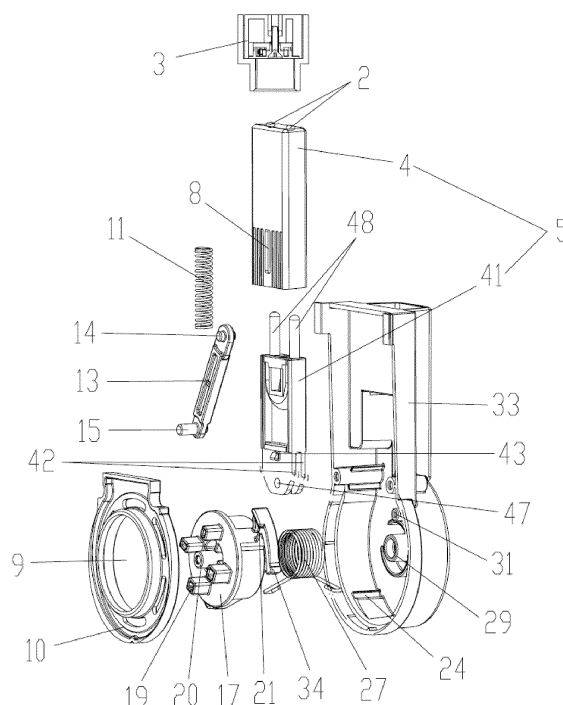


Fig.1

Description

Technical Field

[0001] The present invention relates to a safety switch mechanism for a gardening tool.

Background Art

[0002] In existing technology, some gardening tools are generally provided with safety switch mechanisms, for example, shredder, mower and so on. The safety switch mechanism of the shredder always adopts a slider button and is generally mounted between the main body and the cut-off material collecting box; that is, providing a slider button and a pin member on the cut-off material collecting box and mounting a pin lock on the main body. Pushing the slider button upwards drives the pin member to move upwards accordingly to be cooperated and connected with the pin lock; as a result, the safety switch is triggered. A column and a plane inside of the slider button generate interference fit with a lug boss on the cut-off material collecting box, so as to press the slider button and stop the pin member from falling down after switching on the gardening tool; however, the lug boss will be worn continuously in use, and the magnitude of interference will become less and less gradually, while the pressure to the slider button becomes smaller and smaller. When the gardening tool is running, if it vibrates greatly, the slider button may probably fall off back to the shutdown position, and the gardening tool will stop running accidentally. Therefore, it shows that this kind of safety switch mechanisms is poor in durability and stability.

Summary of the Invention

[0003] The present invention aims at providing an improved safety switch mechanism for a gardening tool with enhanced durability and stability, so as to overcome the above disadvantages in the prior art.

[0004] In order to achieve the above goal, the present invention adopts the following technical proposal: a safety switch mechanism for a gardening tool, comprising a cover plate, a pin lock, and a pin component which is cooperated and connected with the pin lock, wherein the safety switch mechanism also comprises a crank which is rotatably mounted in the cover plate, a first elastic element which is connected between the crank and the cover plate, a connecting rod which connects the crank and the pin component, and a second elastic element which is cooperated and connected with the pin component.

[0005] In addition, the present invention further provides the following additional technical proposals:

[0006] The safety switch mechanism further comprises a knob that is fixedly connected with the crank.

[0007] The pin component includes a vertical axis, when the gardening tool is shut down, the knob is rotated

anticlockwise to drive the connecting rod to turn around the vertical axis, then under the elastic restoring force of the first and second electric elements, the crank automatically resets and the connecting rod drives the pin component to completely separate from the pin lock.

[0008] The safety switch mechanism further comprises a crank cover that is sleeved on the crank and mounted to the cover plate.

[0009] The first elastic element is a torsional spring, one end of the torsional spring is cooperated and connected with the cover plate, and the other end is cooperated and connected with the crank.

[0010] The crank is provided with a pair of positioning slots, and the cover plate is provided with a positioning column that can be selectively cooperated and connected with the positioning slots.

[0011] The crank is provided with an elastic sheet, and the cover plate is provided with a cover plate slot that can be cooperated and connected with the elastic sheet.

[0012] The pin component comprises a pin member and a pin sleeve, the pin member is slidably mounted in the pin sleeve that is cooperated and connected with the cover plate.

[0013] The second electric element is a compressed spring, which is mounted between the pin member and the pin sleeve.

[0014] The gardening tool is a shredder that comprises a main body and a cut-off material collecting box under the main body, and the safety switch mechanism is provided between the cut-off material collecting box and the main body.

[0015] Compared with the prior art, the present invention has the following advantages: by adopting the crank which is rotatably mounted in the cover plate, the first elastic element which is connected between the crank and the cover plate, the connecting rod which connects the crank and the pin component, and the second elastic element which is cooperated and connected with the pin component, the safety switch mechanism of the present invention makes full use of the elastic element force and the swing angle of the connecting rod, so that the pin member is great in stability in positioning and can automatically reset; and because the safety switch mechanism for the gardening tool does not have the parts in relative abrasion, the good durability is realized.

Brief description of the drawings

[0016]

Fig.1 is the exploded view of the gardening tool of a preferred embodiment of the present invention.

Fig.2 is the assembly drawing of a part of components of Fig.1.

Fig.3 is the schematic drawing of the knob of the gardening tool of a preferred embodiment of the present invention.

Fig.4 is the drawing of power-on status of Fig.1.

Fig.5 is the section view of assembling Fig.4.

Fig.6 is the schematic drawing of position of the connecting rod of Fig.4 while powering on process.

Fig.7 is the force diagram of the connecting rod of Fig.4.

Fig.8 is the drawing of power-off status of Fig.1.

Fig.9 is the section view of assembling Fig.7.

Fig.10 is the schematic drawing of position of the connecting rod of Fig.8 while powering on process.

Fig. 11 is a schematic drawing of the gardening tool.

Detailed Description of the Preferred Embodiments

[0017] The following is nonrestrictive detailed description of the technical proposal of the present invention in combination with the preferred embodiments and drawings.

[0018] As shown in Fig.1-3 and 11, the gardening tool corresponding to the preferred embodiment is a shredder, which is generally comprised of a main body 101, a cut-off material collecting box 102 under the main body 101 and a safety switch mechanism between the main body 101 and the cut-off material collecting box 102. The safety switch mechanism comprises a pin lock 3, a cover plate 33 mounted on the cut-off material collecting box 102, and a pin component 5 that can be cooperated and connected with the pin lock 3 and is mounted inside of the cover plate 33. The pin component 5 comprises a pin sleeve 4 and a pin member 41. Specifically, the pin member 41 is slidably mounted inside of the pin member sleeve 4, wherein a pair of pins is arranged on top of the pin member 41, with a pair of clamp plates 42 arranged at the bottom; besides, a pair of second connection holes 47 and a pair of lug bosses 43 are arranged on the clamp plates 42. A pair of pin holes 2 is arranged on top of the pin sleeve 4, and a pair of sliding chutes 8 is arranged at two sides of the bottom of the pin sleeve 4. The lug bosses 43 and the sliding chutes 8 are in sliding connection; and the pins 48 can pass through the pin holes 2 to be cooperated and connected with the pin lock 3.

[0019] The safety switch mechanism further comprises a knob 50, a crank 17 that is rotatably mounted in the cover plate 33, a first elastic element 27 which is connected between the crank 17 and the cover plate 33, a connecting rod 13 which connects the crank 17 and the pin component 5, and a second elastic element 11 which is cooperated and connected with the pin component 5, wherein the first elastic element 27 is a torsional spring 27, and the second electric element 11 is a compressed spring 11.

[0020] The knob 50 and the crank 17 are fixedly connected with each other, and the pin member 41 is connected with the crank 17 through the connecting rod 13. Specifically, one end of the connecting rod 13 is provided with a first connecting column 15, and the other end is provided with a pair of second connecting columns 14. The crank 17 is provided with a connection portion 16, on which a first connection hole 18 is provided. During

installation, the connecting rod 13 is inserted into the gap between the two pieces of clamp plates 42 of the pin member 41; at the same time, the second connecting columns 14 and the second connection holes 47 are connected together, while the first connecting column 15 is connected together with the first connection hole 18. The connecting rod 13 can rotate about the first connecting column 15 and the second connecting column 14. The crank 17 is also provided with a plurality of connecting columns 19, screw holes 20, elastic sheets 21 and a pair of positioning slots 23. Optimal number of the connecting columns 19 is 4, and the connecting columns 19 and the screw holes 20 are cooperated and connected with the knob 50, while the optimal connection way of the crank 17 and the knob 50 is screw connection. The cover plate 33 is provided with a baffle 36, a cover plate column 29, a cover plate slot 24 and a positioning column 31. The first elastic element, torsional spring 27, is sleeved on the cover plate column 29, with one end connected with the baffle 36, and the other end connected with crank 17. When the crank 17 rotates, two ends thereof abut against the baffle 36 and the crank 17 separately; and always provide a resetting force for the crank 17. The crank sleeve 10 is provided with a through hole 9, and the crank 17 is cooperated and connected with the through hole 9, and the crank 17 can rotate inside of the through hole 9. The second electric element, compressed spring 11, is mounted between the pin sleeve 4 and the pin member 41, with two ends thereof abutting against the top inner wall of the pin sleeve 4 and the top of the pin member 41.

[0021] As shown in Fig.4-7 and Fig.10, the center of rotation of the crank 17 and the knob 50 is numbered as 71, rotating trace of the first connection hole 18 on the crank 17 is a segment of circular arc 70 around the center of rotation 71; the segment of circular arc has two ends E and F, when the first connection hole 18 is on the F end of the circular arc, the safety switch mechanism of the present invention is powered off; and when the first connection hole 18 is on the E end of the circular arc, the safety switch mechanism of the present invention is powered on. For the preferred embodiment of the present invention, an angle B between the segment of circular arc 70 and the center of rotation 71 is 130°. In addition, the pin component 5 includes a vertical axis 1 that passes through the center of rotation 71.

[0022] When it is necessary to power on the gardening tool, the knob 50 is rotated clockwise to drive the crank 17 to rotate, as a result, the connecting rod 13 gradually overlaps with the vertical axis a and pushes the pin member 41 upwards; when the connecting rod 13 rotates and passes through the vertical axis a, and forms an optimal angle A with the vertical axis a, the optimal angle A in the preferred embodiment being 8° (Fig.6), namely the first connection hole 18 of the crank 17 rotates to the E end of the circular arc 70. At this time, one positioning slot 23 of the crank 17 abuts against the positioning column 31 of the cover plate 33, such that the knob 50 stops rotating and the clamping portion 34 on the elastic sheet

21 is clamped and connected with the cover plate slot 24, at the same time, rise of the connecting rod 13 pushes the pin member 41; specifically, the lug boss 43 on the pin member 41 slides in the sliding slot 8 on the pin sleeve 4; when the lug boss 43 slides to the top of the sliding slot 8, it abuts against the sliding slot 8 and drives the pin sleeve 4 to move upwards. When rise of the pin sleeve 4 is blocked by the pin lock 3, the pin 48 on the pin member 41 passes through the through hole 2 on the pin sleeve and cooperates with the pin lock 3, such that the safety switch mechanism remains open. At this time, the compressed spring 11 is compressed, and the component force of the restoring force P on the connecting rod 13 is marked as K. The component force K generates a torque M2 to the crank 17, which is greater than the torque M1 generated by the torsional spring 27, and the two torques are opposite in direction. Therefore, the safety switch mechanism of the present invention can stably maintain the optimal angle A of the connecting rod 13; even if the gardening tool vibrates greatly in use, it will not stop working because of the pin member 41 separating from the pin lock 3. Thus it can be seen that the safety switch mechanism for a gardening tool of the present invention is good in durability and stability.

[0023] As shown in Fig.8-10, when it is necessary to shut down the safety switch mechanism, the knob 50 is rotated anticlockwise to drive the crank 17 to rotate anticlockwise, as a result, the connecting rod 13, the pin member 41 and the pin sleeve 4 move downwards; when the connecting rod 13 passes through the vertical axis a, even if the user lets the knob 50 go, because of the elastic restoring force of the compressed spring 11 and the torsional spring 27, the crank 17, the knob 50 and the connecting rod 13 will not stop, but automatically and continuously move till the pins 48 completely separate from the pin lock 3; therefore, it can prevent the pins 48 from being broken when the user pulls the cut-off material collecting box 102 out while the pins 48 are not completely separated from the pin lock. When the connecting rod 13 passes through the vertical axis a, and the first connection hole 18 of the crank 17 rotates to the F end of the circular arc, the other positioning slot 23 of the crank 17 abuts against the positioning column 31 of the cover plate 33; at this time, the crank 17 cannot rotate, and the knob stops rotating, so the safety switch mechanism is powered off.

[0024] As shown in Fig.11, the main body 101 of the gardening tool has a surface portion 111 with a discharge opening 113 for cut-off material (e.g. mown grass) or shredded pieces. Behind said opening and inside the main body a dangerous devices 115 may operate, such as a rotating knife or blade, a shredder or the like, driven by an electric or combustion motor 116. At said surface portion and preferably close to the discharge opening, the pin lock 3 may be arranged accessible from outside of the main body.

[0025] The cut-off material collecting box 102 has a surface portion 112 that is designed matching to the men-

tioned main body surface portion 111. It has a matching material receiving opening 114 and has the cover plate 33 and the devices 4 and 5 seqq at a location matching that of the pin lock 3.

[0026] When the collecting box 102 is not attached to the main body 101, the safety switch mechanism deenergizes the main body in that the electric supply to a driving motor 116 is interrupted by the pin lock 3 so that the dangerous device is forcedly in-operative. When the collecting box 102 is attached to the main body 101, the opening 113 of the body is closed. Concurrently, the pin lock 3 is engaged by the pins 48 of the pin member 41 and removes thereby the interruption of the electrical path. Accordingly, the driving motor is no longer forcedly in-operative, but can be operated by other and usual devices such as an electric switch (not shown).

[0027] What to be pointed out is that the above embodiment is only to describe the technical design and technical features of the present invention, such that the persons skilled in the art can understand and further implement the present invention, but not to limit the scope of protection of the present invention. All equivalent change or modification made on the basis of the spirit of the present invention shall belong to the scope of protection of the present invention.

Claims

1. A safety switch mechanism for a gardening tool, comprising a cover plate, a pin lock, and a pin component which is cooperated and connected with the pin lock, wherein the safety switch mechanism also comprises a crank which is rotatably mounted in the cover plate, a first elastic element which is connected between the crank and the cover plate, a connecting rod which connects the crank and the pin component, and a second elastic element which is cooperated and connected with the pin component.
2. The safety switch mechanism for a gardening tool according to claim 1, wherein the safety switch mechanism further comprises a knob that is fixedly connected with the crank.
3. The safety switch mechanism for a gardening tool according to claim 1, wherein the pin component includes a vertical axis, when the gardening tool is shut down, the knob is rotated anticlockwise to drive the connecting rod to turn around the vertical axis, then under the elastic restoring force of the first and second electric elements, the crank automatically resets and the connecting rod drives the pin component to completely separate from the pin lock.
4. The safety switch mechanism for a gardening tool according to claim 1, wherein the safety switch mechanism further comprises a crank cover that is

sleeved on the crank and mounted to the cover plate.

5. The safety switch mechanism for a gardening tool according to claim 1, wherein the first elastic element is a torsional spring, one end of the torsional spring is cooperated and connected with the cover plate, and the other end is cooperated and connected with the crank. 5
6. The safety switch mechanism for a gardening tool according to claim 1, wherein the crank is provided with a pair of positioning slots, and the cover plate is provided with a positioning column that can be selectively cooperated and connected with the positioning slots. 10 15
7. The safety switch mechanism for a gardening tool according to claim 1, wherein the crank is provided with an elastic sheet, and the cover plate is provided with a cover plate slot that can be cooperated and connected with the elastic sheet. 20
8. The safety switch mechanism for a gardening tool according to claim 1, wherein the pin component comprises a pin member and a pin sleeve, the pin member is slidably mounted in the pin sleeve that is cooperated and connected with the cover plate. 25
9. The safety switch mechanism for a gardening tool according to claim 8, wherein the second electric element is a compressed spring, which is mounted between the pin member and the pin sleeve. 30
10. The safety switch mechanism for a gardening tool according to any of claims 1-9, wherein the gardening tool is a shredder that comprises a main body and a cut-off material collecting box under the main body, and the safety switch mechanism is provided between the cut-off material collecting box and the main body. 35 40

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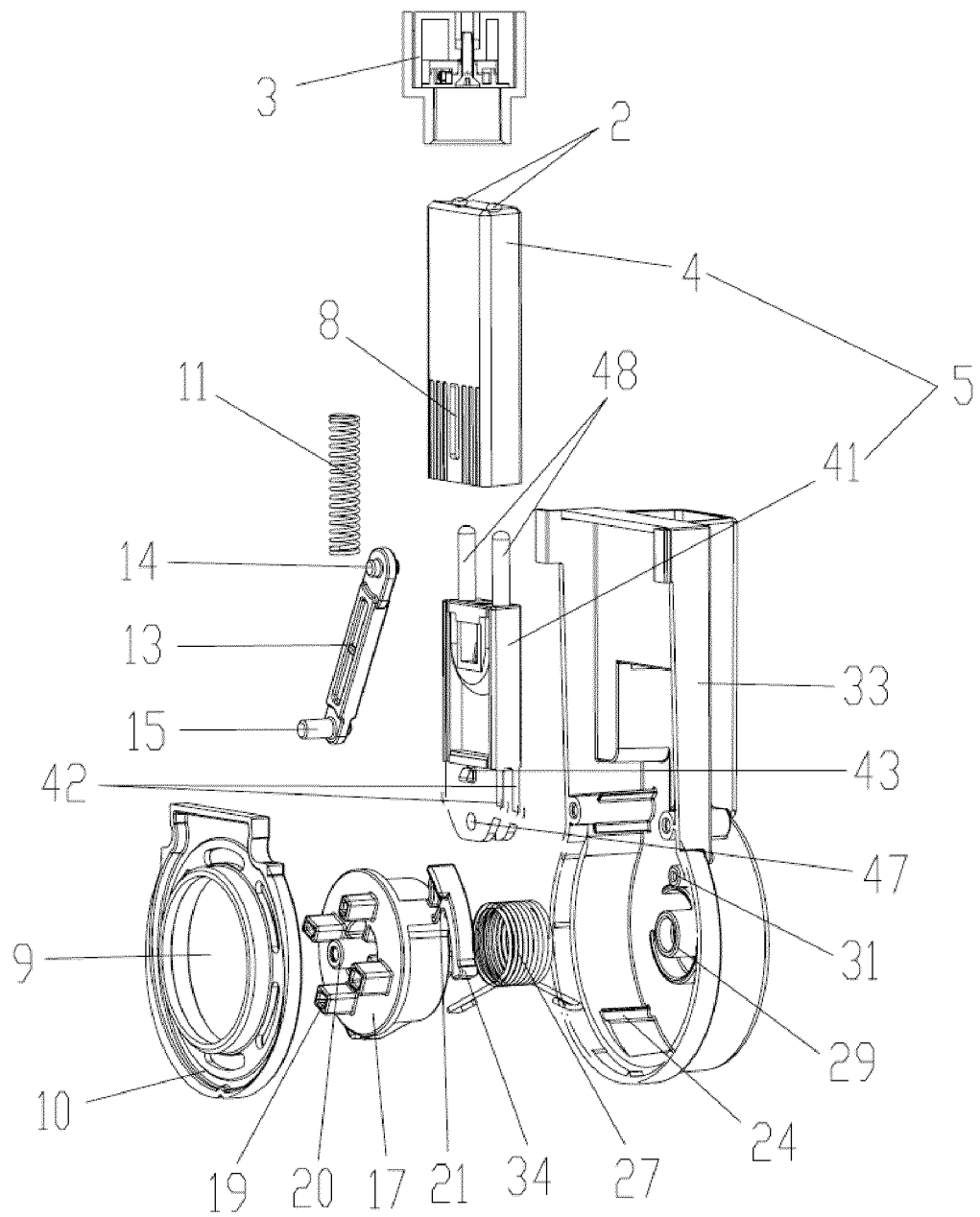


Fig.1

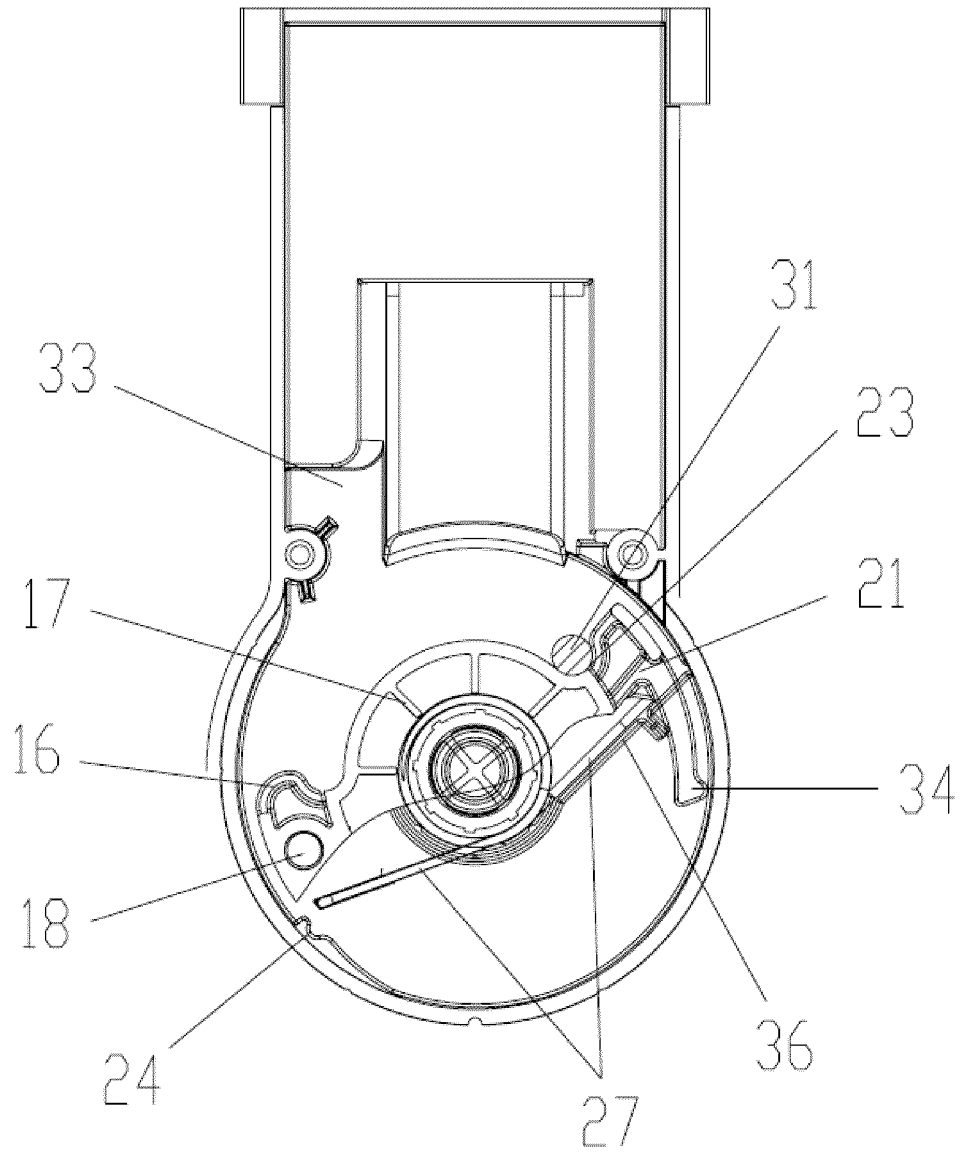


Fig.2

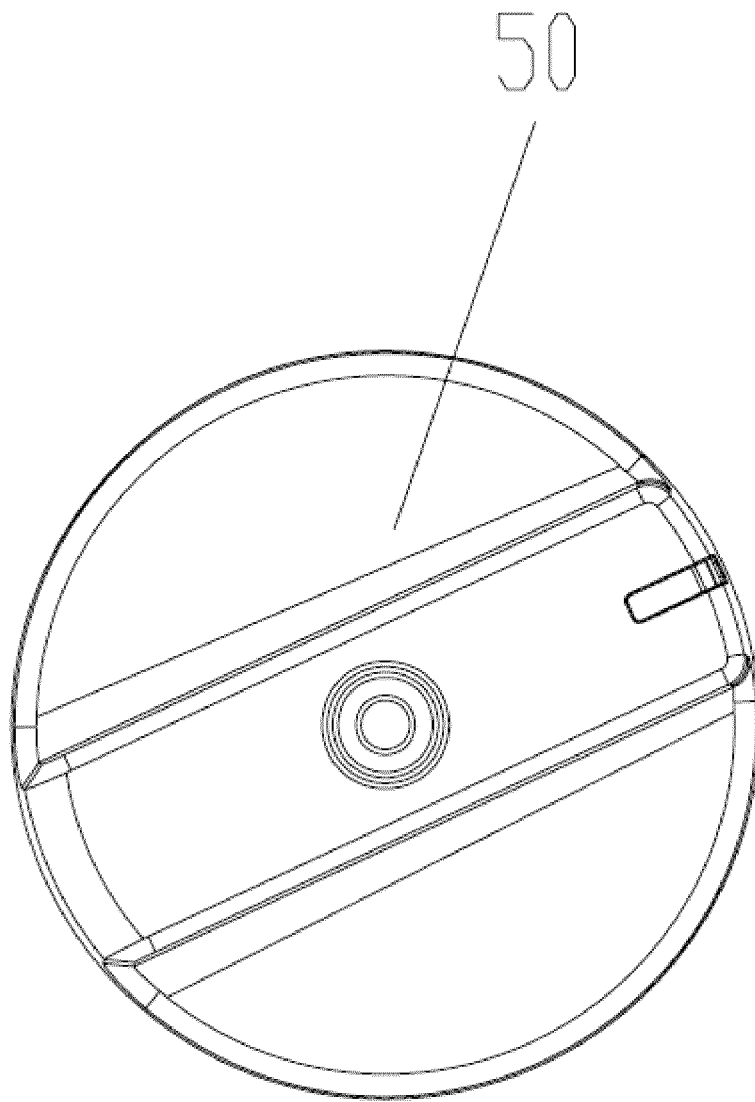


Fig.3

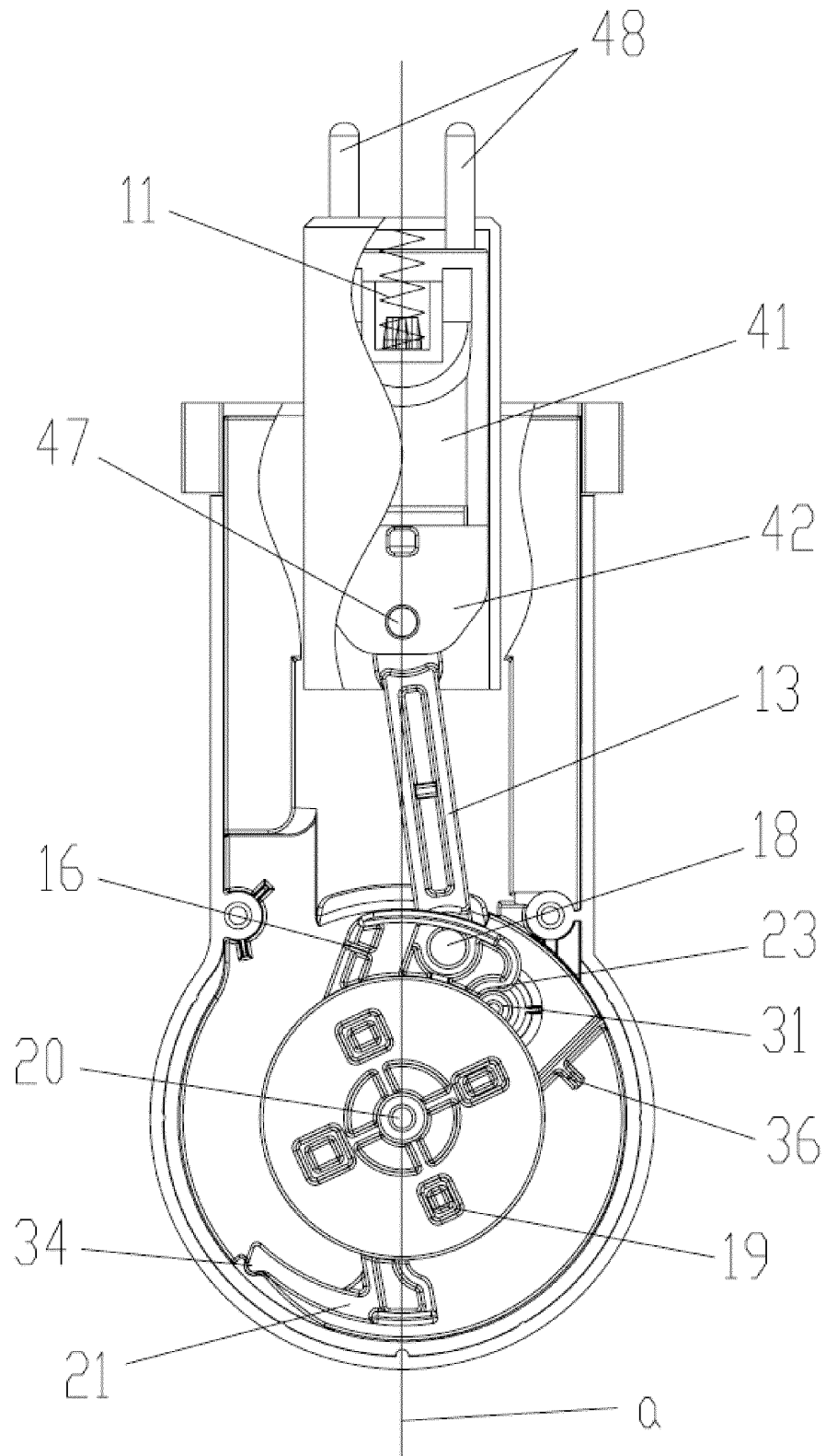


Fig.4

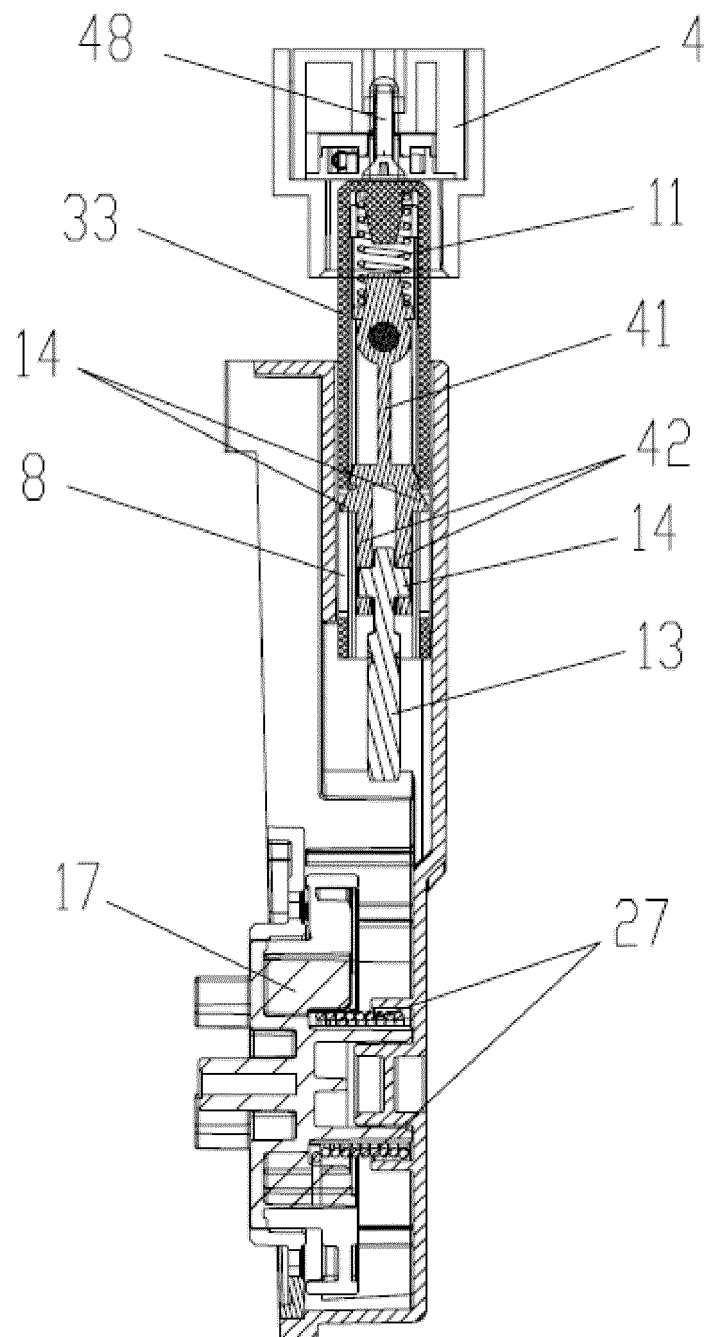


Fig.5

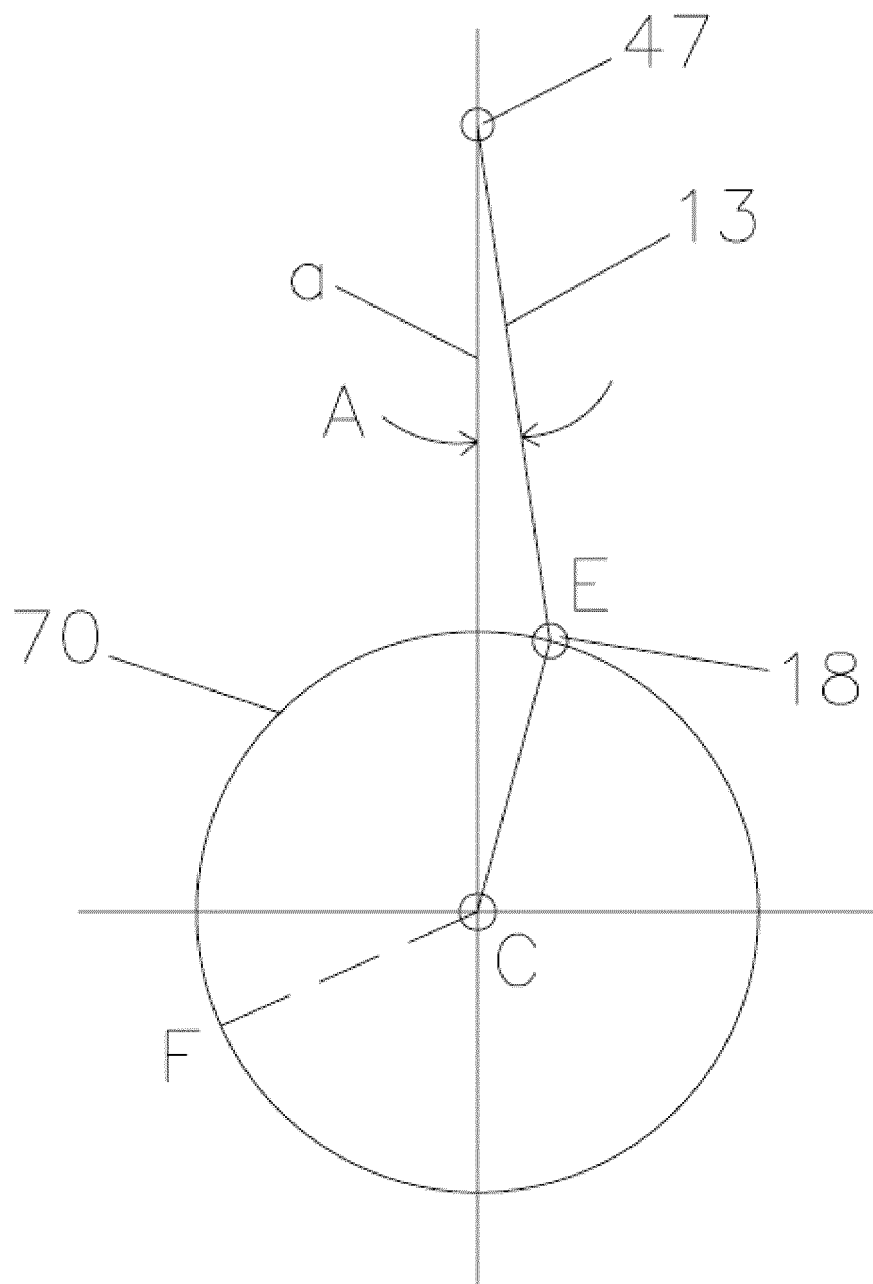


Fig.6

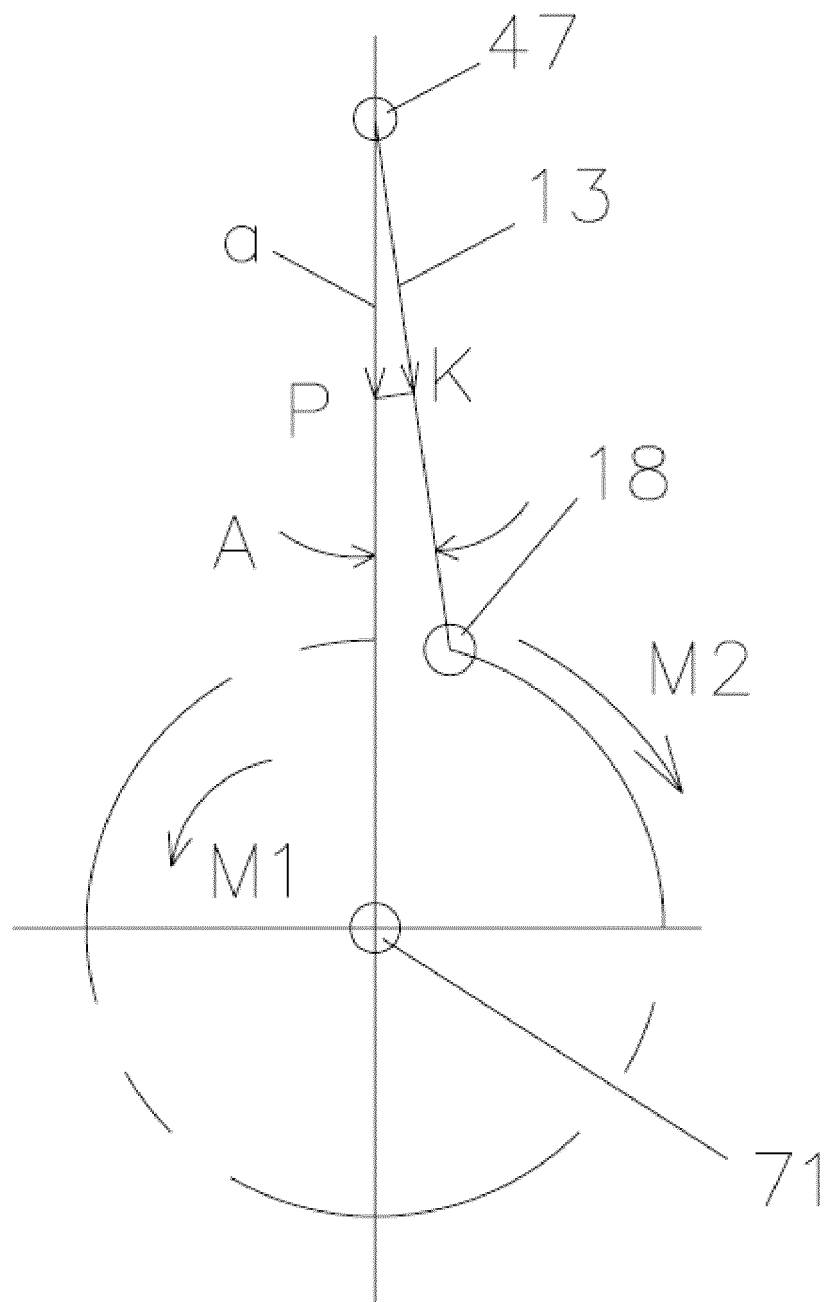


Fig.7

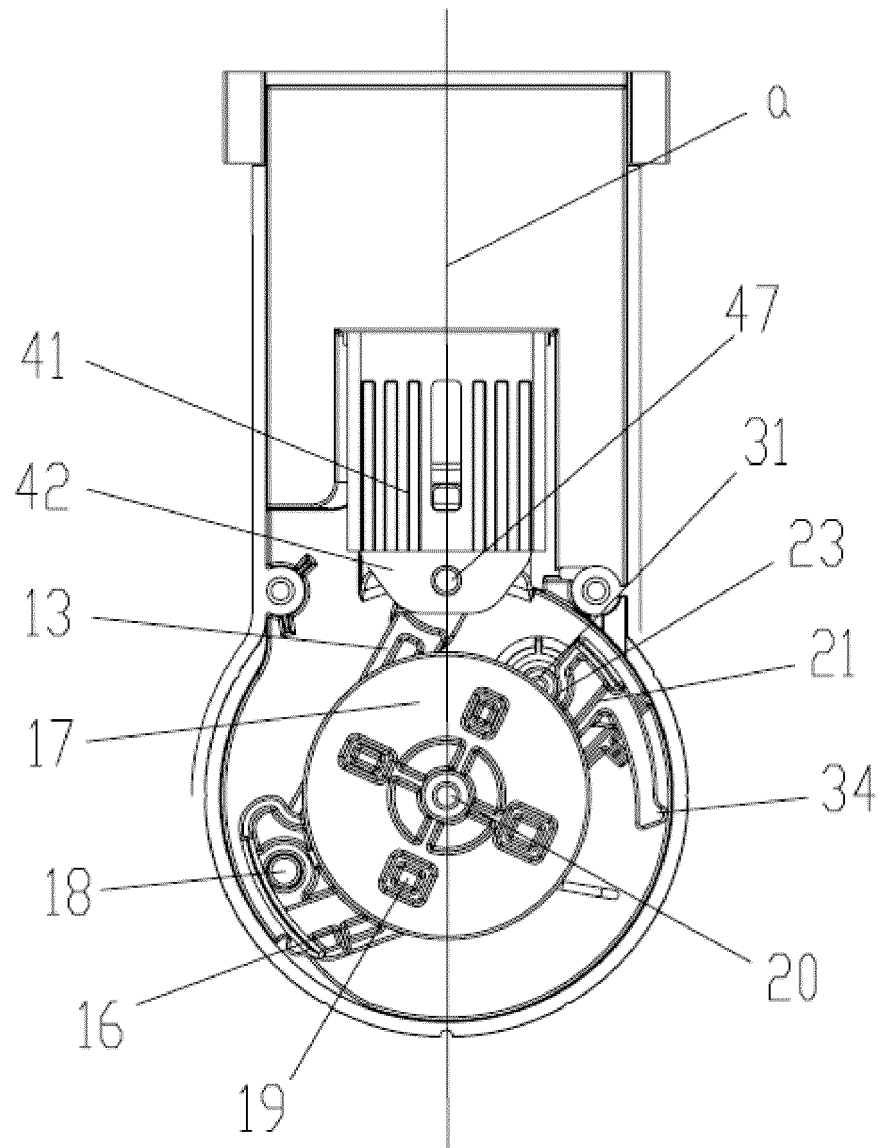


Fig.8

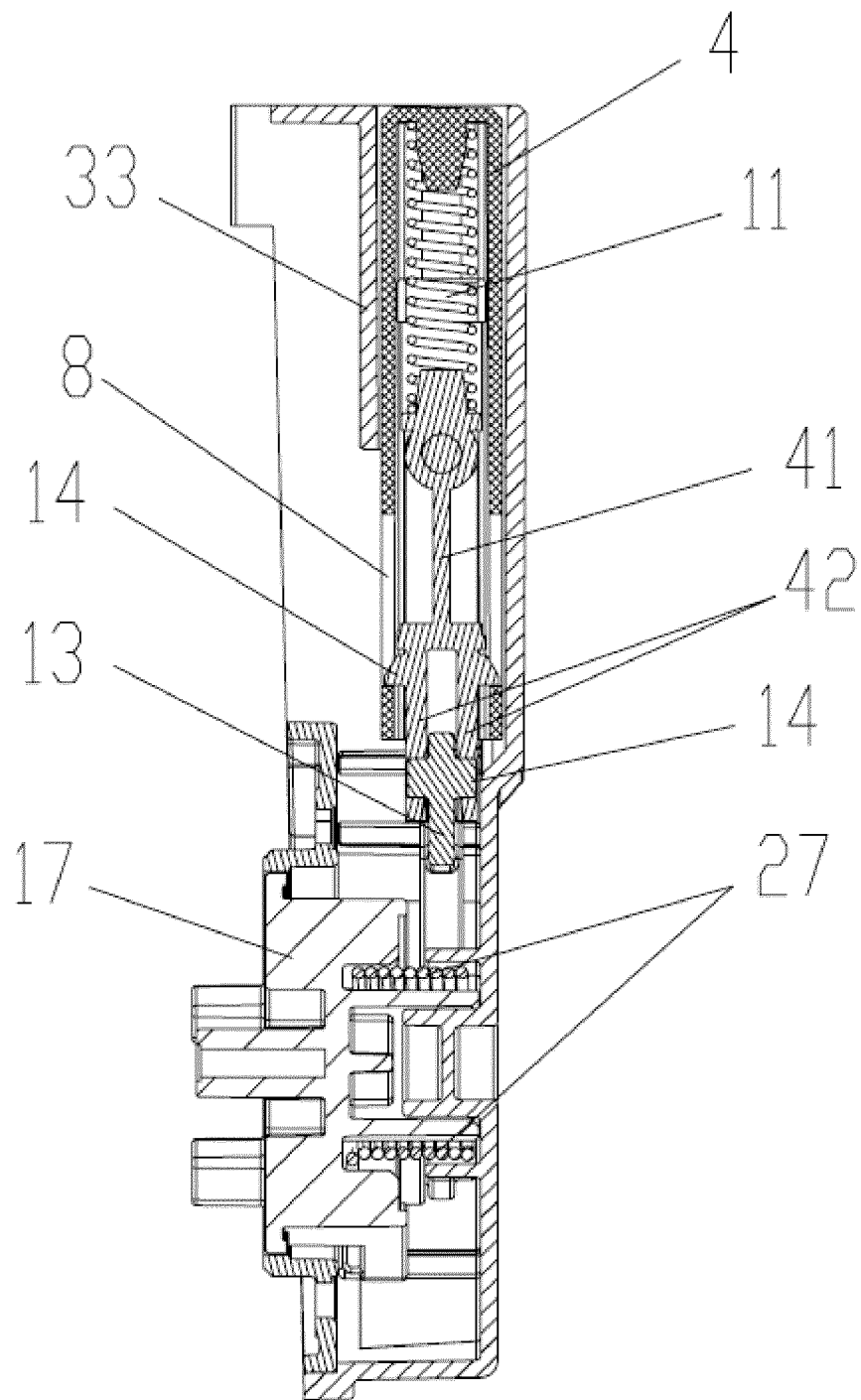


Fig.9

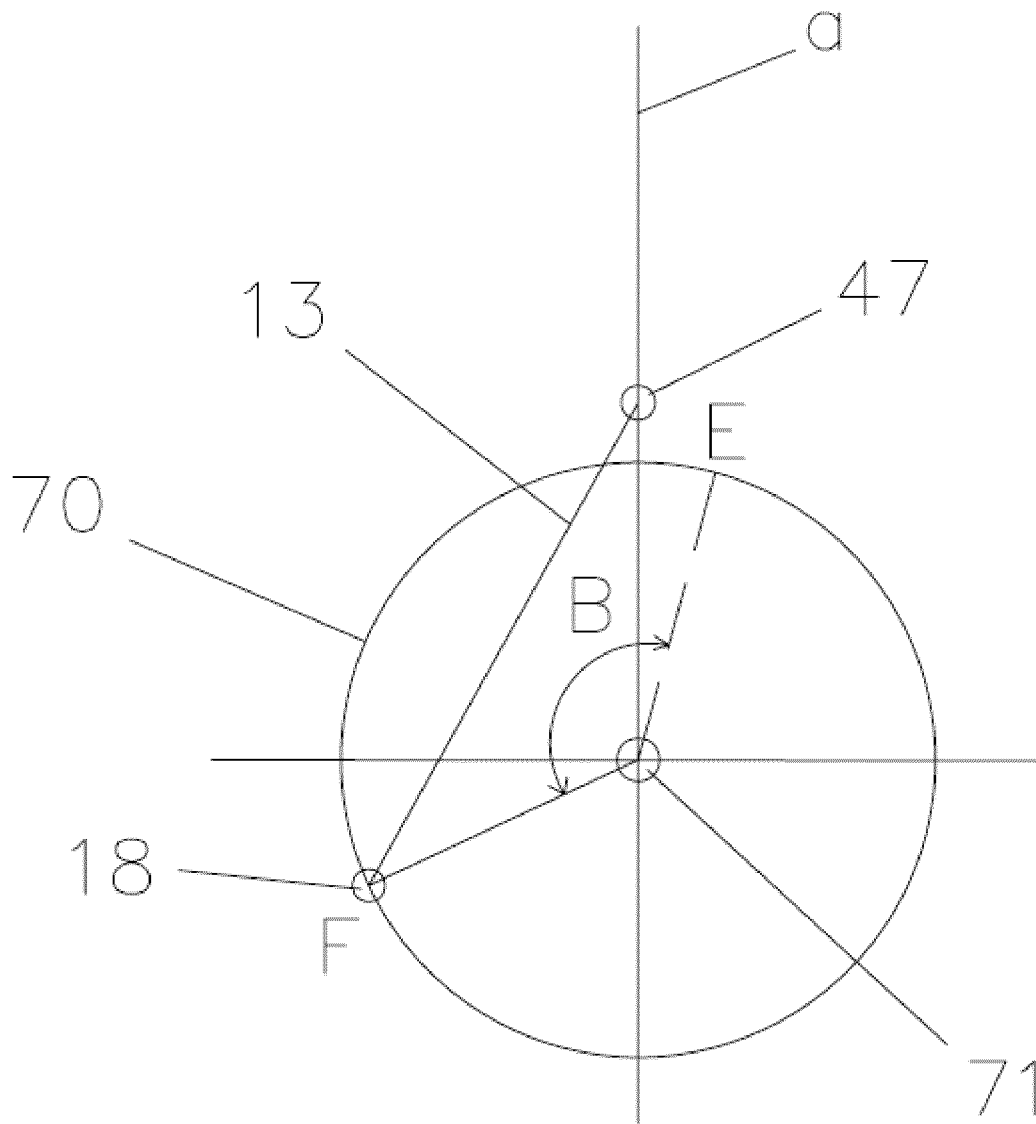


Fig.10

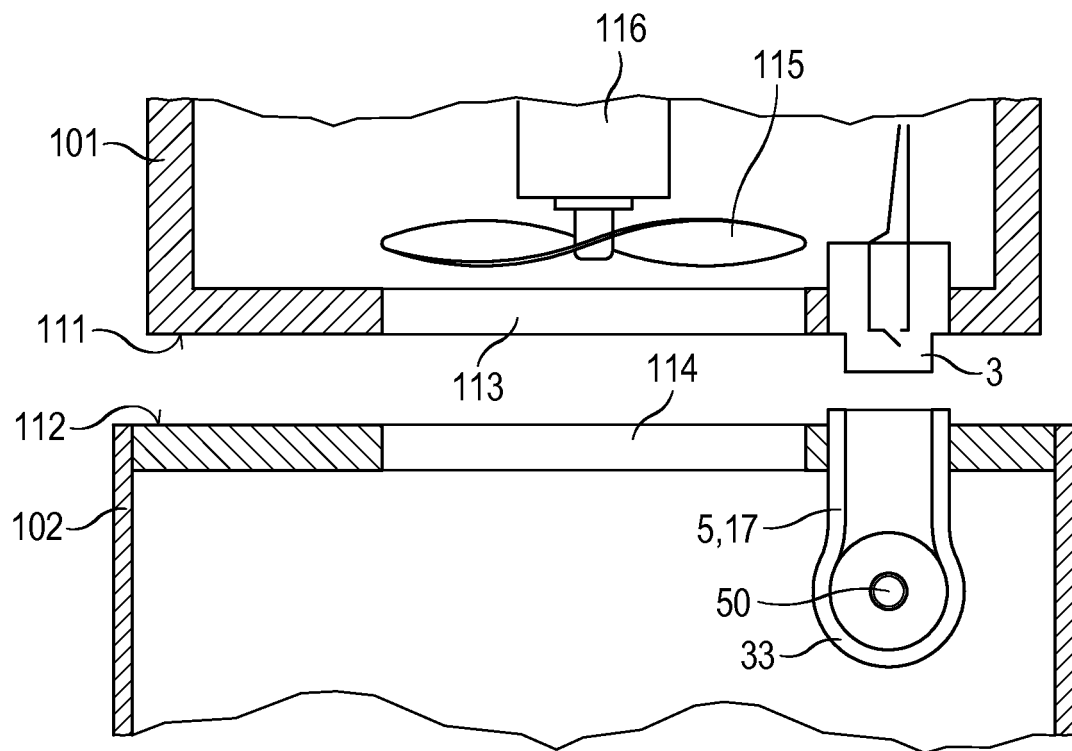


Fig. 11