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(54) **ELECTRONIC ATOMIZATION DEVICE**

(57) An electronic atomization device is provided, including: a shell (10) having a proximal end (110) and a distal end (120), a liquid storage cavity (112), a heating element (14), and a battery core (40); an end cap element (20), configured to close the distal end (120) of the shell (10), where the end cap element (20) can be detached from the shell (10) to open the distal end (120), to allow the battery core (40) to be taken out, and the end cap element (20) can switch between a first locked state and a first unlocked state, so as to be selectively prevented from being or allowed to be detached from the shell (10); and an operating element (22), having a first connection state and a second connection state relative to the end cap element (20), where the operating element (22) is configured to, in the first connection state, be prevented from unlocking and driving the end cap element (20) to be detached, and to, in the second connection state, be allowed to unlock and drive the end cap element to be detached (20). Only when the operating element (22) and the end cap element (20) are in the second connection state, the end cap element (20) can be unlocked and

detached, which helps prevent a user from easily detaching the end cap element (20) to take out the battery core (40).

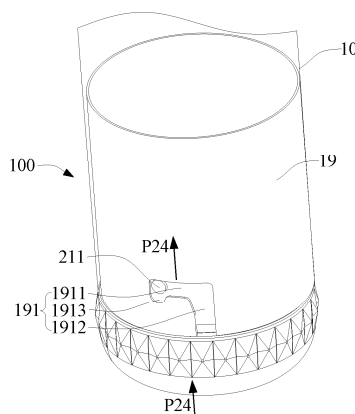


FIG. 17

## Description

### CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This application claims priority to Chinese Patent Application No. 202322664177.9, filed with the China National Intellectual Property Administration on September 28, 2023 and entitled "ELECTRONIC ATOMIZATION DEVICE", which is incorporated herein by reference in its entirety.

### TECHNICAL FIELD

**[0002]** Embodiments of this application relate to the field of electronic atomization technologies, and in particular, to an electronic atomization device.

### BACKGROUND

**[0003]** During use of tobacco products (for example, cigarettes and cigars), tobaccos are burnt to generate tobacco smoke. An attempt has been made to replace these tobacco-burning products by producing products that release compounds without burning.

**[0004]** An example of such products is a heating device, which releases compounds by heating rather than burning materials. For example, the materials may be tobacco or other non-tobacco products, where the non-tobacco products may or may not include nicotine. In another example, aerosol providing products exist, for example, the so-called electronic atomization devices. The devices usually include liquid. The liquid is heated to be atomized, so as to generate an inhalable aerosol. In a conventional electronic atomization device, a battery core that supplies power is usually fixed inside a shell of the device, and a detachable end cap is arranged at a distal end of the shell. The distal end is opened by detaching the end cap to allow the battery core to be taken out or replaced.

### SUMMARY

**[0005]** An embodiment of this application provides an electronic atomization device, including a shell having a proximal end and a distal end facing away from each other along a longitudinal direction, and

a liquid storage cavity, configured to store a liquid substrate;

a heating element, configured to heat the liquid substrate to generate an aerosol;

a battery core, configured to provide electric power to the heating element;

an end cap element, at least partially closing the distal end of the shell, and detachably connected to the shell, where the end cap element is constructed to be detachable from the shell to open the distal end of the shell, to allow the battery core

to be taken out from the distal end of the shell; and the end cap element is switchable between a first locked state and a first unlocked state, in the first locked state, is prevented from being detached from the shell, and in the first unlocked state, allowed to be detached from the shell; and

an operating element, connected to the end cap element and having a first connection state and a second connection state relative to the end cap element, where the operating element is arranged, in the first connection state, to be prevented from driving the end cap element to move from the first locked state to the first unlocked state and/or driving the end cap element to be detached from the shell; and the operating element is arranged, in the second connection state, to be allowed to drive the end cap element to move from the first locked state to the first unlocked state and/or drive the end cap element to be detached from the shell.

**[0006]** In some embodiments, an air inlet is provided on the end cap element, so as to allow air to enter the electronic atomization device; and

in the first connection state, the operating element is operable by a user to move between an open position and a closed position relative to the end cap element; and the operating element opens the air inlet in the open position, and closes the air inlet in the closed position.

**[0007]** In some embodiments, the end cap element is drivable by the operating element to move along the longitudinal direction of the shell, to move from the first locked state to the first unlocked state.

**[0008]** In some embodiments, in the first unlocked state, the end cap element is drivable by the operating element to rotate relative to the shell and/or move along the longitudinal direction of the shell, and then is detached from the shell.

**[0009]** In some embodiments, the electronic atomization device further includes:

a connecting element, fixedly connected to the shell, and at least partially surrounding the end cap element, where the end cap element is detachably connected to the connecting element, so as to form a detachable connection with the shell.

**[0010]** In some embodiments, the electronic atomization device further includes:

an engagement groove and an engagement protrusion, where the engagement groove is provided on one of the connecting element and the end cap element, and the engagement protrusion is arranged on the other of the connecting element and the end cap element; and

the engagement groove includes a first portion extending along a circumferential direction of the shell, a notch provided at a first end of the first portion, and a second portion extending out from a second end of the first portion along the longitudinal direction of the

shell; and the engagement protrusion is configured to be retained in the notch to define the first locked state of the end cap element, and the engagement protrusion is configured to be detachable from the notch to define the first unlocked state of the end cap element.

**[0011]** In some embodiments, the operating element is configured to be operable by a user operation to switch between a second locked state and a second unlocked state, in the second locked state, is prevented from moving between the closed position and the open position, and in the second unlocked state, is allowed to move between the closed position and the open position.

**[0012]** In some embodiments, the electronic atomization device further includes:  
a locking structure, configured to define the second locked state of the operating element in the open position and/or the closed position.

**[0013]** In some implementations, the locking structure includes:

a protruding edge, arranged on the operating element; and

a blind hole, arranged on the end cap element, where the protruding edge is configured to extend into the air inlet in the open position, and extend into the blind hole in the closed position.

**[0014]** In some implementations, the locking structure includes:

a limiting protrusion, arranged on the operating element; and

a first locking groove and a second locking groove, spaced apart from each other along a circumferential direction of the end cap element, where the limiting protrusion is configured to, in the open position, extend into the first locking groove, and in the closed position, extend into the second locking groove.

**[0015]** In some embodiments, the electronic atomization device further includes:

an elastic element, configured to provide a bias when the operating element is in the closed position and/or in the open position, thereby driving the operating element to switch from the second unlocked state to the second locked state, or the elastic element is configured to provide the bias to the operating element to maintain the operating element in the second locked state.

**[0016]** In some embodiments, the operating element in the first connection state is independently movable relative to the end cap element; and/or

the operating element in the second connection state is allowed to only move together with the end cap element.

**[0017]** In some embodiments, in the first connection state, a first spacing is defined between the operating

element and the shell, and in the second connection state, a second spacing is defined between the operating element and the shell; and  
the first spacing is greater than the second spacing.

**[0018]** In some embodiments, the operating element is rotatable about a central axis thereof by a first angle, to move between the open position and the closed position;

the operating element is rotatable about the central axis thereof by a second angle, to change from the first connection state to the second connection state; and  
the first angle is less than the second angle.

**[0019]** According to the foregoing electronic atomization device, only when the operating element and the end cap element are in the second connection state, the end cap element can be unlocked and detached, which helps prevent a user from easily detaching the end cap element to take out the battery core.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0020]** One or more embodiments are illustratively described with reference to the figures in the corresponding accompanying drawings, and these illustrative descriptions are not to limit the embodiments. Elements having same reference numerals in the accompanying drawings are denoted as similar elements, and the figures in the accompanying drawings are not drawn to scale, unless particularly stated otherwise.

FIG. 1 is a schematic structural diagram of an electronic atomization device from a perspective according to an embodiment;

FIG. 2 is a schematic structural diagram of the electronic atomization device in FIG. 1 from another perspective;

FIG. 3 is a schematic cross-sectional view of the electronic atomization device in FIG. 1 from a perspective;

FIG. 4 is a schematic structural diagram of the electronic atomization device in FIG. 1 from another perspective;

FIG. 5 is a schematic exploded view of some components of the electronic atomization device in FIG. 4;

FIG. 6 is a schematic exploded view of an end cap assembly in FIG. 5 from a perspective;

FIG. 7 is a schematic exploded view of the end cap assembly in FIG. 6 from another perspective;

FIG. 8 is a schematic structural diagram of the end cap element in FIG. 6 from another perspective;

FIG. 9 is a schematic diagram of an operating element and an end cap element in an end cap assembly being locked in an open position in a first connection state;

FIG. 10 is a schematic diagram of unlocking the

operating element and the end cap element from an open position in a first connection state in FIG. 9; FIG. 11 is a schematic diagram of the operating element and the end cap element being rotated to a closed position in a first connection state in FIG. 10; FIG. 12 is a schematic diagram showing that the operating element is pressed in a closed position to form a locked state in FIG. 11;

FIG. 13 is a schematic cross-sectional view of an operating element in a closed position after locking is formed from another perspective;

FIG. 14 is a schematic diagram of unlocking an operating element and an end cap element in a first connection state from another perspective;

FIG. 15 is a schematic diagram showing that the operating element rotates to a detaching operation position in FIG. 14;

FIG. 16 is a schematic diagram showing that the operating element is press-coupled to the end cap element in a detaching operation position to form a second connection state in FIG. 15;

FIG. 17 is a schematic diagram of pressing the operating element to drive unlocking of the end cap element in FIG. 16;

FIG. 18 is a schematic diagram showing that the operating element is rotated and pulled to drive the end cap element to be separated from a connecting element, to detach the end cap assembly from the electronic atomization device in FIG. 17; and

FIG. 19 is a schematic diagram of removing a battery core from a distal end after the end cap assembly is disassembled from the electronic atomization device in FIG. 18.

## DETAILED DESCRIPTION

**[0021]** Technical solutions in embodiments of this application are clearly and completely described below with reference to accompanying drawings in the embodiments of this application. Apparently, the described embodiments are merely some rather than all of the embodiments of this application. All other embodiments obtained by a person of ordinary skill in the art based on the embodiments of this application without creative efforts fall within the protection scope of this application.

**[0022]** Terms "first", "second", and "third" in this application are merely intended for a purpose of description, and shall not be understood as an indication or implication of relative importance or implicit indication of the quantity or order of indicated technical features. All directional indications (for example, up, down, left, right, front, and back) in the embodiments of this application are only used for explaining relative position relationships, movement situations, or the like among the various components in a specific posture (as shown in the drawings). If the specific posture changes, the directional indication changes accordingly. In addition, terms "include", "have", and any variant thereof are intended to cover a non-

exclusive inclusion. For example, a process, a method, a system, a product, or a device that includes a series of steps or units is not limited to the listed steps or units, and instead, further optionally includes a step or unit that is not listed, or further optionally includes another step or unit that is intrinsic to the process, the method, the product, or the device.

**[0023]** The "embodiment" mentioned in the specification means that particular features, structures, or characteristics described with reference to the embodiments may be included in at least one embodiment of this application. The phrase appearing at various locations in this specification does not necessarily indicate a same embodiment, and is not an independent or alternative embodiment exclusive to another embodiment. A person skilled in the art explicitly or implicitly understands that the embodiments described in the specification may be combined with other embodiments.

**[0024]** It should be noted that when an element is considered to be "fixed" to another element, the element may be directly on the other element or an intermediate element may exist. When an element is considered to be "connected to" another element, the element may be directly connected to another element, or one or more intermediate elements may simultaneously exist therebetween. Terms "vertical", "horizontal", "left", "right", and similar expressions used in this specification are only for purpose of illustration, and do not represent a unique implementation.

**[0025]** This application provides an electronic atomization device, which is configured to atomize a liquid substrate to generate an aerosol.

**[0026]** FIG. 1 and FIG. 2 show schematic diagrams of an electronic atomization device 100 according to an embodiment, which includes a plurality of components arranged in an external body or a shell (which may be referred to as a housing). An overall design of the external body or the shell may be changed, and a form or a configuration of the external body that may define an overall dimension and a shape of the electronic atomization device 100 may be changed. Generally, an elongated body may be formed from a single integrated housing, or the elongated housing may be formed from two or more separable bodies.

**[0027]** For example, the electronic atomization device 100 may have a control body at an end. The control body includes a housing containing one or more reusable components (for example, storage batteries such as rechargeable batteries and/or rechargeable supercapacitors, and various electronic devices for controlling an operation of a product), and have the external body or the shell for inhalation at an other end.

**[0028]** In some embodiments, the external body or the shell of the electronic atomization device 100 substantially defines an external surface of the electronic atomization device 100. In specific embodiments shown in FIG. 1 and FIG. 2, the electronic atomization device 100 includes:

a shell 10 that may include one or more reusable components. The shell 10 has a proximal end 110 and a distal end 120 that are opposite to each other along a longitudinal direction. During use, the proximal end 110 is an end close to a user for inhalation, and the distal end 120 is an end away from the user.

**[0029]** In some examples, the shell 10 may be formed by metal or an alloy such as stainless steel or aluminum, or another suitable material includes various plastic (for example, polycarbonate), metal-plating over plastic, ceramic, and the like.

**[0030]** In some embodiments, the shell 10 is jointly formed by a plurality of components. In addition, in some embodiments, the shell 10 is open at the distal end 120. As shown in FIG. 3 to FIG. 5, the shell 10 includes: a first housing portion 11 and a second housing portion 12. The first housing portion 11 is close to or defines the proximal end 110, and the second housing portion 12 is close to or defines the distal end 120.

**[0031]** As shown in FIG. 1 to FIG. 5, the electronic atomization device 100 further includes:

an air outlet 113, configured for inhalation by the user, where the air outlet 113 is located at the proximal end 110 of the shell 10 and is defined or formed by the first housing portion 11; and

a liquid storage cavity 112, configured to store the liquid substrate and an atomization assembly configured to absorb the liquid substrate from the liquid storage cavity 112 and heat and atomize the liquid substrate. To facilitate atomization and output, the liquid storage cavity 112 and the atomization assembly are both arranged close to the proximal end 110. The electronic atomization device 100 further includes an aerosol output tube 111 arranged along the longitudinal direction. The aerosol output tube 111 at least partially extends in the liquid storage cavity 112, and a space between an outer wall of the aerosol output tube 111 and an inner wall of the shell 10 forms the foregoing liquid storage cavity 112. An end portion of the aerosol output tube 111 opposite to the proximal end 110 is in communication with the air outlet 113, to output the aerosol atomized and generated by the atomization assembly to the air outlet 113 for inhalation.

**[0032]** In the embodiment shown in FIG. 3, the atomization assembly configured to atomize the liquid substrate includes:

a liquid guide element 13, made of a capillary material or a porous material, for example, a sponge, a cotton fiber, or a porous body such as a porous ceramic body, where the liquid guide element 13 is arranged perpendicular to a longitudinal direction of the shell 10, and the liquid guide element 13 is in flow communication with the liquid storage cavity 112, to absorb the liquid substrate sourced from the liquid

storage cavity 112; and

a heating element 14, engaged with an exterior of the liquid guide element 13, where in FIG. 3, for example, the heating element 14 is a spiral coil, a heating mesh, or the like that encircles or wraps a portion of the liquid guide element 13. The heating element 14 is configured to heat at least part of the liquid substrate in the liquid guide element 13 to generate an aerosol.

**[0033]** Alternatively, in some other variant implementations, the liquid guide element 13 may further be constructed in various regular or irregular shapes, and partially in fluid communication with the liquid storage cavity 112 to receive the liquid substrate. Alternatively, in another variant implementation, the liquid guide element 13 may have more regular or irregular shapes, such as a polygonal block shape, a channel shape having a groove on a surface, or an arch shape having a hollow channel inside.

**[0034]** Alternatively, in some other variant implementations, the heating element 14 may be coupled to the liquid guide element 13 through printing, deposition, sintering, physical assembly, or the like. In some other variant implementations, the liquid guide element 13 may have a plane or curved surface for supporting the heating element 14, and the heating element 14 is formed on a plane or a curved surface of the porous body 14 through mounting, printing, deposition, and the like. Alternatively, in some other variant implementations, the heating element 14 is a conductive trajectory formed on a surface of the liquid guide element 13. In an implementation, the conductive trajectory of the heating element 14 may be in a form of a printed circuit formed by printing. In some implementations, the heating element 14 is a patterned conductive trajectory. In some other implementations, the heating element 14 is planar. In an implementation, the heating element 14 is a conductive trajectory extending in a circuitous, meandering, reciprocal, or zigzagging manner.

**[0035]** Referring to FIG. 3, the shell 10 is further provided therein with:

an upper support element 15 and a lower support element 16, which are configured to be located at two sides of the liquid guide element 13 in the longitudinal direction, so as to respectively sandwich and support the liquid guide element 13 from upper and lower sides. After assembly, the liquid guide element 13 is supported and sandwiched between the upper support element 15 and the lower support element 16. A liquid channel 151 is arranged on the upper support element 15. During use, a liquid substrate in the liquid storage cavity 112 passes through the liquid channel 151 of the upper support element 15 and then is delivered to the liquid guide element 13, as shown by an arrow R1 in FIG. 3. The upper support element 15 and the lower support element 16 further define an empty cavity surrounding the liquid guide element 13 and/or the heating element 14. The

empty cavity is used as an atomization chamber, to release the aerosol generated by the heating element 14 through heating.

**[0036]** Referring to FIG. 3, the shell 10 is further provided therein with:

a flexible sealing element 17 arranged between the first housing portion 11 and the upper support element 15, to provide sealing therebetween.

**[0037]** Referring to FIG. 3, the shell 10 is further provided therein with:

a battery core 40, configured to provide power for the heating element 14, where the battery core 40 is arranged close to the distal end 120, or the battery core 40 is accommodated and mounted in the second housing portion 12;

a circuit board 60, arranged between the battery core 40 and the lower support element 16 to guide a current between the battery core 40 and the heating element 14, where the circuit board 60 is arranged substantially perpendicular to the longitudinal direction of the electronic atomization device 100;

a first elastic electrical contact 62, extending from the battery core 40 to the circuit board 60 to conductively connect the battery core 40 to the circuit board 60, where one end of the first elastic electrical contact 62 is soldered to or abuts against the circuit board 60, an other end of the first elastic electrical contact abuts against or is detachably connected to a positive electrode/negative electrode of the battery core 40 to form an electrical conduction, and the first elastic electrical contact 62 is separable from the battery core 40; and

a second elastic electrical contact 61, where the second elastic electrical contact extends from the circuit board 60 to the lower support element 16 and is soldered, in contact, or the like with electrically conductive pins at two ends of the heating element 14 in the lower support element 16 to form an electrically conductive connection, so as to connect the heating element 14 to the circuit board 60.

**[0038]** Referring to FIG. 3, the shell 10 is further provided therein with:

an internal support 18, located in the second housing portion 12, and located between the battery core 40 and the circuit board 60 along the longitudinal direction, where the internal support 18 is configured to support and hold the circuit board 60 and the first elastic electrical contact 61, and the internal support 18 is configured to at least partially accommodate and surround the battery core 40.

**[0039]** The circuit board 60 is further provided with an air flow sensor such as a microphone sensor or a micro-electro-mechanical system (MEMS) sensor, so as to sense an air flow that is generated through inhalation by the user through the air outlet 113 and flows through the air flow channel. Further, the electronic atomization

device 100 and/or the circuit board controls, based on a sensing result of the air flow sensor, the battery core 40 to provide power for the heating element 14, so as to heat and atomize the liquid substrate to generate the aerosol.

**[0040]** Referring to FIG. 3 to FIG. 5, the electronic atomization device 100 further includes:

an end cap assembly 20, engaged with and closing the distal end 120 of the shell 10, where the end cap assembly 20 may be removed and detached from the distal end 120 of the shell 10. After the end cap assembly 20 is removed or detached from the distal end 120 of the shell 10, the distal end 120 of the shell 10 can be opened up or unlocked, so that the battery core 40 can be taken out from the distal end 120 of the shell 10 or left out of the shell 10.

**[0041]** To form a detachable connection between the end cap assembly 20 and the distal end 120 of the shell 10, referring to FIG. 3 to FIG. 5, the electronic atomization device 100 further includes:

a connecting element 19, where the connecting element 19 is located in the shell 10 and arranged at the distal end 120 in this embodiment; the connecting element 19 is fixedly connected to the second housing portion 12 of the shell 10 in a close-fitting manner such as staking or interference; and during use, the end cap assembly 20 is detachably connected to the connecting element 19, thereby establishing a detachable connection to the shell 10. In the embodiment, the connecting element 19 is made of a rigid alloy, such as stainless steel or polymer plastic.

**[0042]** Referring to FIG. 3 to FIG. 5, the connecting element 19 is substantially arranged in a circular shape. The connecting element 19 is provided with an engagement groove 191 that is configured to connect to the end cap assembly 20. Referring to FIG. 3 to FIG. 5, the end cap assembly 20 at least partially extends into the connecting element 19. The end cap assembly 20 is provided with an engagement protrusion 211. During use, the engagement protrusion 211 is protruded into the engagement groove 191, thereby fixedly connecting the end cap assembly 20 to the shell 10.

**[0043]** As shown in FIG. 3, the end cap assembly 20 at least partially extends into the shell 10 from the distal end 120 after assembly. Moreover, an air inlet avoidance hole 221 is provided on the end cap assembly 20, so as to allow external air to enter the electronic atomization device 100 after assembly. During inhalation, an air flow path passing through the electronic atomization device 100 is shown by an arrow R2 in FIG. 3. The external air enters from the air inlet avoidance hole 221 of the end cap assembly 20, and is delivered to the heating element 14 through a gap between the battery core 40 and the shell 10 and the lower support element 16. Then, the external air carries the aerosol from the atomization chamber, and outputs the aerosol to the air outlet 113 through the aerosol output tube 111 for inhalation by the user.

**[0044]** As shown in FIG. 6 to FIG. 8, the end cap assembly 20 includes:

an end cap element 21, substantially in a shape of a cup or a recess, where the end cap element 21 is substantially located in the shell 10 and/or the connecting element 19 after assembly; and in one aspect, the end cap element 21 is configured to connect to the connecting element 19, thereby detachably connecting the end cap assembly 20 to the shell 10; in another aspect, the end cap element 21 is configured to mount and retain another component of the end cap assembly 20;

an operating element 22, engaged with the end cap element 21 and constructed to move relative to the end cap element 21, where the operating element 22 covers and closes the distal end 120 of the shell 10 after assembly, and the operating element 22 is at least partially exposed outside the distal end 120 of the shell 10, allowing the user to perform an operation, for example, a pressing operation or a rotation operation;

a sealing element 23, located between the operating element 22 and the end cap element 21 to provide sealing therebetween;

a countersunk head screw 24, where the countersunk head screw is at least partially located in the end cap element 21, and is connected to the operating element 22 after passing through the end cap element 21, thereby forming a rotatable connection between the operating element 22 and the end cap element 21, to prevent the operating element 22 from being detached or separated from the end cap element 21; and

an elastic element 25, for example, a spring, configured to provide an elastic force to bias the operating element 22 toward the end cap element 21.

**[0045]** As shown in FIG. 6 to FIG. 8, an outer side surface of the operating element 22 is constructed to be in a bumpy shape, so that the user is facilitated to operate a movement of the operating element 22 by combining a finger with the outer side surface of the operating element 22 to apply an action force.

**[0046]** As shown in FIG. 6 to FIG. 8, the air inlet avoidance hole 221 is provided on the operating element 22, so that after being selectively aligned and conducted with an air inlet 216 on the end cap element 21, the external inlet air is allowed to enter the electronic atomization device 100 during inhalation.

**[0047]** As shown in FIG. 6 to FIG. 8, the operating element 22 is provided with a protruding edge 222 extending toward the end cap element 21. The protruding edge 222 is constructed to be an annulus surrounding and defining the air inlet avoidance hole 221. The protruding edge 222 is further configured to extend into the end cap element 21, so as to prevent rotation of the operating element 22 relative to the end cap element 21, thereby allowing the operating element 22 to form a locked state relative to the end cap element 21.

**[0048]** As shown in FIG. 6 to FIG. 8, an inner side wall of

the operating element 22 is further provided with a limiting protrusion 223, which is configured to limit a rotation angle or a travel in a process in which the operating element 22 rotates relative to the end cap element 21.

**[0049]** As shown in FIG. 6 to FIG. 8, the operating element 22 is further provided with a connecting portion 224, which is configured to accommodate and assemble with the countersunk head screw 24.

**[0050]** As shown in FIG. 6 to FIG. 8, the end cap element 21 is provided with:

an engagement protrusion 211, arranged on an outer side surface of the end cap element 21 and configured to detachably connect, through extending into the engagement groove 191 of the connecting element 19, the end cap element 21 to the shell 10; an air inlet 215, configured to be aligned with and in communication with the air inlet avoidance hole 221 on the operating element 22 when the operating element 22 is rotated to an open position relative to the end cap element 21, so as to allow air to enter the electronic atomization device 100; and a blind hole 216, configured to from a locked state with the protruding edge 222 on the operating element 22 when the operating element 22 is rotated relative to the end cap element 21 to the closed position, so as to prevent the operating element 22 from rotating, where when the operating element 22 is rotated relative to the end cap element 21 to the closed position, the blind hole 216 is aligned with the air inlet avoidance hole 221 on the operating element 22 to stagger and close the air inlet 215, so as to prevent the external air from entering the electronic atomization device 100 through the air inlet 215.

**[0051]** According to FIG. 6 to FIG. 8, the sealing element 23 is provided with a notch 233 opposite to the limiting protrusion 223 of the operating element 22. Therefore, the sealing element 23 is located in the operating element 22 after assembly, and the limiting protrusion 223 is fitted with the notch 233, so that the sealing element 23 is fixedly limited or engaged with the operating element 22, thereby preventing the sealing element and the operating element from rotating relative to each other. The sealing element 23 is further provided with a first avoidance hole 231 opposite to the air inlet avoidance hole 221, which is configured to avoid the air inlet avoidance hole 221. The sealing element 23 is further provided with a second avoidance hole 232. In the open position, the second avoidance hole 232 is opposite to the blind hole 216. In the closed position, the second avoidance hole 232 is opposite to the air inlet 215. During use, the second avoidance hole 232 is temporarily endowed with no substantial function or function.

**[0052]** In some embodiments, the operating element 22 can rotate relative to the end cap element 21 in the open position and the closed position. When the operating element 22 is in the open position, the air inlet avoid-

ance hole 221 is aligned with and in communication with the air inlet 215, so that the external air can enter the electronic atomization device 100. When the operating element 22 is in the closed position, the air inlet avoidance hole 221 is aligned with the blind hole 216 and is staggered from the air inlet 215, so that the end cap 22 covers and closes the air inlet 215, to prevent the external air from entering the electronic atomization device 100.

**[0053]** As shown in FIG. 6 to FIG. 8, the end cap element 21 is further provided with:

a limiting recess 210, arranged on an outer side surface of the end cap element 21, where the limiting recess 210 is substantially arranged along a circumferential direction of the end cap element 21; and the limiting recess 210 is configured to define a rotation angle or a travel distance of the limiting protrusion 223 of the operating element 22 relative to the end cap element 21.

**[0054]** In some embodiments, a locking structure that can be unlocked is arranged between the operating element 22 and the end cap element 21. The locking structure is used to lock the operating element 22 when the operating element 22 is in the open position and/or the closed position, to prevent the operating element 22 from rotating from the open position to the closed position or rotating from the closed position to the open position. However, after the locking structure is unlocked, the operating element 22 is further allowed to rotate from the open position to the closed position or rotate from the closed position to the open position.

**[0055]** For example, in the embodiments shown in FIG. 5 to FIG. 8, the locking structure includes the protruding edge 222 on the operating element 22 and the air inlet 215 and the blind hole 216 on the end cap element 21. For example, when the operating element 22 is in the open position, locking can be formed by inserting or extending the protruding edge 222 into the air inlet 215, so as to prevent the operating element 22 from rotating. Only after the protruding edge 222 is removed or released from the air inlet 215, the protruding edge can be rotated from the open position toward the closed position. When the operating element 22 is in the closed position, locking can be formed by inserting or extending the protruding edge 222 into the blind hole 216, so as to prevent the operating element 22 from rotating. Only after the protruding edge 222 is removed or released from the blind hole 216, the protruding edge can be rotated from the closed position toward the open position.

**[0056]** In the embodiments shown in FIG. 5 to FIG. 8, the locking structure may further include the limiting protrusion 223 of the operating element 22, a first locking groove 212 arranged at a first end of the limiting recess 210, and a second locking groove 213 arranged at a second end of the limiting recess 210. When the operating element 22 is rotated to the open position relative to the end cap element 21, the limiting protrusion 223 of the operating element 22 abuts against the first end of the limiting recess 210 to form position limiting. Moreover, when the operating element 22 is rotated relative to the

end cap element 21 to the open position, the limiting protrusion 223 of the operating element 22 can further extend into the first locking groove 212 to form locking, so as to prevent the operating element 22 from rotating relative to the end cap element 21 from the open position to the closed position. Correspondingly, when the operating element 22 is rotated relative to the end cap element 21 to the closed position, the limiting protrusion 223 of the operating element 22 abuts against the second end of the limiting recess 210 to form position limiting. Moreover, when the operating element 22 is rotated relative to the end cap element 21 to the closed position, the limiting protrusion 223 of the operating element 22 can further extend into the second locking groove 213 to form locking, so as to prevent the operating element 22 from rotating relative to the end cap element 21 from the closed position to the open position.

**[0057]** In the end cap assembly 20 having the construction shown in FIG. 3 to FIG. 8, the operating element 22 can be operated by the user to selectively form different connection states with the end cap element 21, for example, may have a first connection state and a second connection state. When the operating element 22 and the end cap element 21 are in the first connection state, the operating element 22 cannot drive the end cap element 21 to move or to detach the end cap element from the shell 10/the connecting element 19, but can only move relative to the end cap element 21 to selectively open and close the air inlet 215. When the operating element 22 and the end cap element 21 are in the second connection state, the operating element 22 can be caused to synchronously move on the end cap element 21, so that in the second connection state, the operating element 22 can drive the end cap element 21 to move or to detach the end cap element from the shell 10/the connecting element 19.

**[0058]** In the first connection state, for an operation process in which the user operates the operating element 22 by using a finger, to drive the operating element 22 to move to open or close the air inlet 215, reference is made to FIG. 9 to FIG. 12.

**[0059]** FIG. 9 is a schematic diagram of an operating element 22 in an open position. In FIG. 9, a protruding edge 222 of the operating element 22 is inserted into an air inlet 215 of an end cap element 21, an air inlet avoidance hole 221 of the operating element 22 is aligned with and conducts the air inlet 215, and external air can enter the electronic atomization device 100 as shown by an arrow R2 in FIG. 9. In addition, in the open position shown in FIG. 9, the operating element 22 is locked and cannot be rotated toward the open position. For example, in FIG. 9, in one aspect, the operating element 22 is locked by the fit of the protruding edge 222 extending into the air inlet 215. Correspondingly, in the open position shown in FIG. 9, the limiting protrusion 223 of the operating element 22 still extends into the first locking groove 212 to form locking. During locking shown in FIG. 9, the elastic element 25 is extended.

**[0060]** FIG. 10 is a schematic diagram of unlocking the operating element 22 in the open position in FIG. 9 by pulling the operating element 22 by the user. As shown by an arrow P11 in FIG. 10, the finger of the user holds the operating element 22 and pulls the operating element 22 outward, so that the protruding edge 222 is moved out of the air inlet 215 and the limiting protrusion 223 is released from the first locking groove 212, thereby forming unlocking. In the unlocked state shown in FIG. 10, the operating element 22 pulled outward has a first spacing d1 between the operating element and the shell 10/the connecting element 19. In some embodiments, the first spacing is approximately 3 mm. Under unlocking shown in FIG. 10, the elastic element 25 is compressed.

**[0061]** FIG. 11 is a schematic diagram showing that a user rotates the operating element 22 in the unlocked state in FIG. 10 from the open position to the closed position by rotating the operating element 22. As shown by an arrow P12 in FIG. 11, rotation of the operating element 22 is performed about a central axis of the operating element. In addition, in some embodiments, the rotation operation shown by the arrow P12 is performed on the operating element 22, where an angle is 90 degrees, and the rotation operation is limited and defined by the limiting recess 210 of the end cap element 21. In FIG. 11, the air inlet avoidance hole 221 of the operating element 22 that is rotated to the closed position is staggered from the air inlet 215 of the end cap element 21. In addition, in the closed position, the air inlet avoidance hole 221 is aligned with the blind hole 216 of the end cap element 21. Further, in the closed position, the limiting protrusion 223 of the operating element 22 is aligned with the second locking groove 213.

**[0062]** FIG. 12 is a schematic diagram showing that the operating element 22 moves from unlocking to locking in the closed position in FIG. 11 under driving of an elastic restoring force of the elastic element 25. As shown by an arrow P13 in FIG. 12, the operating element 22 is biased toward the end cap element 21 driven by the elastic restoring force of the compressed elastic element 25 in FIG. 11, so that the protruding edge 222 extends into the blind hole 216 and the limiting protrusion 223 extends into the second locking groove 213, thereby forming locking, and keeping the operating element 22 in the closed position and preventing rotation toward the open position. When the operating element 22 is driven to be locked by the elastic element 25,

**[0063]** FIG. 13 is a schematic diagram showing that the operating element 22 in a closed position is driven by the elastic element 25 to locking from another perspective. In FIG. 13, when the operating element 22 is in the closed position, the air inlet avoidance hole 221 is aligned with the blind hole 216 of the end cap element 21 and is closed. Moreover, the protruding edge 222 extends into the blind hole 216 to prevent the operating element 22 from rotating relative to the end cap element 21.

**[0064]** Correspondingly, when the user needs to rotate the operating element 22 from the closed position to the

open position, the user may operate the operating element in an operation manner opposite to that in FIG. 9 to FIG. 12.

**[0065]** In FIG. 4, the end cap assembly 20 is connected to the connecting element 19, so as to keep being connected to the shell 10. In FIG. 4, the operating element 22 is in the open position and is locked. As shown in FIG. 4 and FIG. 14, the connecting element 19 is provided with the engagement groove 191 configured to connect to the end cap element 20. The engagement groove 191 includes a first portion 1911 extending along a circumferential direction and a second portion 1912 extending from the first portion 1911 toward the distal end 120 along an axial direction. Further, the second portion 1912 is open toward the distal end 120.

**[0066]** As shown in FIG. 14, the first portion 1911 has a first end and a second end that face away from each other. The first end of the first portion 1911 has a notch 1913. The second portion 1912 extends from the second end of the first portion 1911 along the axial direction. After assembly, the engagement protrusion 211 of the end cap element 21 is snapped into the notch 1913, so as to prevent the engagement protrusion 211 of the end cap element 21 from rotating from the first portion 1911 to the second portion 1912 along the circumferential direction. In addition, in FIG. 4, when the engagement protrusion 211 is snapped into the notch 1913, the end cap element 21 may be locked, that is, the end cap element 21 cannot rotate relative to the connecting element 19 along the circumferential direction, so as to rotate the engagement protrusion 211 from the first portion 1911 to the second portion 1912.

**[0067]** In this embodiment, for a process in which the end cap assembly 20 is detached from the shell 10, reference is made to FIG. 14 to FIG. 18.

**[0068]** As shown by an arrow P21 in FIG. 14, the user grips the operating element by using a finger to pull the operating element 22 outward, and performs unlocking in the closed position or the open position, so that the operating element 22 can rotate relative to the end cap element 21.

**[0069]** As shown by an arrow P22 in FIG. 15, the user grips the operating element 22 by using a finger for rotation until the limiting protrusion 223 rotates to be aligned with a connection port 214 of the end cap element 21, to define a disassembly operation position for detaching the end cap assembly 20. As shown in FIG. 15, the connection port 214 is located between the first locking groove 212 and the second locking groove 213. A rotation angle by which the operating element 22 rotates from the open position or the closed position to the disassembly operation position is 45 degrees.

**[0070]** As shown by an arrow P23 in FIG. 16, in the disassembly operation position, the user presses the operating element 22, so that the limiting protrusion 223 of the operating element 22 extends into the connection port 214, to form a connection between the operating element 22 and the end cap element 21, there-

by being used for detaching the end cap assembly 20 from the shell 10. As shown in FIG. 16, when the limiting protrusion 223 extends into the connection port 214, a second spacing d2 is defined between the operating element 22 and the shell 10/the connecting element 19. The second spacing d2 is less than the first spacing d1. In some embodiments, the second spacing d2 is approximately 1 mm.

**[0071]** As shown by an arrow P24 in FIG. 17, in the disassembly operation position, the user further presses the operating element 22, so that the limiting protrusion 223 extends into the connection port 214, to drive the end cap element 21 to move toward the proximal end 110, so that the engagement protrusion 211 of the end cap element 21 is disengaged from the notch 1913 of the first portion 1911 of the connecting element 19. In FIG. 17, the end cap element 21 is unlocked after the engagement protrusion 211 of the end cap element 21 is disengaged from the notch 1913 of the first portion 1911 of the connecting element 19, so as to allow the end cap element 21 to rotate relative to the connecting element 19 along the circumferential direction. In FIG. 17, the pressed operating element 22 abuts against the connecting element 19 and/or the shell 10. In addition, as shown in FIG. 17, after the limiting protrusion 223 extends into the connection port 214, the operating element 22 and the end cap element 21 can be connected and fastened, so as to prevent relative rotation or movement between the operating element and the end cap element. In this case, further, the user can drive the end cap element 21 to move and rotate by pressing and rotating the operating element 22, so as to detach the end cap element 21 from the shell 10/the connecting element 19.

**[0072]** As shown by an arrow P25 and an arrow P26 in FIG. 18, in a state in FIG. 17 where the engagement protrusion 211 is disengaged from the notch 1913, the operating element 22 is further operated to drive the end cap element 21 to move, so as to detach the end cap element 21 from the shell 21/the connecting element 19. As shown by an arrow P25 and an arrow P26, a specific moving operation includes the following. First, the operating element 22 is operated to rotate, so as to drive the end cap element 21 to rotate until the engagement protrusion 211 rotates from the first portion 1911 to the second portion 1912. Then, the operating element 22 is pulled downward, so that the engagement protrusion 211 of the end cap element 21 connected through a countersunk head screw 24 is removed from the second portion 1912. After being removed, the engagement protrusion 211 is separated from the engagement groove 191, so as to contact the end cap element 21 and be connected to the shell 10. Other parts of the end cap assembly 20 are all detached from the shell 10 together with the end cap element 21.

**[0073]** Referring to FIG. 19, after the end cap 20 is detached from the distal end 120 of the shell 10, the distal end 120 of the shell 10 of the electronic atomization device 100 is opened or exposed. Further, the user

may take out or remove the battery core 40 from the distal end 120 of the shell 10 by giving a gentle shake or flick. When the battery core 40 is removed, the electrical connection may be disconnected by releasing the electrical connection from the first elastic electrical contact 62.

**[0074]** As shown in FIG. 7, a bare surface of the operating element 22 is further provided with graphic or text indications for indicating that the operating element 22 is located in different positions. For example, in FIG. 7, the operating element 22 is provided with text indications of "ON" and "OFF" to prompt that the user operates the open position and the closed position of the operating element 22, and an operation prompt indicating that a rotation direction enables the operating element 22 to rotate between the open position and the closed position.

**[0075]** As shown in FIG. 7, the connection port 214 of the end cap element 21 is shallower than the first locking groove 212 and the second locking groove 213. When the limiting protrusion 223 is located only in the connection port 214, pressing and driving can be performed when the second spacing d2 is maintained, so that the engagement protrusion 211 of the end cap element 21 is separated from the notch 1913 of the first portion 1911.

**[0076]** It should be noted that the preferred embodiments of this application are provided in the specification and the accompanying drawings of this application, but are not limited to the embodiments described in this specification. Further, a person of ordinary skill in the art may make improvements or modifications according to the foregoing descriptions, and all of the improvements and modifications shall fall within the protection scope of the appended claims of this application.

## Claims

1. An electronic atomization device, comprising a shell having a proximal end and a distal end facing away from each other along a longitudinal direction;

a liquid storage cavity, configured to store a liquid substrate;

a heating element, configured to heat the liquid substrate to generate an aerosol;

a battery core, configured to provide electric power to the heating element;

an end cap element, at least partially closing the distal end of the shell, and detachably connected to the shell, wherein the end cap element is constructed to be detachable from the shell to open the distal end of the shell, to allow the battery core to be taken out from the distal end of the shell; and the end cap element is switchable between a first locked state and a first unlocked state, in the first locked state, is prevented from being detached from the shell, and in the first unlocked state, allowed to be

- detached from the shell; and  
 an operating element, connected to the end cap element and having a first connection state and a second connection state relative to the end cap element, wherein the operating element is arranged, in the first connection state, to be prevented from driving the end cap element to move from the first locked state to the first unlocked state and/or driving the end cap element to be detached from the shell; and the operating element is arranged, in the second connection state, to be allowed to drive the end cap element to move from the first locked state to the first unlocked state and/or drive the end cap element to be detached from the shell.
2. The electronic atomization device according to claim 1, wherein an air inlet is provided on the end cap element, so as to allow air to enter the electronic atomization device; and  
 in the first connection state, the operating element is operable by a user to move between an open position and a closed position relative to the end cap element; and the operating element opens the air inlet in the open position, and closes the air inlet in the closed position.
  3. The electronic atomization device according to claim 1 or 2, wherein the end cap element is drivable by the operating element to move along the longitudinal direction of the shell, to move from the first locked state to the first unlocked state.
  4. The electronic atomization device according to claim 3, wherein in the first unlocked state, the end cap element is drivable by the operating element to rotate relative to the shell and/or move along the longitudinal direction of the shell, and then is detached from the shell.
  5. The electronic atomization device according to claim 1 or 2, further comprising:  
 a connecting element, fixedly connected to the shell, and at least partially surrounding the end cap element, wherein the end cap element is detachably connected to the connecting element, so as to form a detachable connection with the shell.
  6. The electronic atomization device according to claim 5, further comprising:  
 an engagement groove and an engagement protrusion, wherein the engagement groove is provided on one of the connecting element and the end cap element, and the engagement protrusion is arranged on the other of the connecting element and the end cap element; and the engagement groove comprises a first portion extending along a circumferential direction of the shell, a notch provided at a first end of the first portion, and a second portion extending out from a second end of the first portion along the longitudinal direction of the shell; and the engagement protrusion is configured to be retained in the notch to define the first locked state of the end cap element, and the engagement protrusion is configured to be detachable from the notch to define the first unlocked state of the end cap element.
  7. The electronic atomization device according to claim 2, wherein the operating element is configured to be operable by a user operation to switch between a second locked state and a second unlocked state, in the second locked state, is prevented from moving between the closed position and the open position, and in the second unlocked state, is allowed to move between the closed position and the open position.
  8. The electronic atomization device according to claim 7, further comprising:  
 a locking structure, configured to define the second locked state of the operating element in the open position and/or the closed position.
  9. The electronic atomization device according to claim 8, wherein the locking structure comprises:  
 a protruding edge, arranged on the operating element; and  
 a blind hole, arranged on the end cap element, wherein  
 the protruding edge is configured to extend into the air inlet in the open position, and extend into the blind hole in the closed position.
  10. The electronic atomization device according to claim 8, wherein the locking structure comprises:  
 a limiting protrusion, arranged on the operating element; and  
 a first locking groove and a second locking groove, spaced apart from each other along a circumferential direction of the end cap element, wherein  
 the limiting protrusion is configured to, in the open position, extend into the first locking groove, and in the closed position, extend into the second locking groove.
  11. The electronic atomization device according to claim 7, further comprising:  
 an elastic element, configured to provide a bias when the operating element is in the closed position and/or in the open position, thereby driving the operating element to switch from the second unlocked state to

the second locked state, or the elastic element is configured to provide the bias to the operating element to maintain the operating element in the second locked state.

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12. The electronic atomization device according to claim 1 or 2, wherein the operating element in the first connection state is independently movable relative to the end cap element; and/or the operating element in the second connection state is allowed to only move together with the end cap element. 10
13. The electronic atomization device according to claim 1 or 2, wherein in the first connection state, a first spacing is defined between the operating element and the shell, and in the second connection state, a second spacing is defined between the operating element and the shell; and the first spacing is greater than the second spacing. 15 20
14. The electronic atomization device according to claim 2, wherein the operating element is rotatable about a central axis thereof by a first angle, to move between the open position and the closed position; 25
- the operating element is rotatable about the central axis thereof by a second angle, to change from the first connection state to the second connection state; and 30
- the first angle is less than the second angle.

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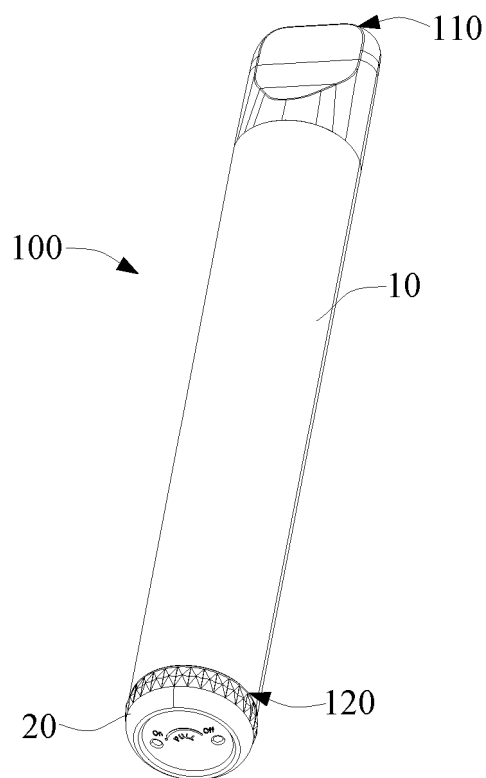


FIG. 1

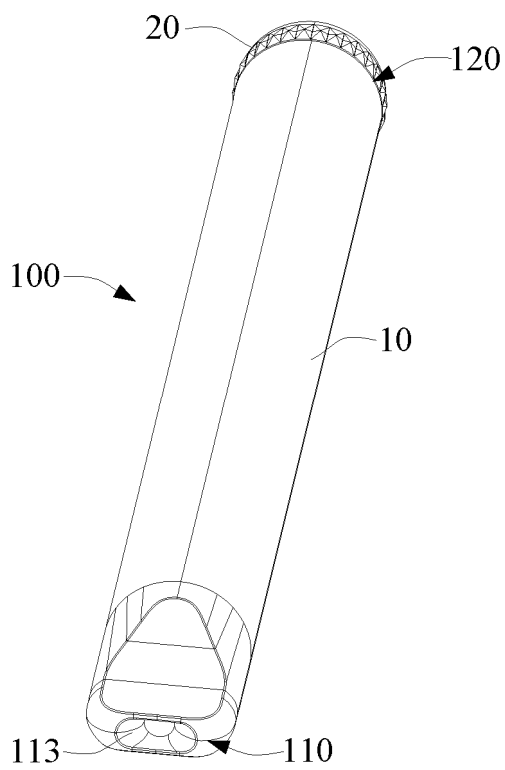


FIG. 2

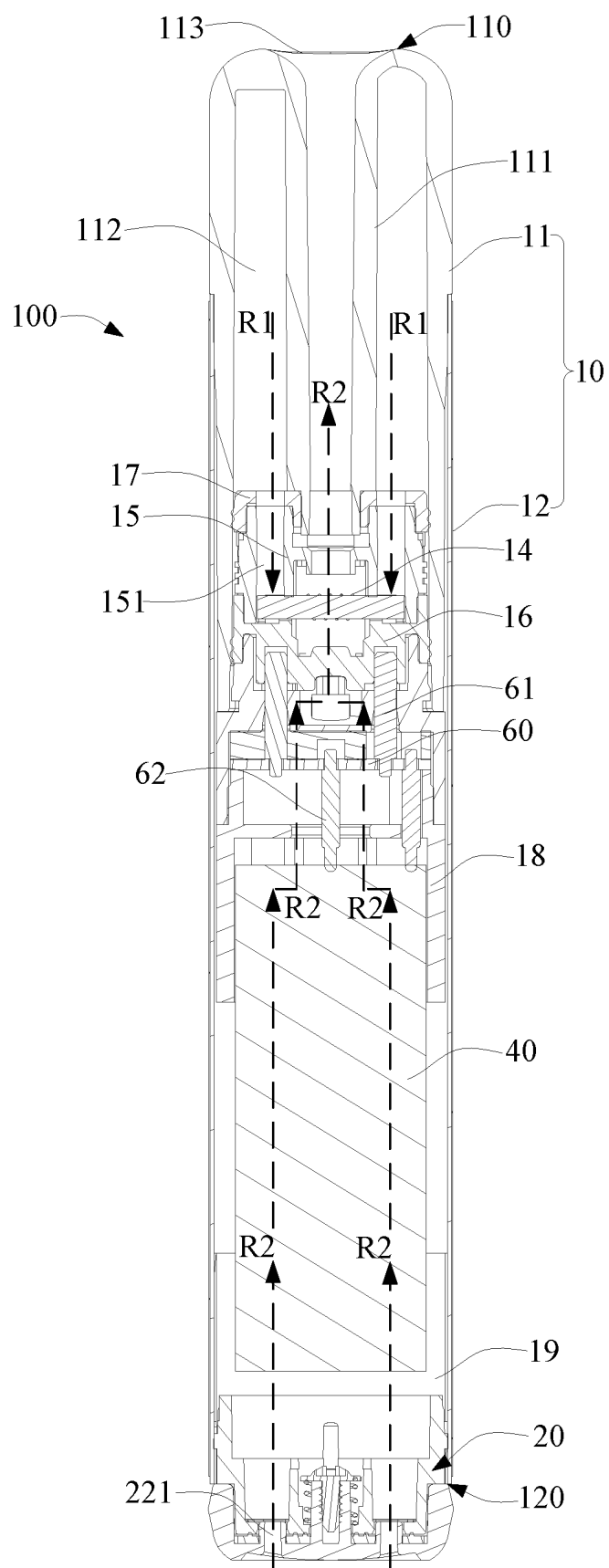


FIG. 3

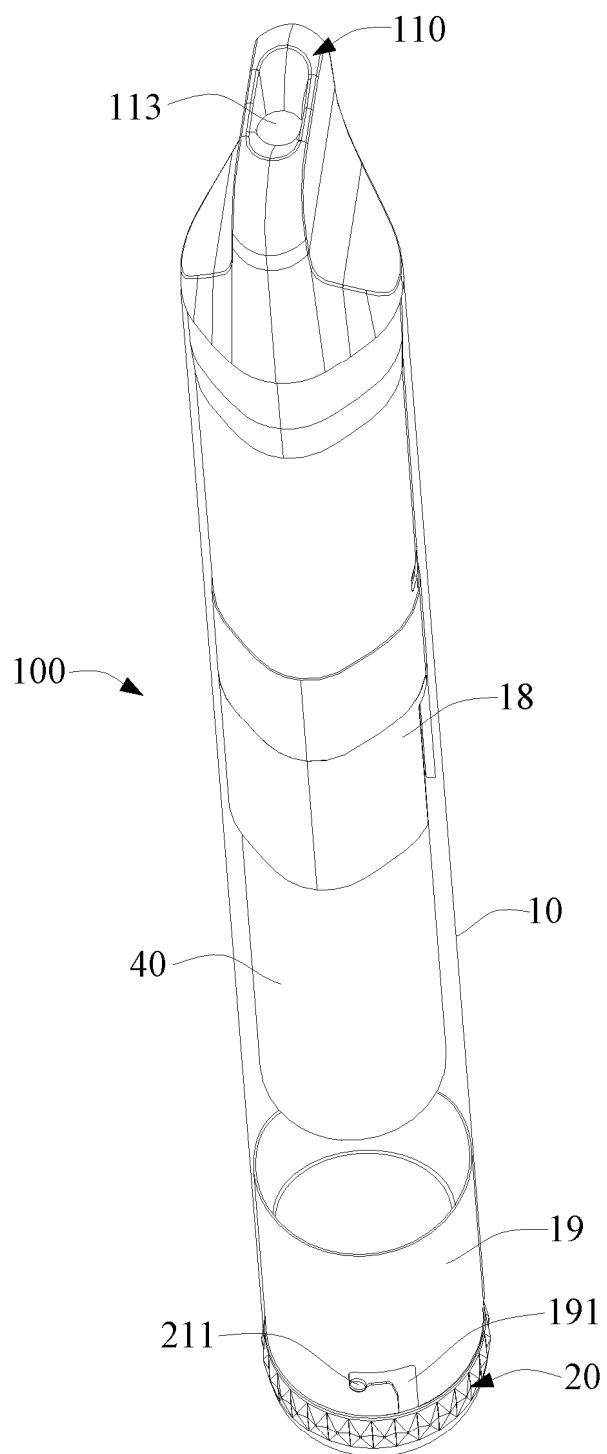


FIG. 4

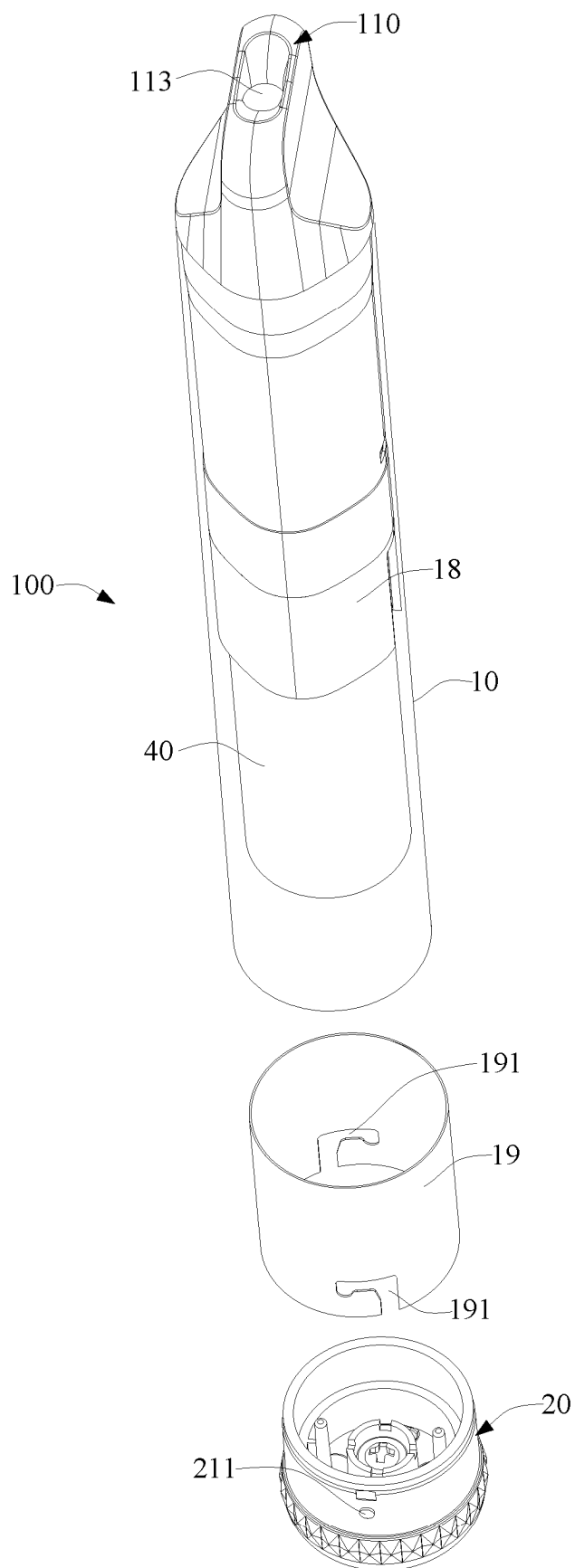


FIG. 5

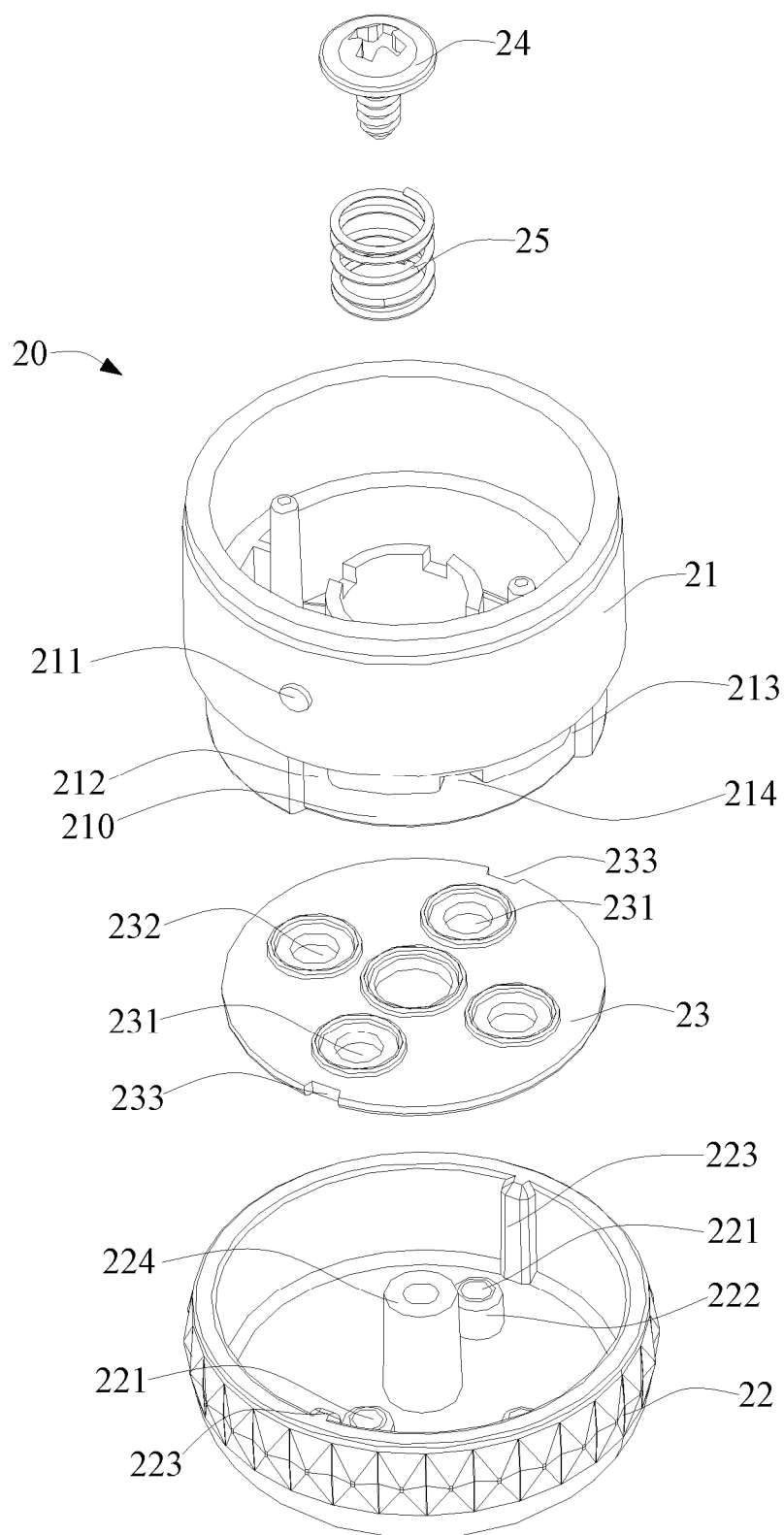


FIG. 6

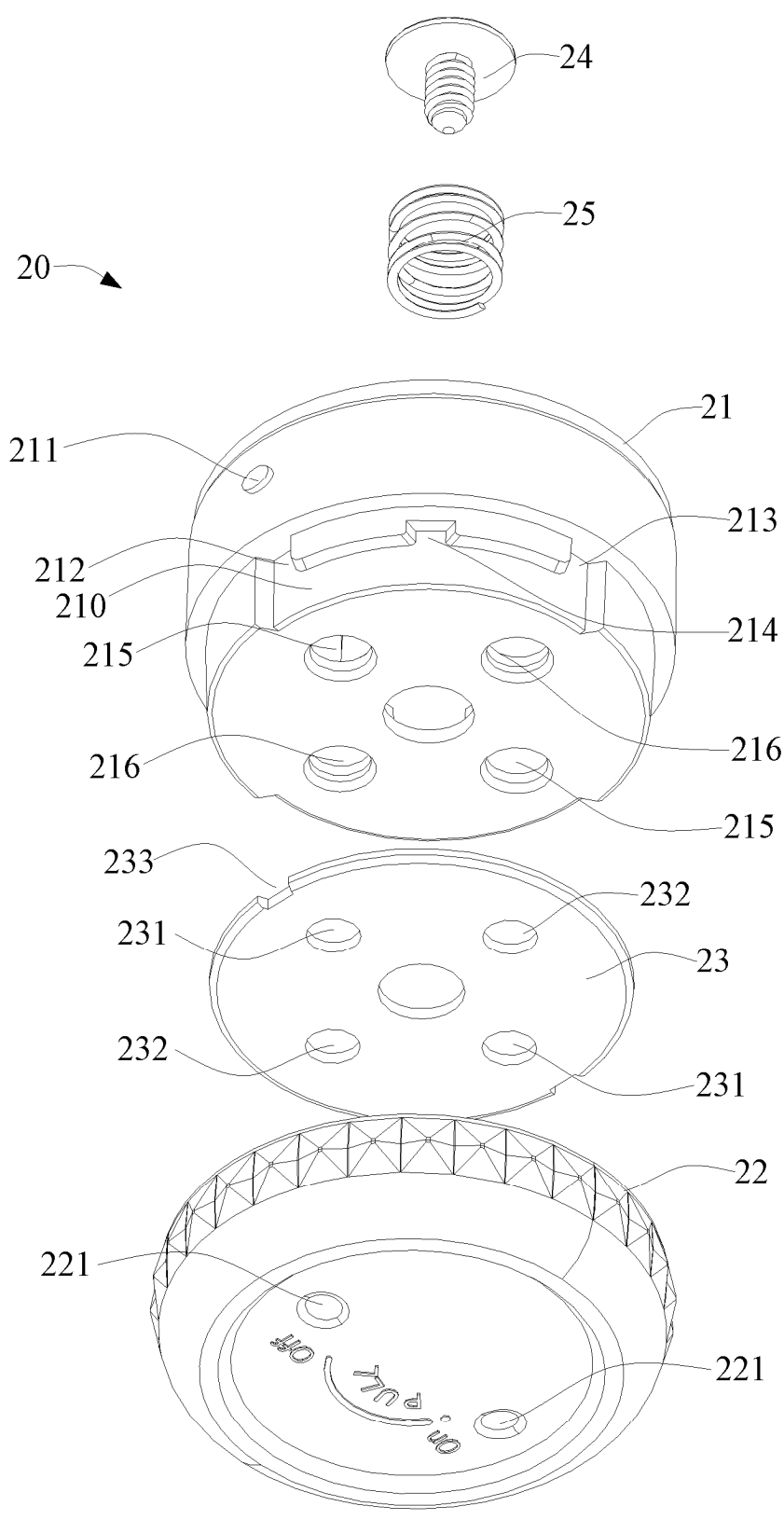


FIG. 7

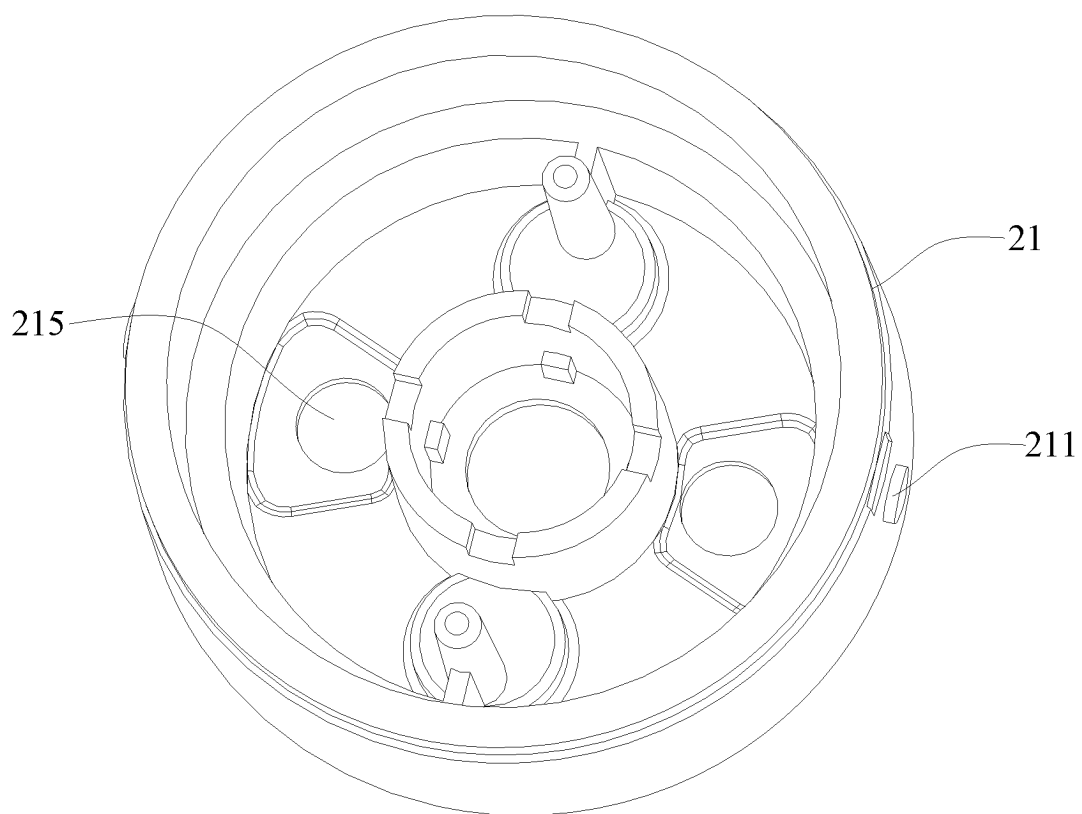


FIG. 8

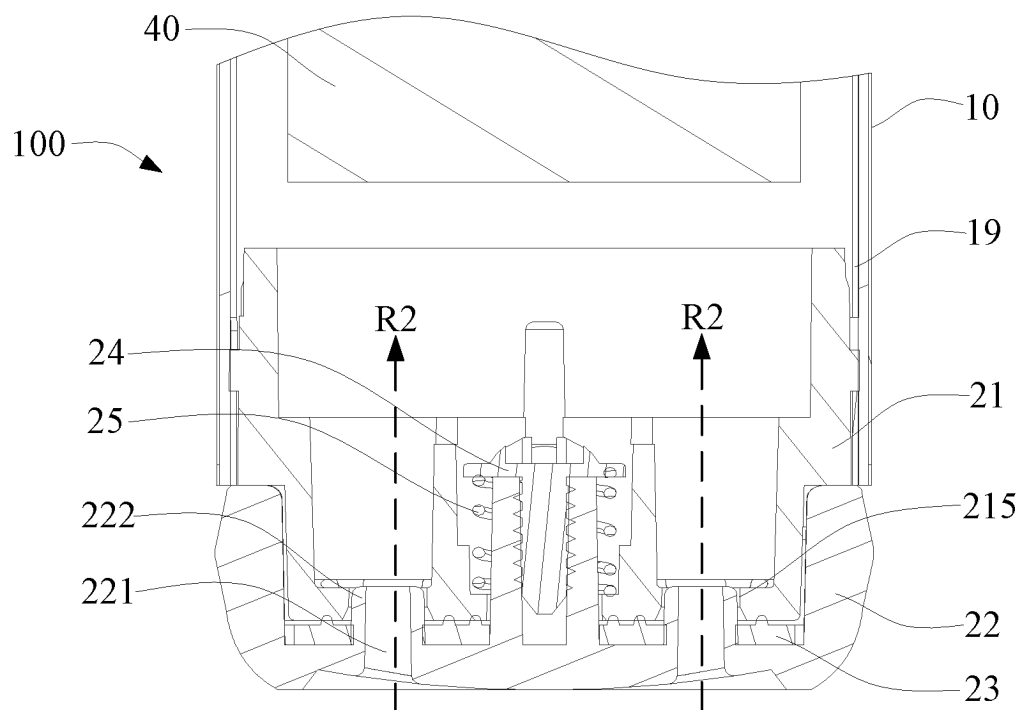


FIG. 9

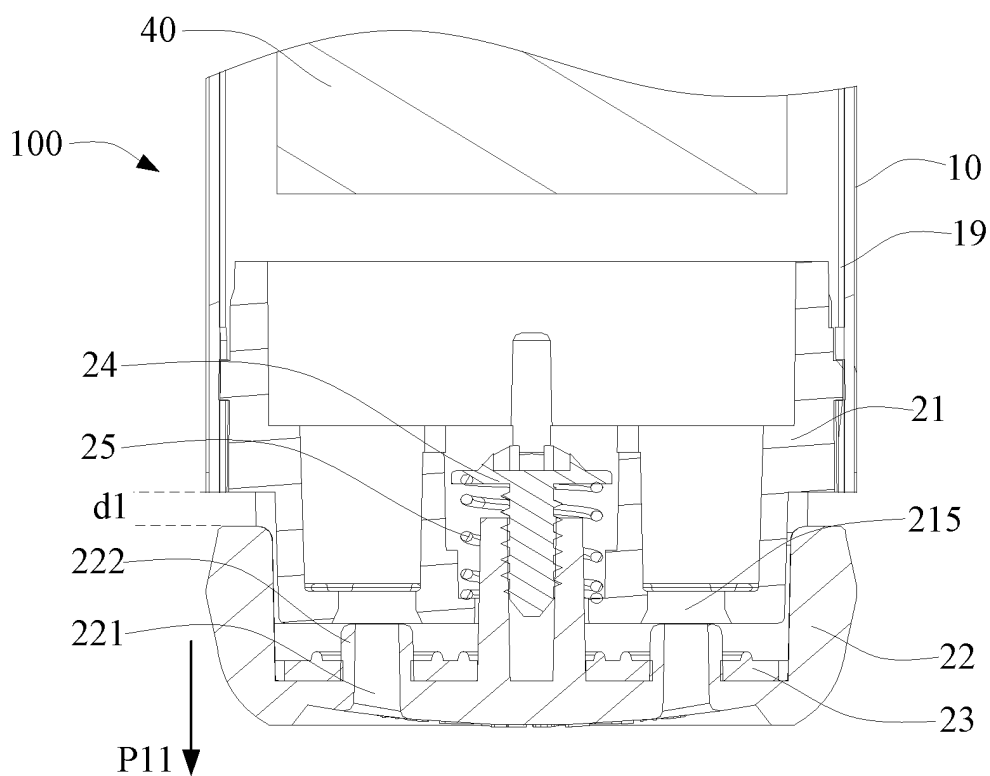


FIG. 10

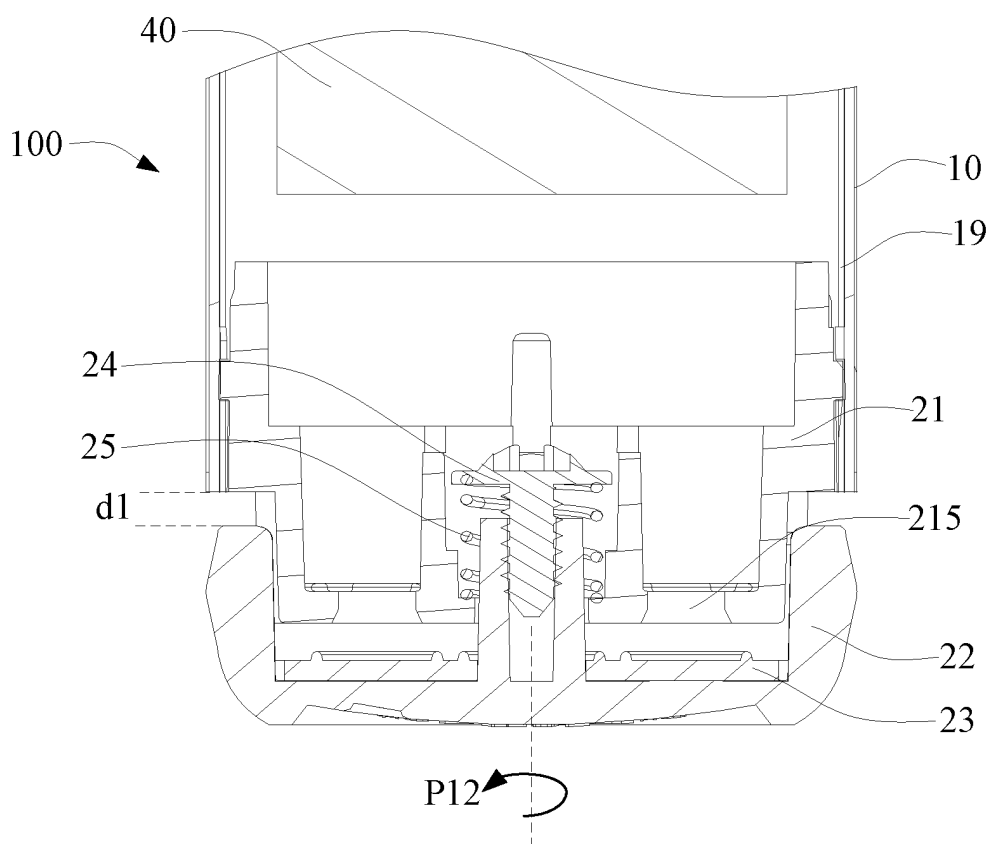


FIG. 11

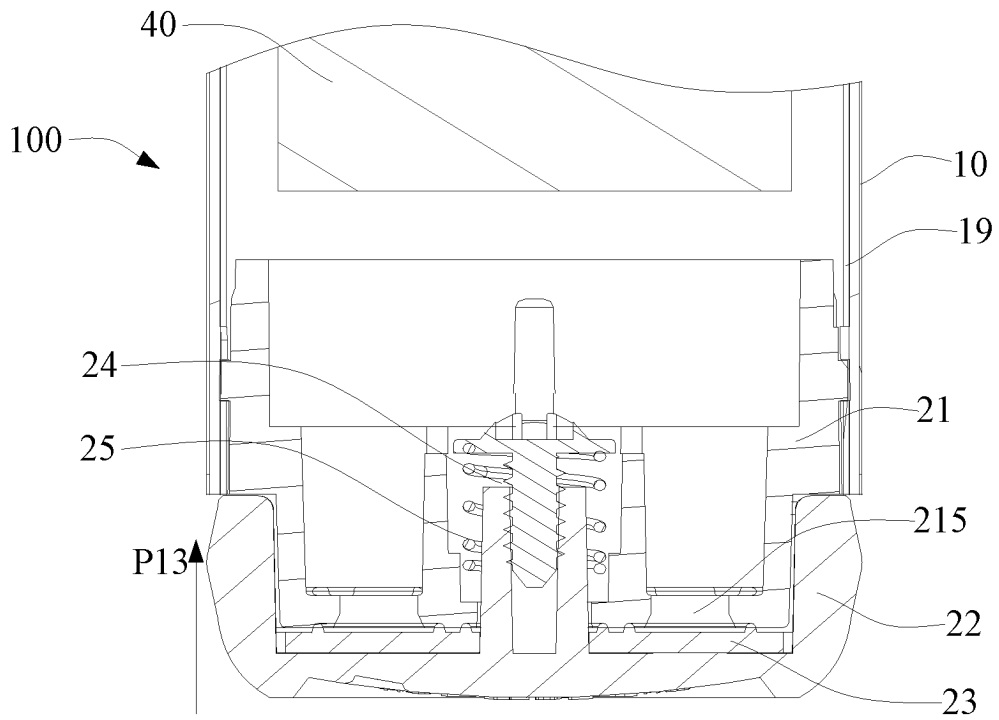


FIG. 12

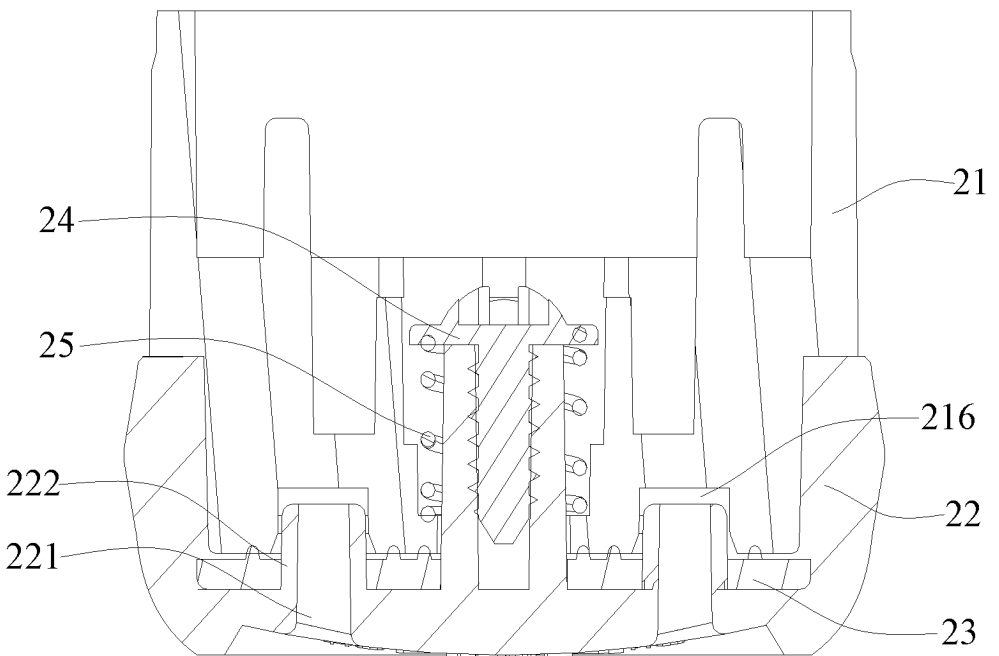


FIG. 13

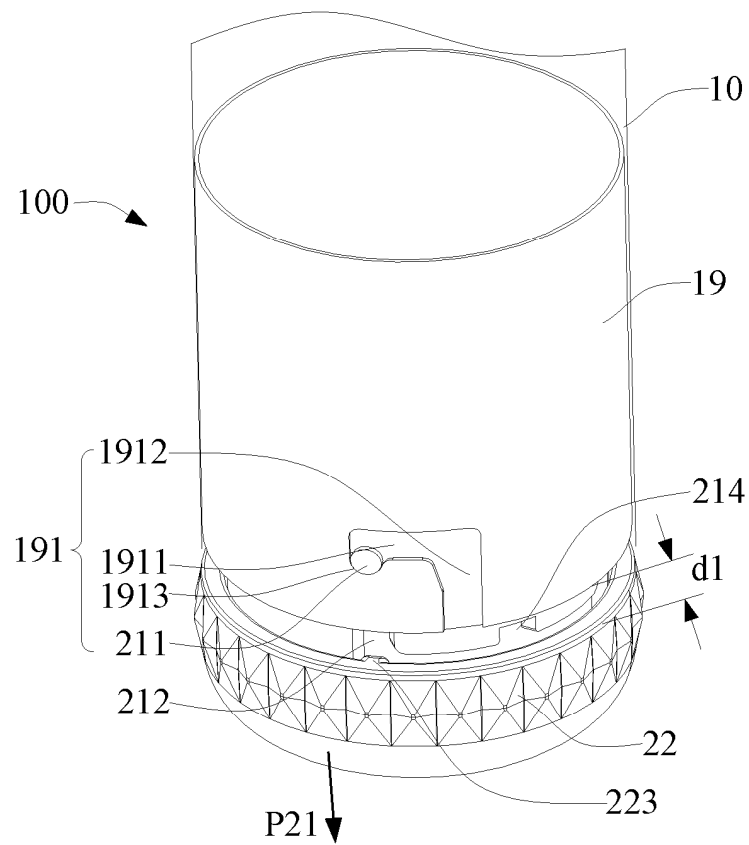


FIG. 14

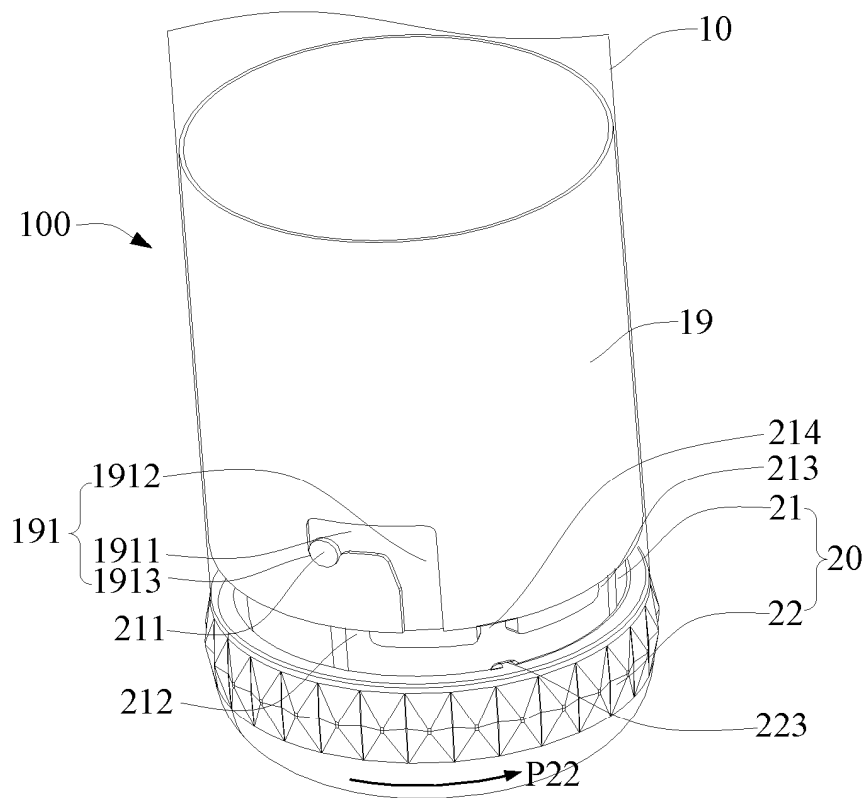


FIG. 15

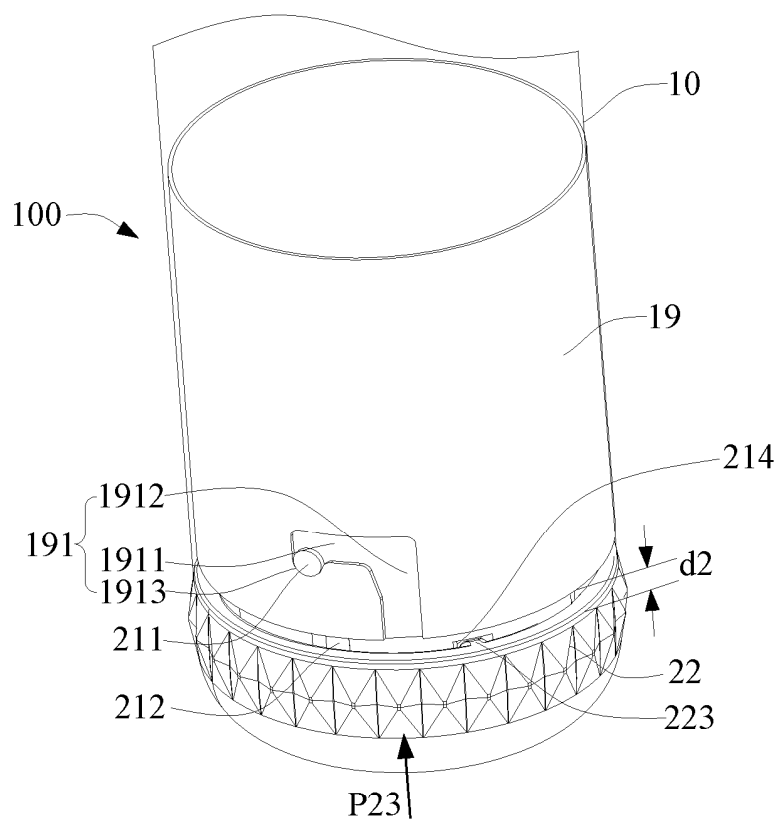


FIG. 16

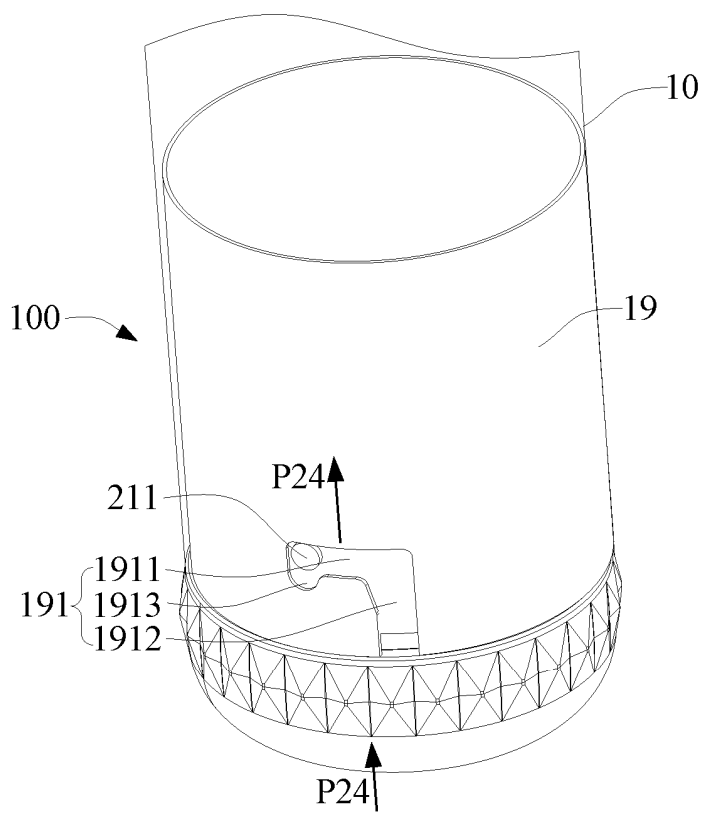


FIG. 17

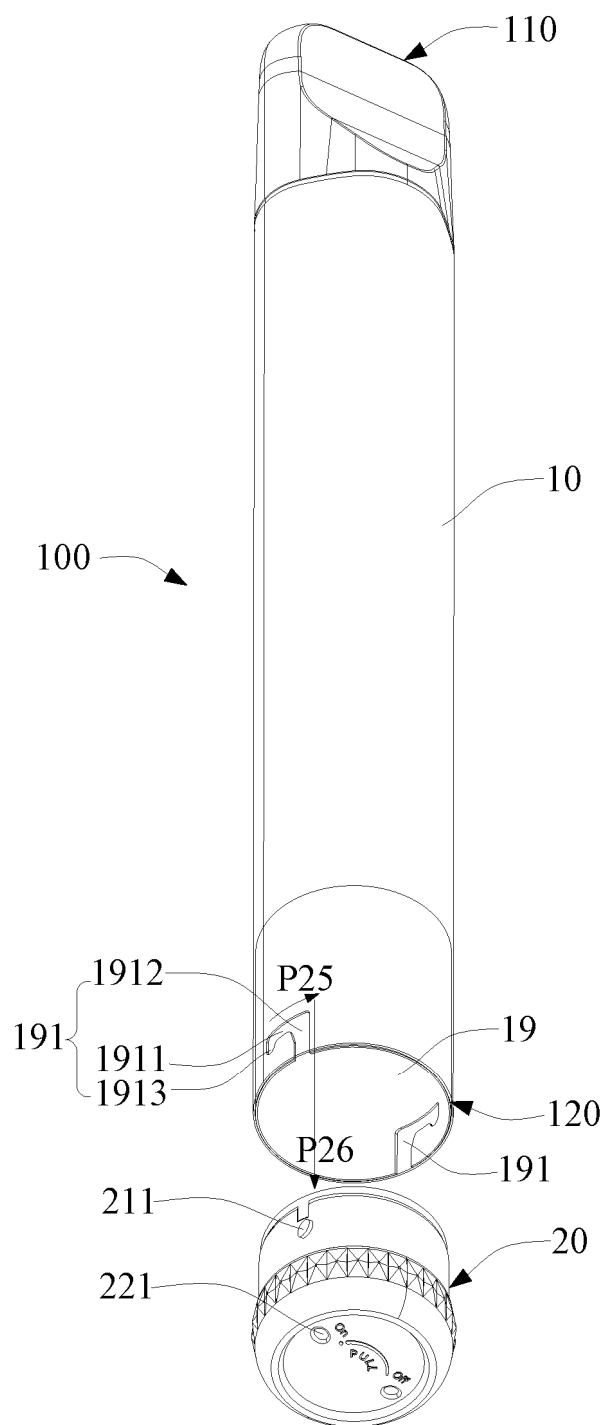


FIG. 18

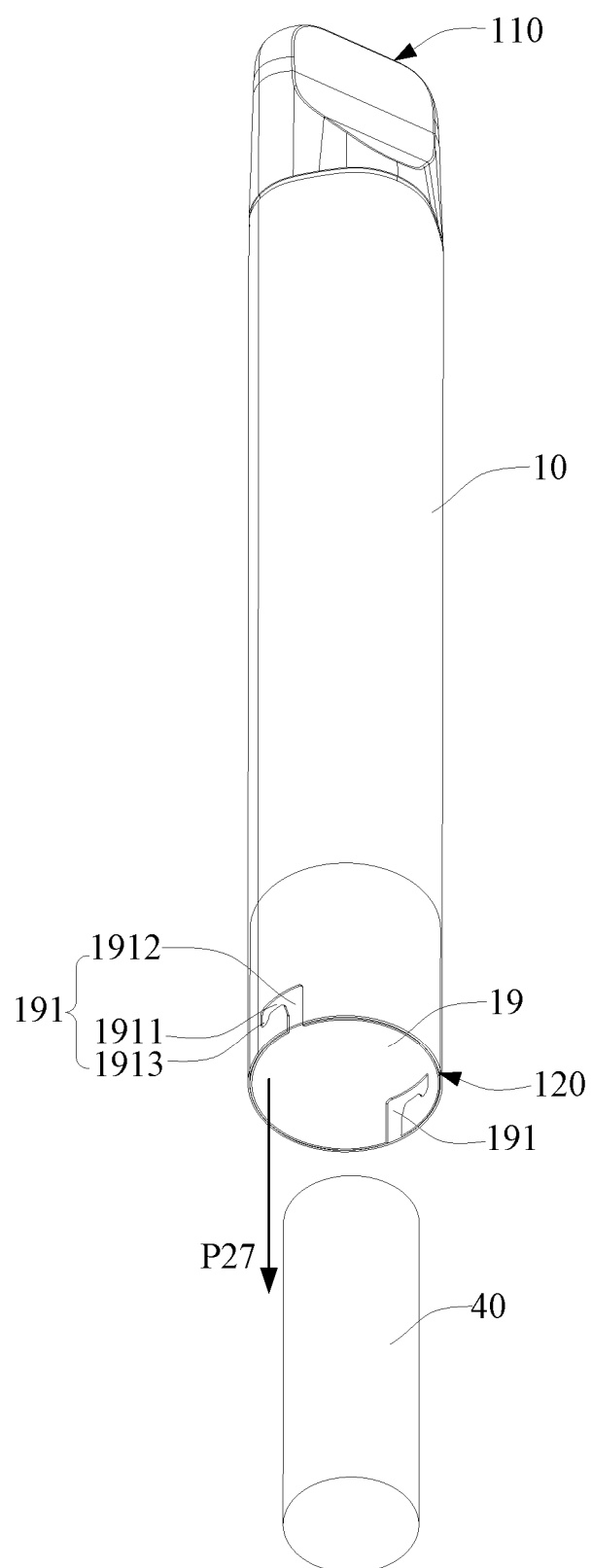


FIG. 19

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2024/116622

## A. CLASSIFICATION OF SUBJECT MATTER

A24F40/40(2020.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24F40, A24F47

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNTXT, ENTXTC, VEN: 盖, 电池, 电芯, 拆卸, 锁, 卡扣, 槽, cap, cover, lid, shell, disassemble, detach, cell, battery, lock, slot, groove

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                 | Relevant to claim No. |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
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| Y         | CN 218682048 U (SHENZHEN SMISS TECHNOLOGY CO., LTD.) 24 March 2023 (2023-03-24)<br>description, paragraphs 35-68, and figures 1-12                 | 1-14                  |
| Y         | CN 116509067 A (CHANGZHOU PATENT ELECTRONIC TECHNOLOGY CO., LTD.) 01 August 2023 (2023-08-01)<br>description, paragraphs 51-65, and figures 1-10   | 1-14                  |
| Y         | CN 116763011 A (JIANG SHANGGUI) 19 September 2023 (2023-09-19)<br>description, paragraphs 24-37, and figures 1-7                                   | 1-14                  |
| Y         | CN 116584701 A (CHANGZHOU PATENT ELECTRONIC TECHNOLOGY CO., LTD.) 15 August 2023 (2023-08-15)<br>description, paragraphs 200-250, and figures 1-29 | 1-14                  |
| A         | WO 2015039280 A1 (KIMREE HI-TECH INC.) 26 March 2015 (2015-03-26)<br>entire document                                                               | 1-14                  |

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

|                                                                                                                                                                         |                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| * Special categories of cited documents:                                                                                                                                | "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention                                              |
| "A" document defining the general state of the art which is not considered to be of particular relevance                                                                | "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone                                                                     |
| "D" document cited by the applicant in the international application                                                                                                    | "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
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| "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) |                                                                                                                                                                                                                                                  |
| "O" document referring to an oral disclosure, use, exhibition or other means                                                                                            |                                                                                                                                                                                                                                                  |
| "P" document published prior to the international filing date but later than the priority date claimed                                                                  |                                                                                                                                                                                                                                                  |

Date of the actual completion of the international search

08 January 2025

Date of mailing of the international search report

09 January 2025

Name and mailing address of the ISA/CN

China National Intellectual Property Administration (ISA/  
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Beijing 100088

Authorized officer

Telephone No.

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/CN2024/116622

| Patent document cited in search report |            |    | Publication date (day/month/year) | Patent family member(s) | Publication date (day/month/year) |
|----------------------------------------|------------|----|-----------------------------------|-------------------------|-----------------------------------|
| CN                                     | 221284676  | U  | 09 July 2024                      | None                    |                                   |
| CN                                     | 218682048  | U  | 24 March 2023                     | None                    |                                   |
| CN                                     | 116509067  | A  | 01 August 2023                    | None                    |                                   |
| CN                                     | 116763011  | A  | 19 September 2023                 | None                    |                                   |
| CN                                     | 116584701  | A  | 15 August 2023                    | None                    |                                   |
| WO                                     | 2015039280 | A1 | 26 March 2015                     | None                    |                                   |

**REFERENCES CITED IN THE DESCRIPTION**

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