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(54) **PRESSURE GENERATOR AND MASSAGER**

(57) The present invention discloses a pressure generator and a massager. The pressure generator includes a housing with a first opening and a receiving space, a movable member movably inserted into the receiving space, and a driving device, configured to drive the movable member to reciprocated move inside the receiving space so as to generate a negative pressure at the first opening.

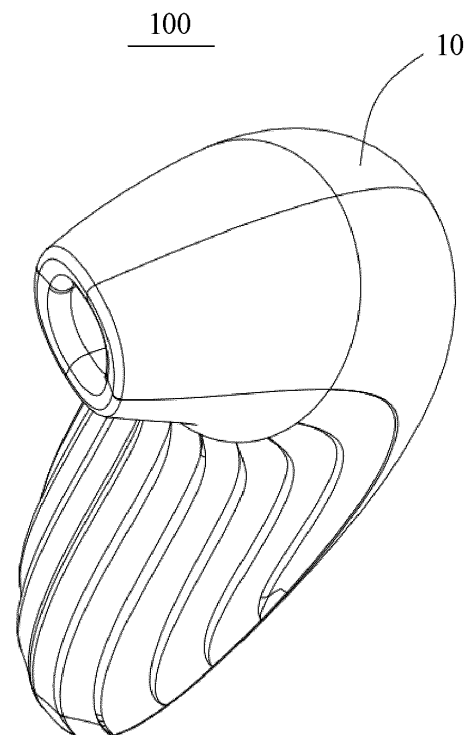


FIG. 1

Description

TECHNICAL FIELD

[0001] The present disclosure relates to the field of massaging devices, and in particular to a pressure generator and a massager.

BACKGROUND

[0002] With the accelerated pace of life, working pressures on people are increased. After daily working, a person may be tired, various portions of a body may ache. In order to relieve fatigue and soreness, people may take a variety of massagers to massage the body, such as a negative pressure massager. The negative pressure massager may adsorb and relax the skin to relieve the fatigue and soreness, so as to sooth the body and mind. However, the negative pressure massager in the related art may have a complicated structure, and may have a poor adsorption effect.

[0003] Therefore, the massager in the related art needs to be improved to avoid the above defects.

SUMMARY

[0004] The present disclosure provides a pressure generator and a massager which can improve suctioning effect thereof.

[0005] One aspect of the present disclosure provides a pressure generator, which includes a housing with a first opening and a receiving space, a movable member movably inserted into the receiving space, and a driving device configured to drive the movable member to reciprocated move inside the receiving space so as to generate a negative pressure at the first opening.

[0006] In at least one embodiment, the movable member includes a free end arranged in the receiving space, and a sealing ring arranged between the housing and the free end, the sealing ring surrounds the free end and resisting against between the free end and the housing.

[0007] In at least one embodiment, the free end defines a sealing slot configured to receive the sealing ring.

[0008] In at least one embodiment, the sealing ring includes an arc-shaped part and two fixing parts extending from two opposite sides of the arc-shaped part respectively, the two fixing parts are arranged at interval along a moving direction of the free end and extended toward the sealing ring, the arc-shaped part, the two fixing parts and the free end cooperate to define a space, and the arc-shaped part is configured to be deformed into the space.

[0009] In at least one embodiment, the pressure generator further includes a massaging member, the massaging member includes a connecting part connected to a side of the free end facing the first opening, and at least one massaging part arranged on the connecting part away from the free end and configured to partially extend

out of the housing through the first opening.

[0010] In at least one embodiment, the movable member is configured to separate the housing into a first chamber communicating with the first opening and a second chamber, and the movable member further includes a unidirectional exhaust structure configured to communicate the first chamber with the second chamber unidirectionally.

[0011] In at least one embodiment, the unidirectional exhaust structure includes at least one exhaust hole running through the free end to communicate the first chamber with the second chamber, and a vent plug arranged on the free end and configured to cover the at least one exhaust hole away from the first chamber.

[0012] In at least one embodiment, the vent plug includes a main part arranged on a side of the free end away from the first opening, and at least one covering part made of elastic material, the at least one covering part is capable of being deformed to cover or open the at least one exhaust hole; or the vent plug includes a main part arranged on a side of the free end away from the first opening and defining at least one through hole communicating with the at least one exhaust hole, and at least one surrounding wall extending away from the main part and surrounding the at least one through hole respectively, the at least one surrounding wall is made of elastic material and capable of being deformed to close or open the at least one through hole.

[0013] In at least one embodiment, the housing includes a rigid part with a second opening, and an absorbing member with the first opening arranged on an end of the absorbing member away from the second opening, the movable member is arranged inside the rigid part, the absorbing member is connected to the rigid part at the second opening and defines an air passage communicating with the second opening.

[0014] In at least one embodiment, a gap is defined between the movable member and an inner wall of the housing, the gap is not greater than 0.1mm.

[0015] In at least one embodiment, the pressure generator includes a protective sleeve made of a cushioning material and configured to sleeve an outside of the housing, the protective sleeve defines a third opening communicated to the first opening.

[0016] In at least one embodiment, the protective sleeve and the housing are spaced apart from each other to define a sound insulation space.

[0017] In at least one embodiment, the movable member includes a driving end connected to the driving device, and a free end connected to the driving end, and the free end defines a cavity communicated to the receiving space.

[0018] In at least one embodiment, at least one massaging protrusion is arranged on a side of the movable member facing the first opening, the at least one massaging protrusion at least partially extends out of the first opening; and/or the pressure generator includes a heating coil or a semiconductor refrigeration sheet arranged

on the housing to adjust temperature at the first opening.

[0019] Another aspect of the present disclosure provides a massager, including: a support shell defining a fourth opening, and the pressure generator as described above. The pressure generator is mounted in the support shell. The fourth opening is communicated to the first opening.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

FIG. 1 is a structural schematic view of a massager according to an embodiment of the present disclosure.

FIG. 2 is a cross-sectional view of the massager as shown in FIG. 1.

FIG. 3 is an exploded view of a pressure generator as shown in FIG. 1 according to a first embodiment of the present disclosure.

FIG. 4 is a structural schematic view of the pressure generator as shown in FIG. 3 in an assembled state. FIG. 5 is a cross-sectional view of the pressure generator as shown in FIG. 4.

FIG. 6 is an enlarged view of a portion A as shown in FIG. 5.

FIG. 7 is a structural schematic view of a part of a pressure generator as shown in FIG. 1 according to a second embodiment of the present disclosure.

FIG. 8 is a structural schematic view of a massaging member and a sealing ring as shown in FIG. 7.

FIG. 9 is a structural schematic view of a pressure generator as shown in FIG. 1 according to a third embodiment of the present disclosure.

FIG. 10 is a structural schematic view of a vent plug as shown in FIG. 9.

FIG. 11 is a structural schematic view of the pressure generator as shown in FIG. 9 in an assembled state.

FIG. 12 is a cross-sectional view of the pressure generator as shown in FIG. 11.

FIG. 13 is a structural schematic view of a pressure generator according to a fourth embodiment of the present disclosure as shown in FIG. 1.

FIG. 14 is a structural schematic view of a vent plug as shown in FIG. 13.

FIG. 15 is a bottom plan view of the vent plug as shown in FIG. 14.

FIG. 16 is a structural schematic view of the massaging member and the sealing ring of the pressure generator having a unidirectional exhaust structure according to an embodiment of the present disclosure.

FIG. 17 is a structural schematic view of a massager according to another embodiment of the present disclosure.

FIG. 18 is a structural schematic view of a pressure generator as shown in FIG. 17 according to a fifth embodiment of the present disclosure.

FIG. 19 is an exploded view of the pressure generator as shown in FIG. 18.

FIG. 20 is a cross-sectional view of the pressure generator as shown in FIG. 18.

FIG. 21 is an enlarged view of a portion B as shown in FIG. 18 according to an embodiment of the present disclosure.

FIG. 22 is an enlarged view of a portion B as shown in FIG. 18 according to another embodiment of the present disclosure.

FIG. 23 is a cross-sectional view of a pressure generator as shown in FIG. 17 according to a sixth embodiment of the present disclosure.

FIG. 24 is a cross-sectional view of a pressure generator as shown in FIG. 17 according to a seventh embodiment of the present disclosure.

FIG. 25 is a cross-sectional view of the pressure generator as shown in FIG. 24.

FIG. 26 is a structural schematic view of a pressure generator as shown in FIG. 17 according to an eighth embodiment of the present disclosure.

DETAILED DESCRIPTION

[0021] Technical solutions in the embodiments of the present disclosure will be clearly and completely described below by referring to the accompanying drawings in the embodiments of the present disclosure. Obviously, the described embodiments are only a part of, but not all of, the embodiments of the present disclosure. All other embodiments obtained by a person of ordinary skill in the art based on the embodiments in the present disclosure and without making creative work shall fall within the scope of the present disclosure.

[0022] As shown in FIGS. 1 and 2, the present disclosure provides a massager 100. The massager 100 is configured to massage a body of a user, especially to massage sensitive portions of the body. The massager 100 may generate a negative pressure to massage and stimulate the sensitive portions.

[0023] The massager 1 may include a support shell 20, a pressure generator 30 arranged inside the support shell 20, and a battery (not labelled) arranged inside the support shell 20. The battery is configured to provide power to the pressure generator 30. A flexible sleeve 10 may be arranged to sleeve on an outside of the support shell 20, and the flexible sleeve 10 is configured to contact the human body. The flexible sleeve 10 defines an adsorption port 11, and a periphery of a wall of the adsorption port 11 is configured to contact a skin of the human body. The support shell 20 defines a fourth opening 21 communicated to the adsorption port 11. Periodic alternating positive and negative pressures generated by the pressure generator 30 may be conducted to the skin through the third opening 21 to stimulate the skin and achieve a massaging effect.

[0024] The flexible sleeve 10 may be made of a skin-friendly material, such as silicon, to improve the user ex-

perience.

[0025] The pressure generator 30 may be implemented by taking specific structures shown in the following embodiments.

Embodiment I

[0026] Referring to FIGS. 3 to 6, a pressure generator 30a includes a housing 31 with a first opening 3131 and a receiving space 3132, a movable member 33 (such as a piston) arranged inside the housing 31, and a driving device 35 configured to drive the movable member 33 to reciprocated move inside the housing 31 so as to generate a negative pressure at the first opening 3131. The movable member 33 is configured to separate the receiving space 3132 of the housing 31 into a first chamber 3133 and a second chamber 3134. The first chamber 3133 is communicated with the first opening 3131. When in use, the first opening 3131 is attached to human body, and the driving device 35 is configured to drive the movable member 33 to move away from the first opening 3131 so that a volume of the first chamber 3133 is increased and the negative pressure is generated at the first opening 3131. Therefore, the first opening 3131 can be sucked onto the human body under the negative pressure.

[0027] The housing 31 includes a rigid part 311 with a second opening 3111, and an absorbing member 313 which is flexible. The movable member 33 is arranged inside the rigid part 311. The absorbing member 313 is connected to the rigid part 311 at the second opening 3111. The absorbing member 313 defines an air passage 3135 communicating with the second opening 3111 and the first opening 3131. The first opening 3131 is formed at an end of the air passage 3135 away from the second opening 3111.

[0028] In at least one embodiment, the rigid part 311 and the absorbing member 313 are integrally formed. It should be understood that, in at least one another embodiment, the rigid part 311 and the absorbing member 313 are formed independently, and the absorbing member 313 can be connected to the rigid part 311 by any suitable structures, such as adhesive glues.

[0029] Referring to FIG. 5, the rigid part 311 includes a first chamber wall 3113 extending along a moving direction of the movable member 33 and surrounding the second opening 3111, and a second chamber wall 3115 connected to an end of the first chamber wall 3113 away from the second opening 3111. A driving end 333 of the moveable member 33 is configured to movably extend through the second chamber wall 3115 and connect the movable member 33 with the driving device 35. The driving device 35 is configured to drive the driving end 333 to move so as to bring the movable member 33 to reciprocated move inside the housing 31.

[0030] Referring to FIG. 5, a self-lubricating sleeve 335 is arranged between the driving end 333 and the second chamber wall 3115, so that the driving end 333 may mov-

ably extend through the second chamber wall 3115, which facilitates reducing a friction between the driving end 333 and the second chamber wall 3115 when the driving end 333 moves relative to the second chamber wall 3115.

[0031] In at least one embodiment, the second chamber wall 3115 defines at least one vent hole 3117. Referring to FIG. 3, the number of the at least one vent hole 3117 is multiple. In at least one embodiment, the at least one vent hole 3117 is configured to run through the second chamber wall 3115. Through such arrangement, air can be vented outside of the housing 31 through the at least one vent hole 3117 when the movable member 33 moves away from the first opening 3131. Therefore, a resistance of the movable member 33 moving away from the first opening 3131 is reduced. Preferably, the at least one vent hole 3117 is configured to run through the second chamber wall 3115 along the moving direction of the movable member 33.

[0032] The movable member 33 further includes a free end 331 connected to the driving end 333, and a sealing ring 332 surrounding the free end 331. The sealing ring 332 is configured to resist against between the free end 331 and the chamber wall of the housing 31 to ensure a sealing performance. In detail, the sealing ring 332 is configured to resist against between the free end 331 and the first chamber wall 3113 of the housing 31. Therefore, air is prevented from running between the first chamber 3133 and the second chamber 3134.

[0033] The driving end 333 is fixedly connected to the free end 331, so that a movement of the driving end 333 can bring the movable member 33 to reciprocated move inside the housing 31.

[0034] In at least one embodiment, the free end 331 defines a sealing slot 3311 on an outer wall thereof, and the sealing ring 332 is at least partially arranged inside the sealing slot 3311.

[0035] In at least one embodiment, the sealing ring 332 includes an arc-shaped part 3321 and two fixing parts 3323 arranged on two opposite sides of the arc-shaped part 3321 respectively. The arc-shaped part 3321 is spaced from the free end 331. The two fixing parts 3323 are arranged at interval along the moving direction of the movable member 33 and extended toward the sealing slot 3311 and received in the sealing slot 3311. The arc-shaped part 3321 together with the two fixing parts 3323 and the free end 331 defines a space 3325. The arc-shaped part 3321 can be deformed into the space 3325 so as to avoid jam during reciprocated moving of the movable member 33. It should be understood that, in at least one embodiment, the sealing ring 332 can be an O-shaped sealing ring, such as a traditional rubber sealing ring.

[0036] Referring to FIG. 6, in at least one embodiment, a center of curvature of the arc-shaped part 3321 is located at a position facing the space 3325, which facilitate the deformation of the arc-shaped part 3321 to move into the space 3325.

[0037] The driving device 35 includes a transmission assembly 351 and a motor 353. The motor 353 is configured to connect to the driving end 333 through the transmission assembly 351. The transmission assembly 351 can be any one of an eccentric transmission structure, a cam and a ball screw.

[0038] In at least one embodiment, the transmission assembly 351 has an eccentric transmission structure and includes an eccentric member 3511 and a connecting rod 3513. The eccentric member 3511 is connected to the motor 353, and the connecting rod 3513 is hinged with the driving end 33. When the pressure generator 30a is in use, the motor 353 is configured to drive the movable member 33 to reciprocated move inside the housing 31 through the eccentric member 3511, the connecting rod 3513, and the driving end 33.

Embodiment II

[0039] Referring to FIGS. 7 and 8, a second embodiment of the present disclosure provides a pressure generator 30b. The difference between the pressure generator 30b of the second embodiment and the pressure generator 30a of the first embodiment is that the pressure generator 30b of the second embodiment further includes a massaging member 37. The massaging member 37 includes a connecting part 371 connected to a side of the free end 331 facing the first opening 3131 and at least one massaging protrusion 373 extending away from the connecting part 371. The at least one massaging protrusion 373 is configured to partially extend out of the housing 31 through the first opening 3131. In at least one embodiment, when the movable member 33 moves toward the first opening 3131 and moves to a position closest to the first opening 3131, the at least one massaging protrusion 373 at least partially extends out of the housing 31 so as to massage human body, thus improving user experience.

[0040] In at least one embodiment, the massaging member 37 and the sealing ring 332 are integrally formed. A periphery of the connecting part 371 is connected with the sealing ring 332. It should be understood that, in at least one embodiment, the massaging member 37 and the sealing ring 332 can be two independent components and the massaging member 37 can be connected to the free end 331 of the movable member 33 with any suitable structures, such as adhesive glues.

Embodiment III

[0041] Referring to FIGS. 9 to 12, a third embodiment of the present disclosure provides a pressure generator 30c. The difference between the pressure generator 30c of the third embodiment and the pressure generator 30a of the first embodiment is that the movable member 33' of pressure generator 30c further includes a unidirectional exhaust structure 39 communicating with the first chamber 3133 and the second chamber 3134. When the

movable member 33' moves towards the first opening 3131, the unidirectional exhaust structure 39 is configured to communicate the first chamber 3133 with the second chamber 3134 under the air pressure in the first chamber 3133; when the movable member 33' moves away from the first opening 3131, the unidirectional exhaust structure 39 is configured to block the communication between the first chamber 3133 and the second chamber 3134 under the air pressure in the second chamber 3134. By setting the unidirectional exhaust structure 39, when the movable member 33' moves away from the first opening 3131, negative pressure is generated at the first opening 3131; when the movable member 33' moves towards the first opening 3131, air in the first chamber 3133 can be exhausted to the second chamber 3134 through the unidirectional exhaust structure 39, and the second chamber 3134 is communicated with the outside. Thus, the resistance during the movement of the movable member 33' can be reduced.

[0042] The unidirectional exhaust structure 39 includes at least one exhaust hole 391 running through the free end 331 of the movable member 33' to communicate the first chamber 3133 with the second chamber 3134, and a vent plug 393 arranged on a side of the free end 331 away from the first chamber 3133 and configured to cover the at least one exhaust hole 391. When the movable member 33' moves towards the first opening 3131, the vent plug 393 is configured to move to open the exhaust hole 391 so that the first chamber 3133 communicates with the second chamber 3134 through the exhaust hole 391 under the air pressure in the first chamber 3133. When the movable member 33' moves away from the first opening 3131, the vent plug 393 is configured to block the communication between the first chamber 3133 and the second chamber 3134 under the air pressure in the second chamber 3134.

[0043] Referring to FIGS. 10 and 12, the vent plug 393 is an annular sheet. In at least one embodiment, the vent plug 393 can be deformed. For example, the vent plug 393 can be made of silicon material to make the vent plug 393 flexible and soft. In detail, referring to FIG. 10, the vent plug 393 includes a main part 3931 arranged on the side of the free end 331 of the movable member 33' away from the first opening 3131 and at least one covering part 3933 configured to cover the at least one exhaust hole 391. The main part 3931 defines at least one through hole 3932. The covering part 3933 is extended from the main part 3931 into the at least one through hole 3932 respectively. In at least one embodiment, the covering part 3933 can move relative to the main part 3931.

[0044] When the movable member 33' moves away from the first opening 3131, the volume of the first chamber 3133 is increased to decrease the air pressure in the first chamber 3133 (a difference between the air pressure in the first chamber 3133 and the air pressure in the second chamber 3134 is not sufficient to prevent a deformation of the covering part 3933), therefore, the negative pressure is generated at the first opening 3131 to gen-

erate a suction force applied on human body. At the same time, the covering part 3933 covers the at least one exhaust hole 391 to block the communication between the first chamber 3133 and the second chamber 3134 under the negative pressure. With the volume of the first chamber 3133 getting bigger, the negative pressure getting bigger, which forces the covering part 3933 to remain covering the at least one exhaust hole 391 to keep blocking the communication between the first chamber 3133 and the second chamber 3134. Therefore, the first opening 3131 remains at a suction state.

[0045] When the movable member 33' moves towards the first opening 3131, the volume of the first chamber 3133 is decreased to decrease the negative pressure. The movable member 33' compresses air in the first chamber 3133 to increase the air pressure in the first chamber 3133. When a difference between the air pressure in the first chamber 3133 and the air pressure in the second chamber 3134 is greater enough to deform the covering part 3933 to open the at least one exhaust hole 391, air is vented from the first chamber 3133 to the second chamber 3134 to reduce the movement resistance of the movable member 33'.

[0046] In at least one embodiment, the main part 3931 can be connected to the free end 331 of the movable member 33' by adhesive glues.

[0047] In at least one embodiment, referring to FIGS. 9 and 10, the number of the at least one exhaust hole 391 is multiple. Correspondingly, the number of the at least one through hole 3932 and the number of the at least one covering part 3933 are multiple.

[0048] In at least one embodiment, referring to FIGS. 12 and 13, a heating coil 38 or a semiconductor refrigeration sheet 38 is arranged on the rigid part 311. In detail, the heating coil 38 or the semiconductor refrigeration sheet 38 are arranged on an outer side of the first chamber wall 3113. In at least one embodiment, the semiconductor refrigeration sheet 38 includes a hot end and a cold end opposite to the hot end. The hot end or the cold end can be attached to the first chamber wall 3113 so as to adjust a temperature of the absorbing member 313, thereby improving user's experiences. It should be understood that, in at least one embodiment, the semiconductor refrigeration sheet 38 can be replaced with the heating coil 38.

[0049] The sealing ring 332' can be a general O-shaped sealing ring, such as a rubber sealing ring. It should be understood that, in at least one embodiment, the sealing ring 332' can be the sealing ring 332 described in the first embodiment. That is, the sealing ring 332' can include the arc-shaped part 3321 and two fixing parts 3323 arranged two opposite sides of the arc-shaped part 3321 respectively. The two fixing parts 3323 are arranged at interval along the moving direction of the movable member and extended toward sealing slot 3311 and received in the sealing slot 3311 and received in the sealing slot 3311. The arc-shaped part 3321 together with the two fixing parts 3323 and the free end 331 defines

a space 3325. The arc-shaped part 3321 can be deformed into the space 3325.

Embodiment IV

[0050] Referring to FIGS. 13 to 15, a fourth embodiment of the present disclosure provides a pressure generator 30d. The difference between the pressure generator 30d of the fourth embodiment and the pressure generator 30c of the third embodiment is that a structure of the vent plug 393' is different from that of the vent plug 393. The vent plug 393' includes a main part 3931' arranged on the side of the free end 331 of the movable member 33' away from the first opening 3131 and at least one surrounding wall 3935 extending away from the main part 3931'. The main part 3931' defines at least one through hole 3932' corresponding to the at least one exhaust hole 391. The through holes 3932' is configured to communicate with the at least one exhaust hole 391. The at least one surrounding wall 3935 is configured to surround the at least one through hole 3932' respectively, and extend toward the second chamber 3134. Each of the at least one surrounding wall 3935 defines an air channel 3937 communicating with a corresponding through hole 3932'. The surrounding wall 3935 is made of elastic material and configured to be deformed to open or close (or substantially close) the air channel 3937.

[0051] When the movable member 33" moves away from the first opening 3131, the volume of the first chamber 3133 is increased to decrease the air pressure in the first chamber 3133 (a difference between the air pressure in the first chamber 3133 and the air pressure in the second chamber 3134 is not sufficient to prevent a deformation of the surrounding wall 3935), therefore, negative pressure is generated at the first opening 3131 to generate a suction force applied on human body. At the same time, the surrounding wall 3935 closes to block the communication between the first chamber 3133 and the second chamber 3134 under the negative pressure. With the volume of the first chamber 3133 getting bigger, the negative pressure getting bigger, which forces the surrounding wall 3935 to remain blocking the communication between the first chamber 3133 and the second chamber 3134. Therefore, the first opening 3131 remains at the suction state.

[0052] When the movable member 33" moves toward the first opening 3131, the volume of the first chamber 3133 is decreased to decrease the negative pressure. The moveable member 33 compresses air in the first chamber 3133 to increase the air pressure in the first chamber 3133. When a difference between the air pressure in the first chamber 3133 and the air pressure in the second chamber 3134 (the air pressure in the first chamber 3133 is greater than the air pressure in the second chamber 3134) is greater enough to make the surrounding wall 3935 deform to open the air channel 3937, the at least one air channel 3937 is communicated the first chamber 3133 through the at least one through holes

3932 and the at least one exhaust hole 391 with the second chamber 3134, therefore, air can be vented from the first chamber 3133 to the second chamber 3134 to reduce the movement resistance of the movable member 33".

[0053] It should be understood that, the unidirectional exhaust structure of the present disclosure is not limited to the unidirectional exhaust structure 39 described in the third embodiment and the fourth embodiment. For example, the unidirectional exhaust structure 39 can be a one-way valve extending through the free end 331. The vent plug 393, 393' described in the third embodiment and the fourth embodiment can be a flat plate structure made of rigid material, and the vent plug can be connected to the free end 331 through a spring. When the air pressure in the first chamber 3133 is greater enough to make the spring deform to open the exhaust hole 391. When the movable member 33 moves away from the first opening 3131, the volume of the first chamber 3133 gets bigger to decrease the air pressure in the first chamber 3133, the vent plug 35 blocks the exhaust hole 391 to block the communication between the first chamber 3133 and the second chamber 3134. Along with the volume of the first chamber 3133 gets bigger, the negative pressure gets bigger, which forces the vent plug 35 to remain blocking the exhaust hole 391.

[0054] The negative pressure generator with the unidirectional exhaust structure is not limited to the negative pressure generator shown in the third and fourth embodiments. Referring to FIG. 16, the negative pressure generator with the unidirectional exhaust structure can further include the massaging member 37 as shown in FIG. 8. The massaging member 37 includes the connecting part 371 connected to a side of the free end 331 of the movable member 33 facing the first opening 3131 and the massaging protrusions 373 extending away from the connecting part 371. The massaging protrusions 373 is configured to be capable of at least partially extending out of the housing 31 through the first opening 3131. In order to make the first chamber 3133 and the second chamber 3134 communicate with each other, the connecting part 371 defines at least one air hole 3711 communicating with the at least one exhaust hole 391. Additionally, referring to FIG. 16, the massaging member 37 can be integrally formed with the sealing ring 332 with an outer edge of the connecting part 371 connected with the sealing ring 332.

[0055] It should be understood that, the driving device is not limited to the driving device 35 shown in the first to fourth embodiments. For example, the driving device can be an electromagnetic driver. The electromagnetic driver includes a first magnetic component and a second magnetic component connected to the transmission member. One of the first magnetic component and the second magnetic component is a coil, and the other one of the first magnetic component and the second magnetic component is a magnet. When the coil is energized, interaction force between the first magnetic component and the second magnetic component can drive the mov-

able member to reciprocated move.

[0056] The magnet can be a permanent magnet or an electromagnet.

[0057] As shown in FIG. 17, the present disclosure provides a massager 100'. The massager 100' is configured to massage a body of a user, especially to massage sensitive portions of the body. The massager 100' may generate a negative pressure to massage and stimulate the sensitive portions.

[0058] The massager 100' may include a support shell 20, a pressure generator 30 arranged inside the support shell 20, and a battery 40 arranged inside the support shell 20. The battery 40 is configured to provide power to the pressure generator 30. A flexible sleeve 10 may be arranged to sleeve an outside of the support shell 20, and the flexible sleeve 10 is configured to contact the human body. The flexible sleeve 10 defines an adsorption port 11, and a periphery of a wall of the adsorption port 11 is configured to contact a skin of the user. The support shell 20 defines a third opening 200 communicated to the adsorption port 11. Periodic alternating positive and negative pressures generated by the pressure generator 30 may be conducted to the skin through the third opening 200 to stimulate the skin and achieve a massaging effect.

[0059] The flexible sleeve 10 may be made of a skin-friendly material, such as silicon, to improve the user experience.

[0060] The pressure generator 30 may be implemented by taking specific structures shown in the following embodiments.

Embodiment V

[0061] As shown in FIGS. 18 to 22, a fifth embodiment of the present disclosure provides a pressure generator 30e. The pressure generator 30e includes a housing 31 defining a receiving space 3132, a movable member 33 movably extending into the receiving space 3132, and a driving device 35. The driving device 35 is configured to drive the movable member 33 to move along the receiving space 3132 reciprocally and linearly. The housing 31 defines a first opening 3131 communicated to the receiving space 3132. A gap 300 is defined between the movable member 33 and an inner wall of the housing 31.

[0062] In detail, the movable member 33 includes a free end 331 and a driving end 333. A cavity 3310 is defined in the free end 331. The free end 331 includes a bottom wall 3315 connected to the driving end 333 and a side wall 3313 extending from the bottom wall 3315 toward the first opening 3131. The bottom wall 3315 and the side wall 3313 cooperatively define the cavity 3310. The cavity 3310 is communicated to the receiving space 3132. The cavity 3310 allows a volume of the receiving space 3132 to be increased so that the pressure generator 30e has a large pressure variation range and a large pressure variation space. At the same time, the cavity 3310 may increase a contact area between the movable

member 33 and air in the receiving space 3132, such that the movable member 33 may be subjected to a uniform force while moving, and the movable member 33 may move stably. The driving end 333 includes a transmitting element (not labelled) extended along the moving direction of the moveably member 33.

[0063] The free end 331 further includes a sleeve ring 334 sleeving the side wall 3313. The sleeve ring 334 is made of a metal, preferably made of aluminum alloy and the like. In the present embodiment, the gap 300 is defined between the sleeve ring 334 and the inner wall of the housing 31. As desired, an outer diameter of the bottom wall 3315 is greater than an outer diameter of the side wall 3313, thereby forming a limiting stage (not labelled) to position the sleeve ring 334. In the present embodiment, the movable member 33 includes a piston.

[0064] In the present embodiment, the pressure generator 30e further includes a protective sleeve 32. The protective sleeve 32 is made of a cushioning material and sleeved an outside of the housing 31. The protective sleeve 32 defines a third opening 320 communicated to the first opening 3131. The protective sleeve 32 is made of a cushioning material, such as silicone and the like. As shown in FIG. 17, the protective sleeve 32 is disposed between the support shell 20 and the housing 31. By arranging the protective sleeve 32, transmission of vibration to the outside may be reduced, and on the other hand, transmission of noise, which is generated due to the movable member 33 moving while the movable member 33 contacts the housing 31, to the outside may be reduced, such that noise may be reduced.

[0065] Only when the gap 300 is not greater than 0.1mm, a dynamic pressure may be generated at the third opening 320 and the first opening 3131, i.e., the negative pressure may be generated at the third opening 320 and the first opening 3131. By defining the gap 300 to be smaller, a larger noise may be prevented while using the massager 100', achieving a noise reduction. In use, the driving device 35 may be arranged to allow the movable member 33 (such as a piston) to move along a length direction in the housing 31 reciprocally. When the adsorption port 11 of the massager 100' is attached to the skin, the third opening 320 is covered. The movable member 33 moving reciprocally may change a volume of the receiving space 3132 defined by the housing 31. In this way, an internal air pressure is dynamically changed, even when the receiving space defined by the housing 31 generates the alternating positive and negative pressures. Preferably, the gap 300 is not greater than 0.05 mm.

[0066] In the present embodiment, as shown in FIG. 20, a block 321 is arranged at each of two ends of the protective sleeve 32, and the block 321 is extended toward the receiving space 3132. Two blocks 321 define a receiving cavity of the housing 31. The outside of the housing 31 is sleeved by the protective sleeve 32 for wrapping, which can further reduce noise. The block 321 may be a convex block, and a plurality of blocks 321 may

be spaced apart from each other and disposed between the two ends of the protective sleeve 32. Alternatively, the block 321 may be a ring-shaped wall, and two blocks 321 may be disposed at the two ends of the protective sleeve 32 respectively.

[0067] As shown in FIG. 22, the protective sleeve 32 and the housing 31 may be spaced apart from each other to define a sound insulation space 310. The sound insulation space 310 prevents the noise, which is generated by the reciprocating movement of the movable member 33, from transmitting to the outside, thus further reducing the noise. As needed, the sound insulation space 310 may preferably be a vacuum, which has a better effect to reduce the noise.

[0068] The driving device 35 includes a transmission assembly 351 and a motor 353. The transmission assembly 351 includes an eccentric member 3511 arranged on a shaft of the motor 353 and a connecting rod 3513. The eccentric member 3511 is movably connected to the driving end 333 through the connecting rod 3513. A bearing 3515 may be disposed between the connecting rod 3513 and the driving end 333, and another bearing 3515 may be disposed between the connecting rod 3513 and the eccentric member 3511. The bearing 3515 is fixed to the eccentric member 3511 through a screw 3517 to allow the connecting rod 3513 and the eccentric part 32 to rotate stably. The another bearing 3515 is fixed to a fixed protrusion on the driving end 333 through another screw 3517 to allow the connecting rod 3513 and the driving end 333 to rotate stably.

Embodiment VI

[0069] Another embodiment of the present disclosure further provides a pressure generator 30f. Referring to FIG. 23, the pressure generator 30f differs from the pressure generator 30e in the above embodiment only in that: the sleeve ring 334 and the side wall 3313 of the movable member 33 are configured as a one-piece structure. The one-piece structure is plastic. Preferably, the sleeve ring 334 and the side wall 3313 are formed as one piece by injection molding. Other structures of the pressure generator 30f are the same as those in the fifth embodiment, and will not be repeated.

Embodiment VII

[0070] As shown in FIGS. 24 and 25, a pressure generator 30g in the Embodiment VII differs from the pressure generator 30e in the Embodiment V in the following aspects.

[0071] As shown in FIG. 25, the free end 331 may be in a shape of a flat plate.

[0072] In the present embodiment, the pressure generator 30g further includes an absorbing member 313 connected to the housing 31. An end of the absorbing member 313 defines an adsorbing port 3130. The adsorbing port 3130 is communicated to the first opening

3131. The periodic alternating positive and negative pressures may also be generated at the adsorbing port 3130.

[0073] In the present embodiment, the absorbing member 313 is integrally formed with the housing 31. It shall be understood that, in other embodiments, the absorbing member 313 and the housing 31 may be connected by glue or the like. When the absorbing member 313 is arranged in the massager 100', the absorbing member 313 may be integrally formed or separately formed with the flexible sleeve 10.

[0074] The housing 31 includes a first cavity wall 3113 and a second cavity wall 3115. The first cavity wall 3113 is extended in the moving direction of the movable member 33 and enclosed to define the first opening 3131. The second cavity wall 3115 is disposed at an end of the first cavity wall 3113 away from the first opening 3131. The gap 300 is defined between the movable member 33 and the first cavity wall 3113. The second cavity wall 3115 is movably extended through the driving end 333. The driving end 333 is connected to the movable member 33 and the driving device 35, such that the driving device 35 may drive the driving end 333 to further drive the movable member 33 to reciprocally move within the housing 31.

[0075] In the present embodiment, the second cavity wall 3115 defines a leaking hole 3116. The leaking hole 3116 is extended through the second cavity wall 3115 along the moving direction of the movable member 33.

[0076] The driving device 35 includes a transmission assembly 351 and a motor 353. The motor 353 is connected to the driving end 333 through the transmission assembly 351. The transmission assembly 351 may be any one of an eccentric transmission structure, a cam, and a rolling ball screw.

[0077] In the present embodiment, the transmission assembly 351 is the eccentric transmission structure. The transmission assembly 351 includes an eccentric member 3511 and a connecting rod 3513 that are transmittably connected to each other. The eccentric member 3511 is connected to the motor 353, and the connecting rod 3513 is connected to the driving end 333.

[0078] When the pressure generator is operating, the adsorbing port 3130 is placed at a part of the body that needs massage. The motor 353 is configured to drive the movable member 33 to reciprocally move in the housing 31 by driving the eccentric member 3511, the connecting rod 3513 and the driving end 333 successively. In this way, the periodic alternating positive and negative pressures may be generated at the adsorbing port 3130, achieving the effect of adsorption and relief.

Embodiment VIII

[0079] As shown in FIG. 26, a difference between a pressure generator 30h in the Embodiment VIII and the pressure generator 30g of the Embodiment VII includes following aspects.

[0080] In the fourth embodiment, a plurality of massag-

ing protrusions 373 may be arranged on a side of the movable member 33 facing the first opening 3131. While the movable member 33 is moving reciprocally towards the first opening 3131, the plurality of massaging protrusions 373 may at least partially protrude out of the adsorbing port 3130. In detail, when the movable member 33 moves towards the first opening 3131 to reach a position closest to the first opening 3131, the plurality of massaging protrusions 373 may at least partially protrude out of the adsorbing port 3130. In this way, the plurality of massaging protrusions 373 may massage the body.

[0081] To be noted that, a structure of the driving device 35 is not limited to the structure shown in the fourth and the fifth embodiment. For example, the driving device 35 may be an electromagnetic drive member. The electromagnetic drive member includes a first magnetic member and a second magnetic member connected to the driving end. One of the first magnetic member and the second magnetic member includes wires, and the other of the first magnetic member and the second magnetic member includes a magnet. When the wire is conducted, a force between the first magnetic member and the second magnetic member may drive the movable member to move reciprocally.

[0082] The above description only describes embodiments of the present disclosure, and is not intended to limit the present disclosure, various modifications and changes can be made to the present disclosure. Any modifications, equivalent substitutions, improvements, etc. made within the spirit and scope of the present disclosure are intended to be included within the scope of the present disclosure.

Claims

1. A pressure generator (30), comprising:

a housing (31) with a first opening (3131) and a receiving space (3132);
a movable member (33), movably inserted into the receiving space (3132); and
a driving device (35), configured to drive the movable member (33) to reciprocated move inside the receiving space (3132) so as to generate a negative pressure at the first opening (3131).

2. The pressure generator (30) according to claim 1, wherein the movable member (33) comprises:

a free end (331) arranged in the receiving space (3132); and
a sealing ring (332) arranged between the housing (31) and the free end (331), the sealing ring (332) surrounding the free end (331) and resisting against between the free end (331) and the housing (31).

3. The pressure generator (30) according to claim 2, wherein the free end (331) defines a sealing slot (3311) configured to receive the sealing ring (332).
4. The pressure generator (30) according to claim 3, wherein the sealing ring (332) comprises:
 - an arc-shaped part (3321); and
 - two fixing parts (3323) extending from two opposite sides of the arc-shaped part (3321) respectively, the two fixing parts (3323) being arranged at interval along a moving direction of the free end (331) and extended toward the sealing ring (332), the arc-shaped part (3321), the two fixing parts (3323) and the free end (331) cooperating to define a space (3325), and the arc-shaped part (3321) being configured to be deformed into the space (3325).
5. The pressure generator (30) according to claim 2, wherein further comprising a massaging member (37), the massaging member (37) comprising:
 - a connecting part (371) connected to a side of the free end (331) facing the first opening (3131); and
 - at least one massaging part (373) arranged on the connecting part (371) away from the free end (331) and configured to partially extend out of the housing (31) through the first opening (3131).
6. The pressure generator (30) according to claim 2, wherein, the movable member (33) is configured to separate the housing (31) into a first chamber (3313) communicating with the first opening (3131) and a second chamber (3134); and the movable member (33) further comprises a unidirectional exhaust structure (39) configured to communicate the first chamber (3313) with the second chamber (3134) unidirectionally.
7. The pressure generator (30) according to claim 6, wherein the unidirectional exhaust structure (39) comprises:
 - at least one exhaust hole (391) running through the free end (331) to communicate the first chamber (3313) with the second chamber (3134); and
 - a vent plug (393) arranged on the free end (331) and configured to cover the at least one exhaust hole (391) away from the first chamber (3313).
8. The pressure generator (30) according to claim 7, wherein
 - the vent plug (393) comprises:
- a main part (3931) arranged on a side of the free end (331) away from the first opening (3131); and
- at least one covering part (3933) made of elastic material, the at least one covering part (3933) being capable of being deformed to cover or open the at least one exhaust hole (391);
- or
- the vent plug (393) comprises:
 - a main part (3931) arranged on a side of the free end (331) away from the first opening (3131) and defining at least one through hole (3932) communicating with the at least one exhaust hole (391); and
 - at least one surrounding wall (3935) extending away from the main part (3931) and surrounding the at least one through hole (3932) respectively, the at least one surrounding wall (3935) being made of elastic material and capable of being deformed to close or open the at least one through hole (3932).
9. The pressure generator (30) according to claim 2, wherein the housing (31) comprises:
 - a rigid part (311) with a second opening (3111), the movable member (33) being arranged inside the rigid part (311); and
 - an absorbing member (313) with the first opening (3131) arranged on an end of the absorbing member (313) away from the second opening (3111), the absorbing member (313) being connected to the rigid part (311) at the second opening (3111) and defining an air passage (3135) communicating with the second opening (3111).
10. The pressure generator (30) according to claim 1, wherein a gap (300) is defined between the movable member (33) and an inner wall of the housing (31), the gap (300) being not greater than 0.1mm.
11. The pressure generator (30) according to claim 10, wherein further comprising a protective sleeve (32) made of a cushioning material and configured to sleeve an outside of the housing (31), the protective sleeve (32) defining a third opening (320) communicated to the first opening (3131).
12. The pressure generator (30) according to claim 11, wherein the protective sleeve (32) and the housing (31) are spaced apart from each other to define a sound insulation space (310).
13. The pressure generator (30) according to claim 10,

wherein the movable member (33) comprises:

a driving end (333) connected to the driving device (35); and

a free end (331) connected to the driving end (333), and the free end (331) defining a cavity (3310) communicated to the receiving space (3132).

14. The pressure generator (30) according to claim 1, wherein at least one massaging protrusion (373) is arranged on a side of the movable member (33) facing the first opening (3131), the at least one massaging protrusion (373) at least partially extending out of the first opening (3131); and/or the pressure generator (30) comprises a heating coil (38) or a semiconductor refrigeration sheet (38) arranged on the housing (31) to adjust temperature at the first opening (3131).

15. A massager (100), comprising a support shell (20) defining a fourth opening (21), and a pressure generator (30) of any one of claims 1 to 14; wherein, the pressure generator (30) is mounted in the support shell (20); and the fourth opening (21) is communicated to the first opening (3131).

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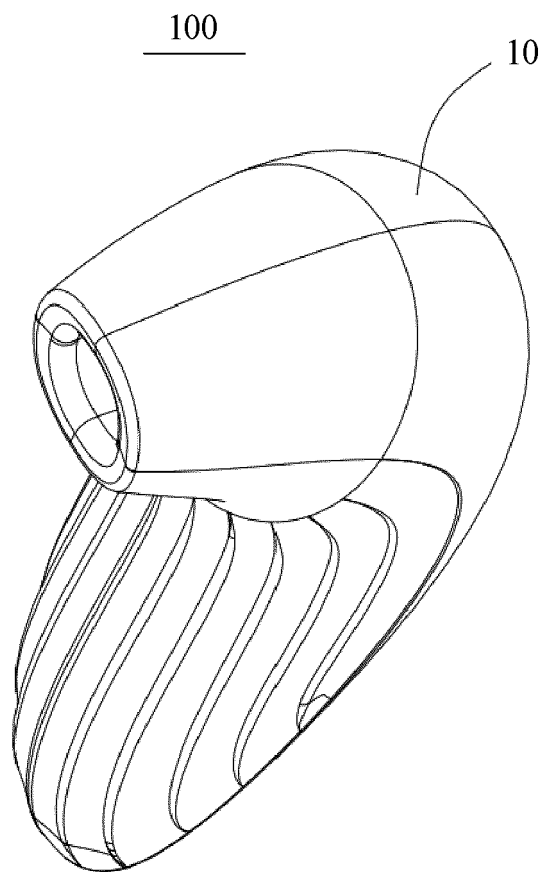


FIG. 1

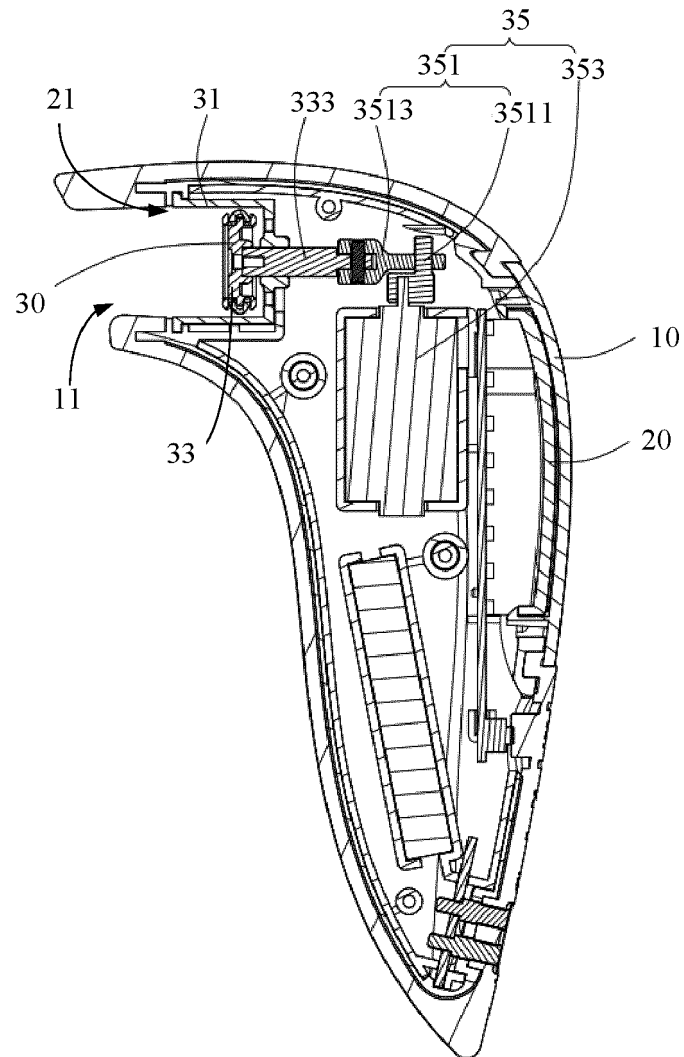


FIG. 2

30a

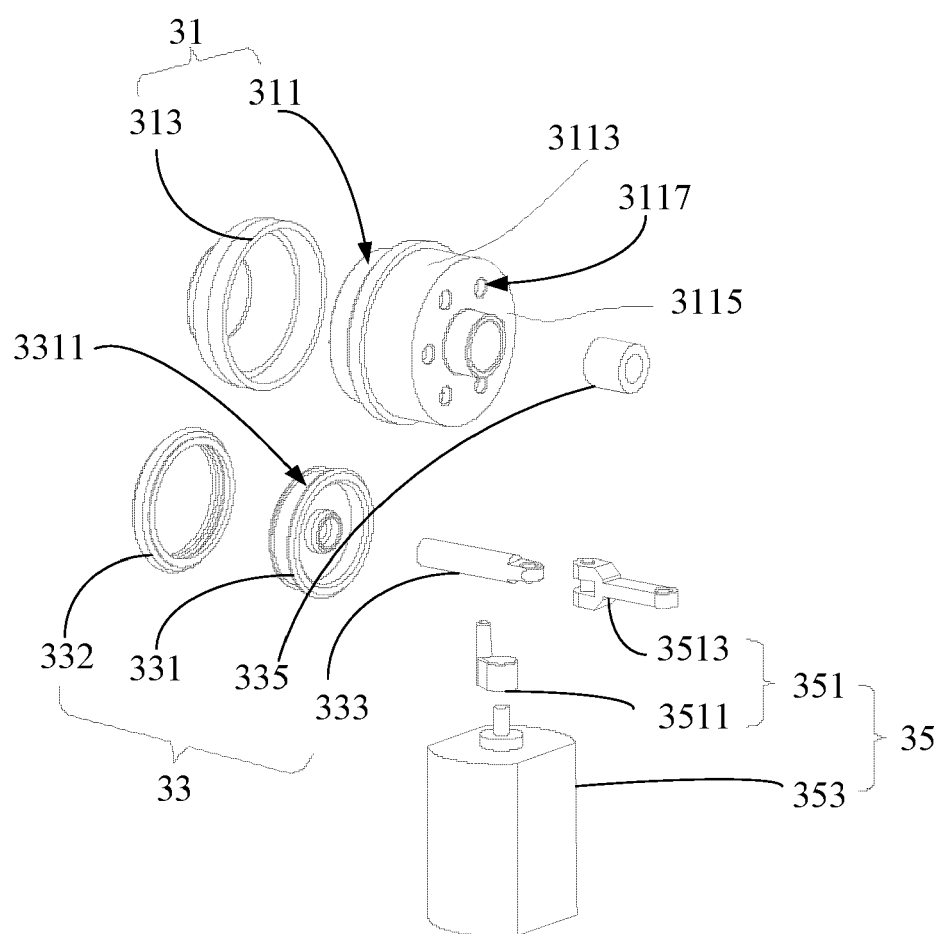


FIG. 3

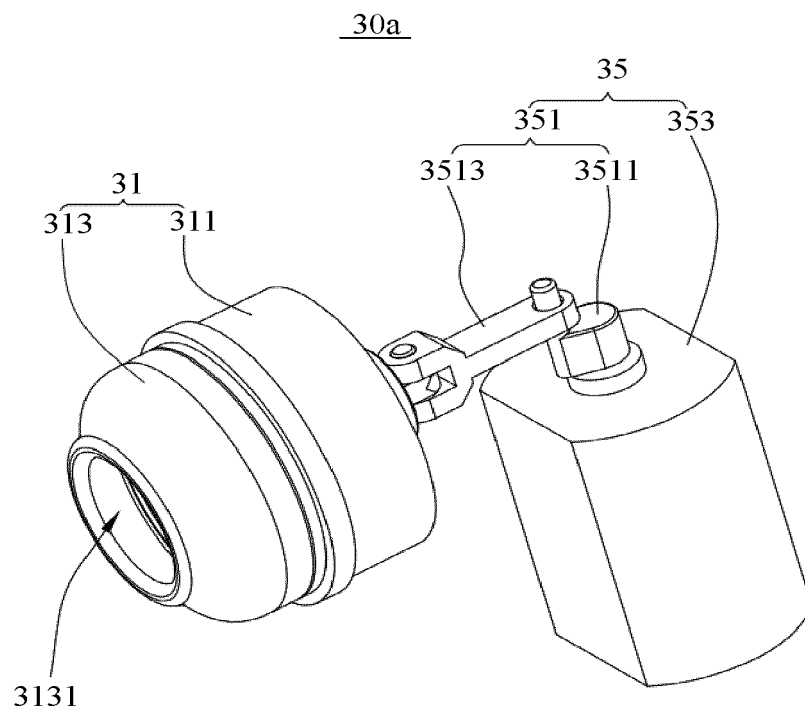


FIG. 4

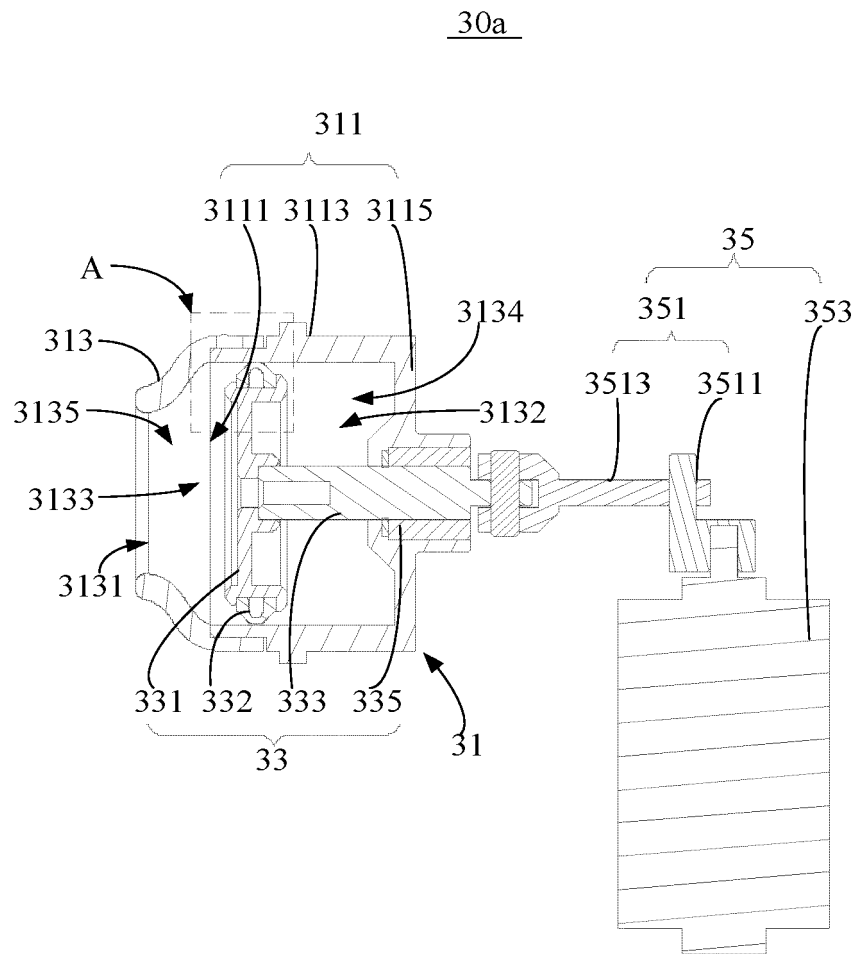


FIG. 5

A

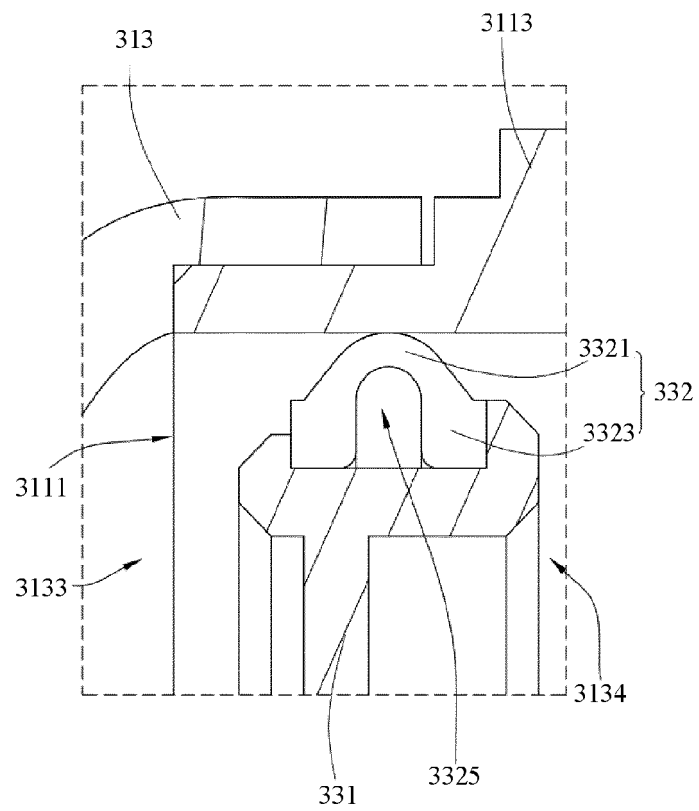


FIG. 6

30b

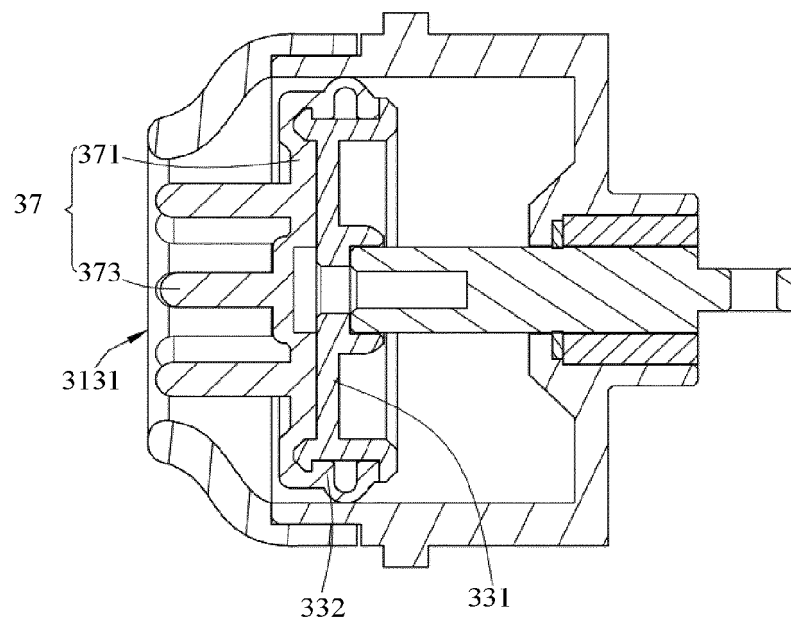


FIG. 7

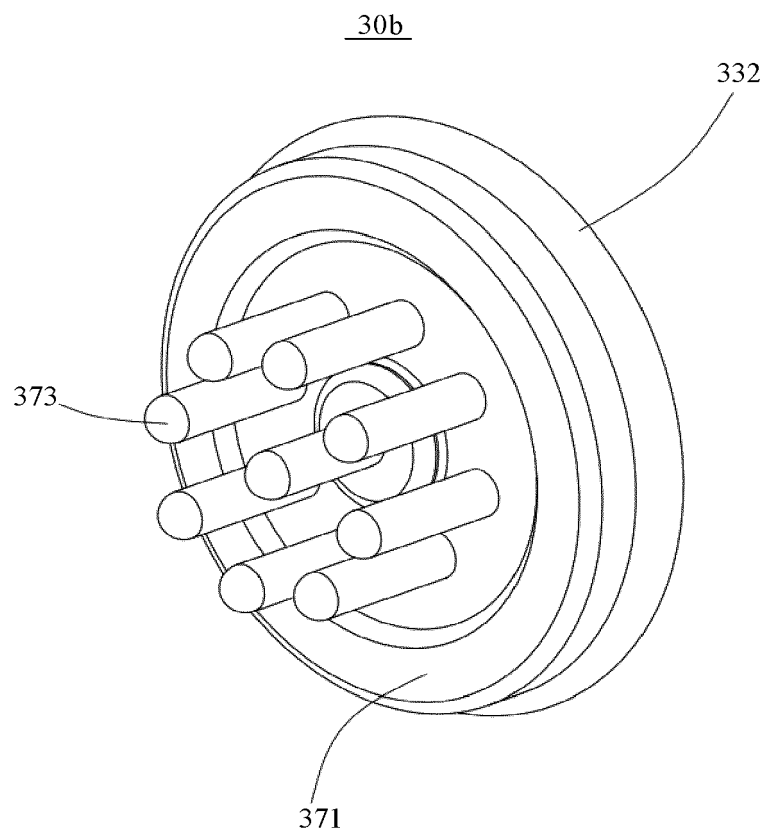


FIG. 8

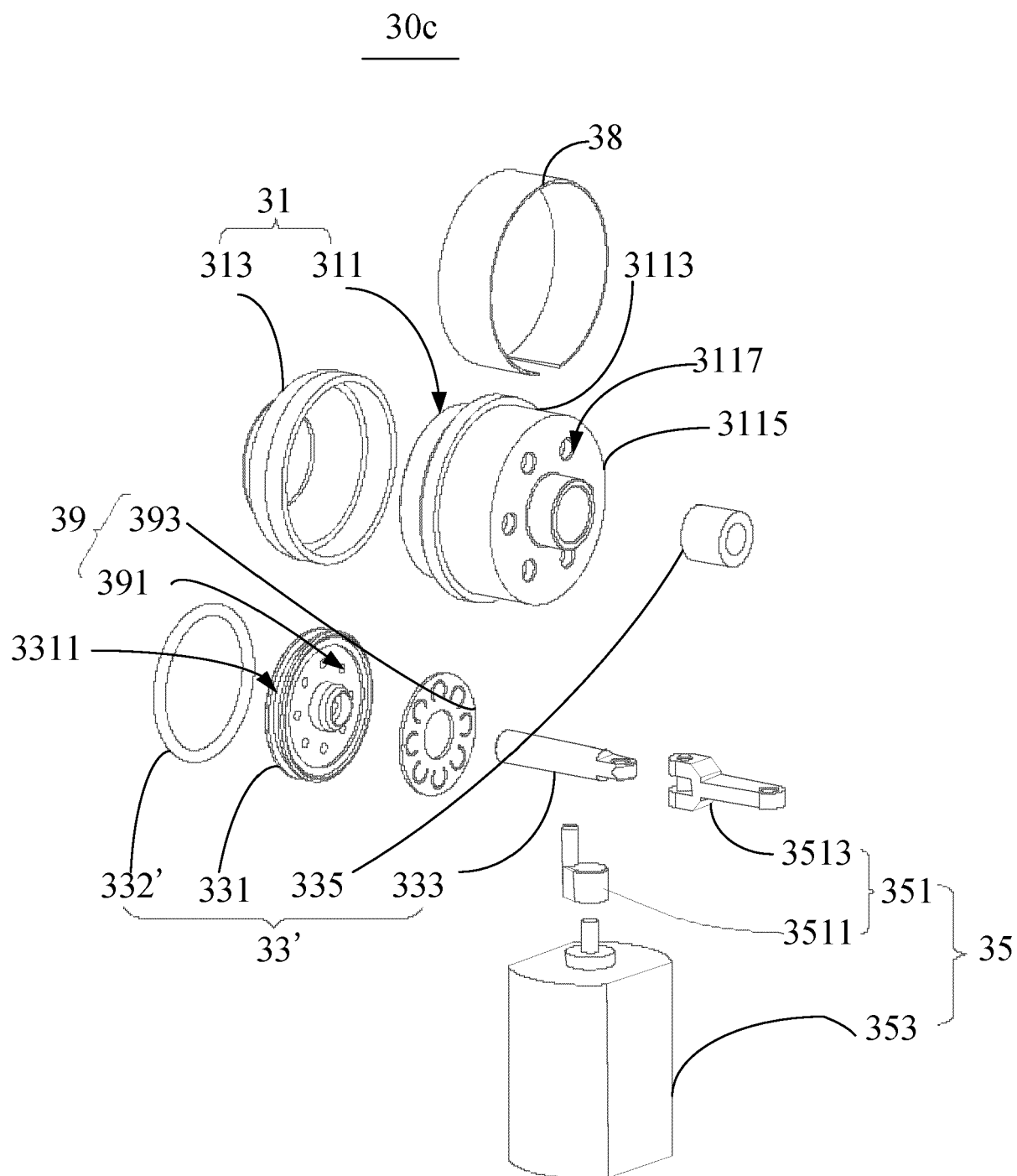


FIG. 9

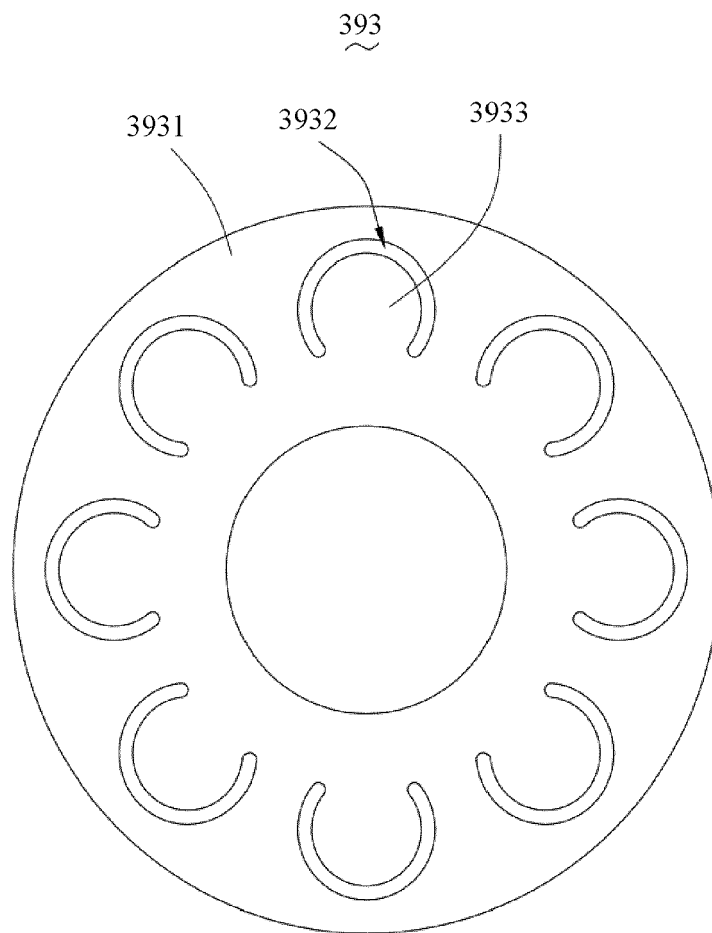


FIG. 10

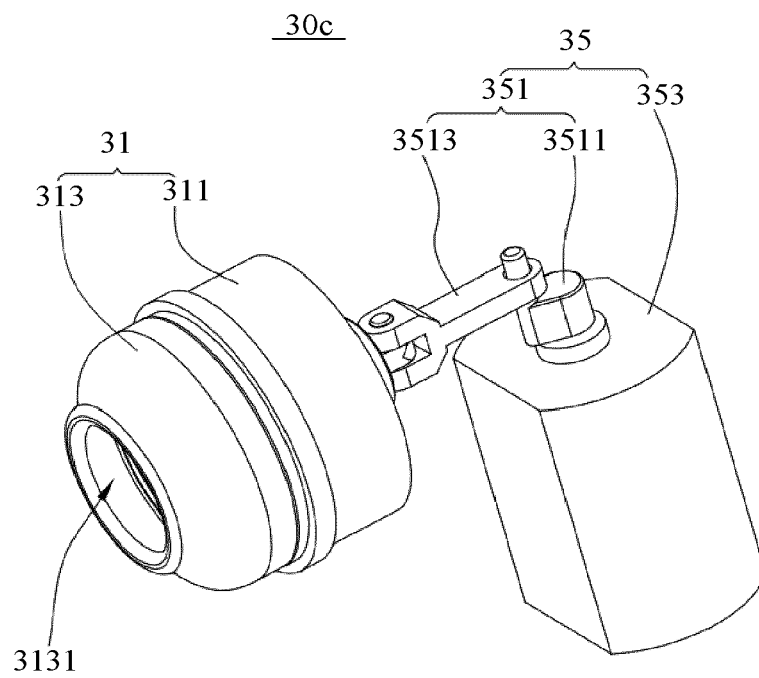


FIG. 11

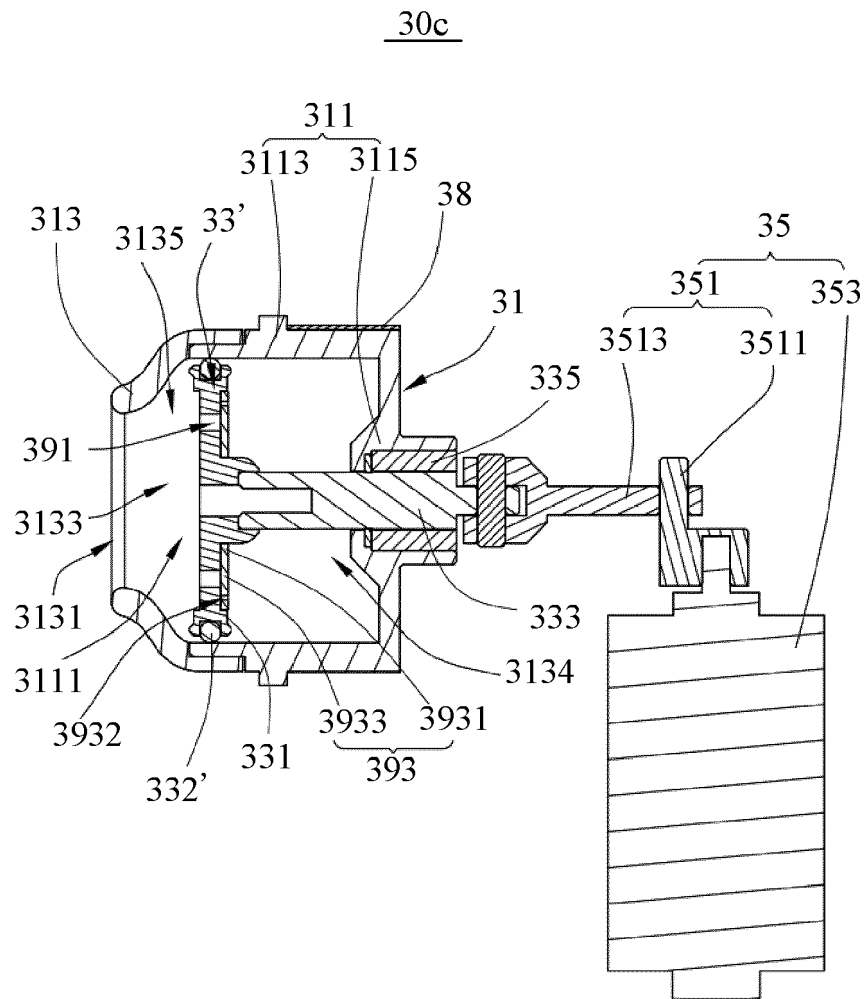


FIG. 12

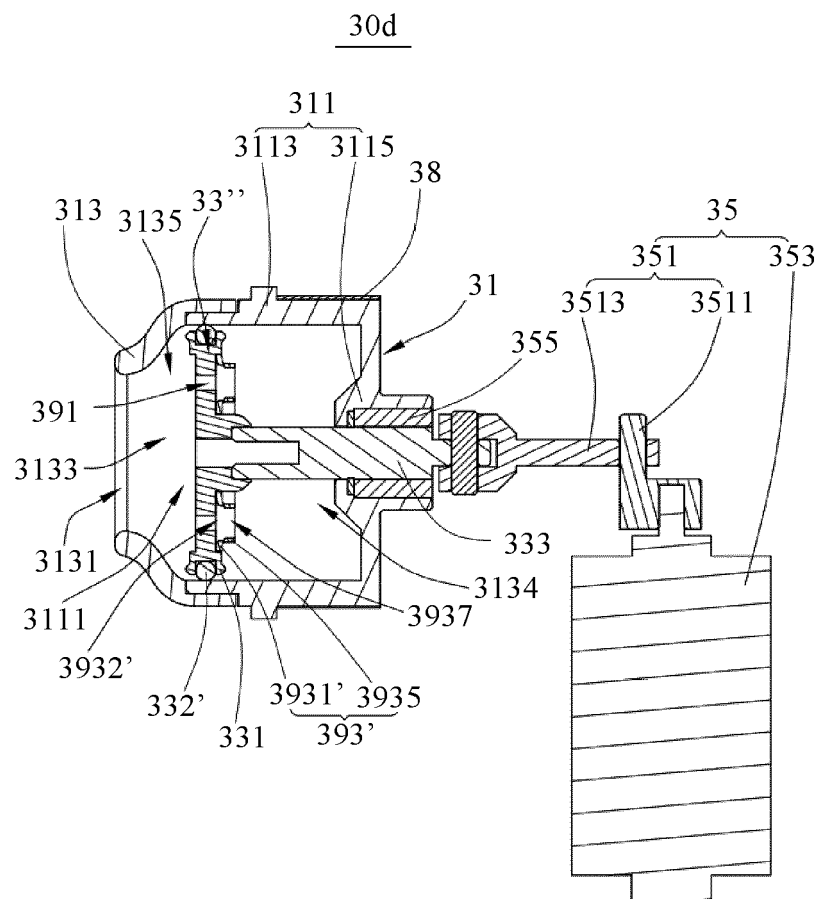


FIG. 13

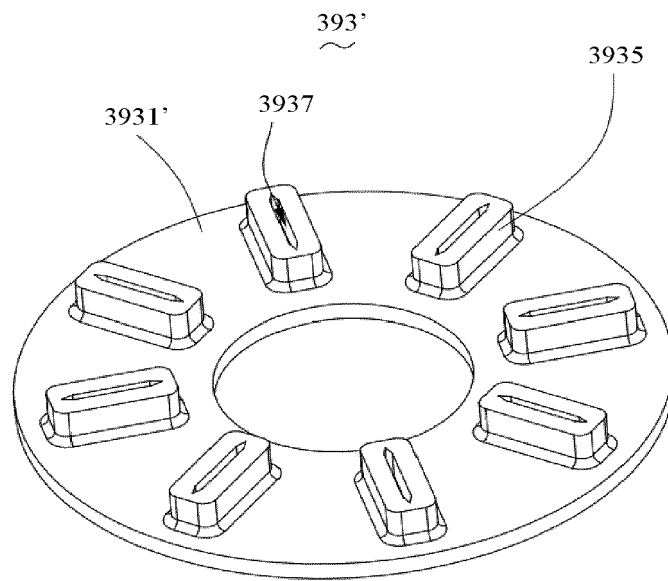


FIG. 14

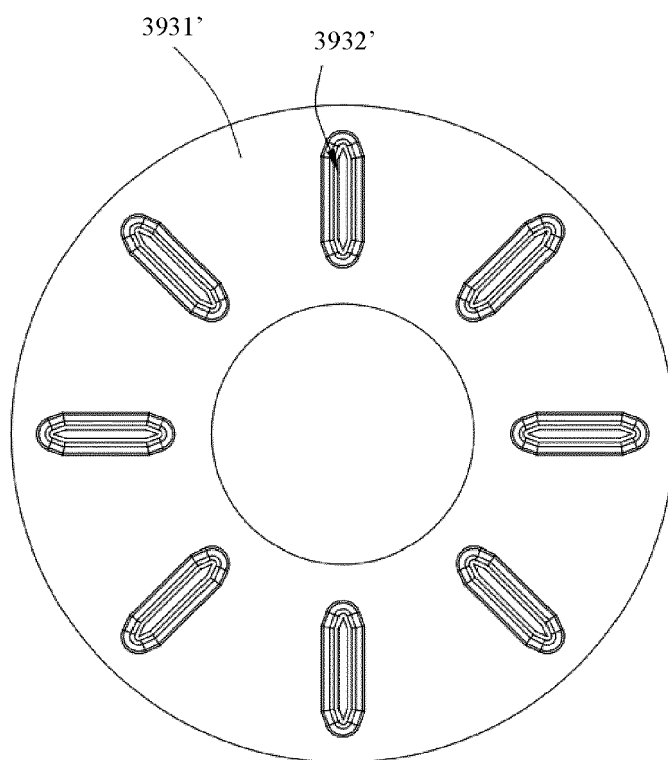


FIG. 15

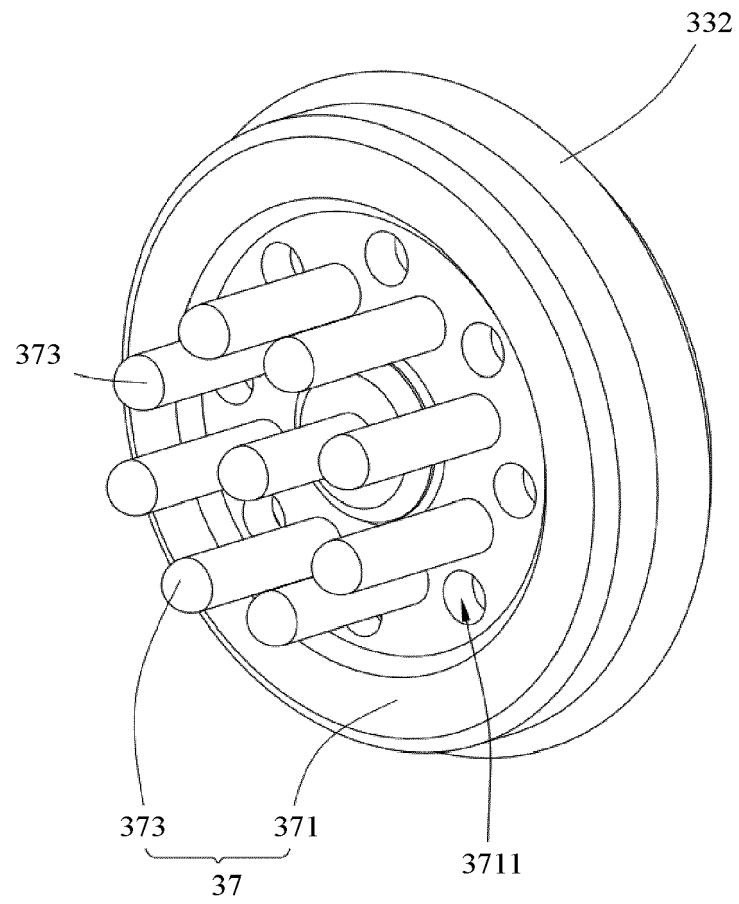


FIG. 16

100'

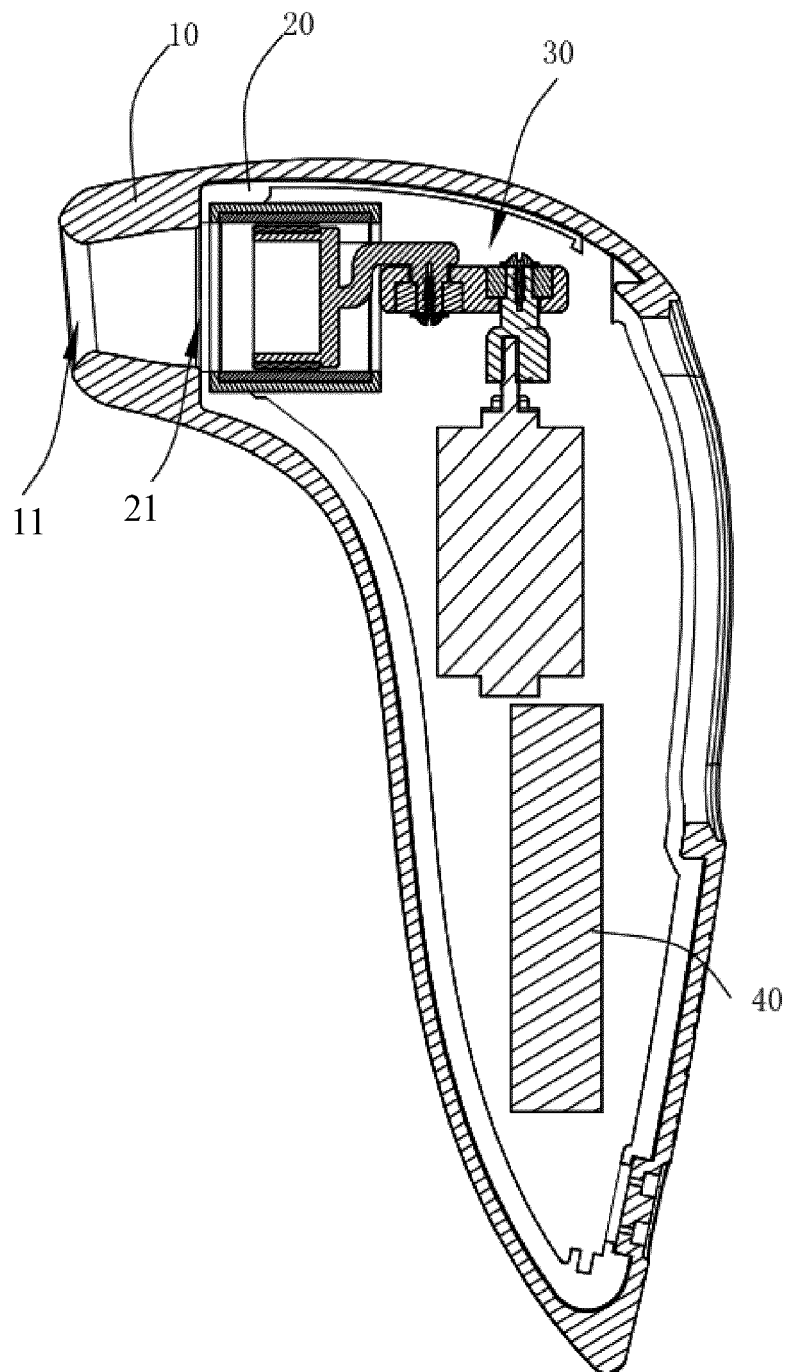


FIG. 17

30e

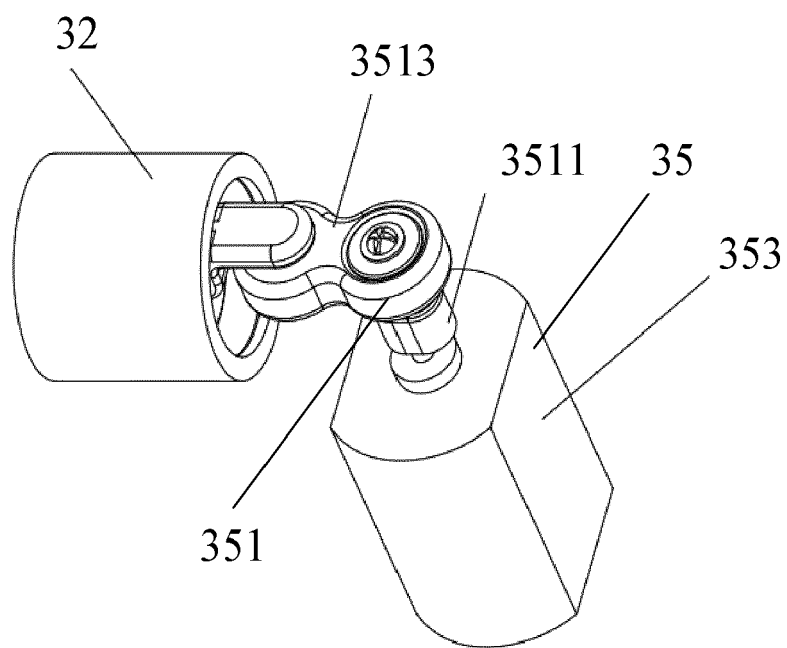


FIG. 18

30e

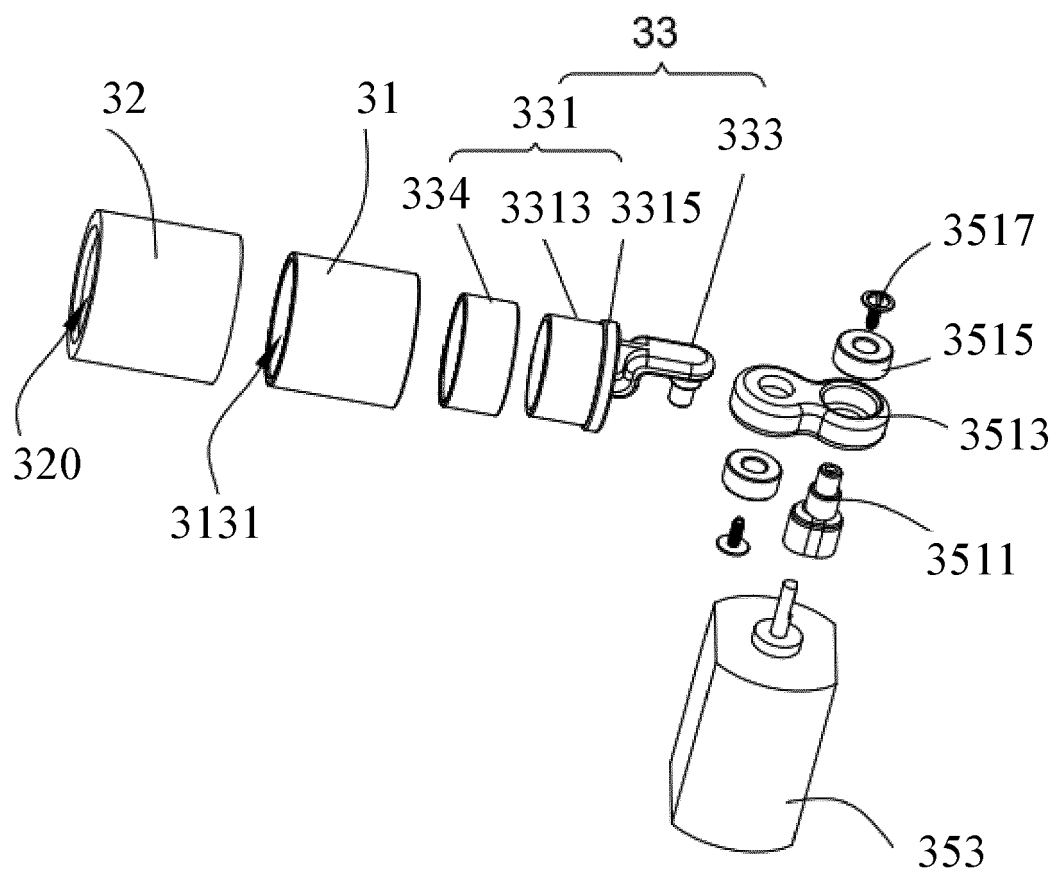


FIG. 19

30e

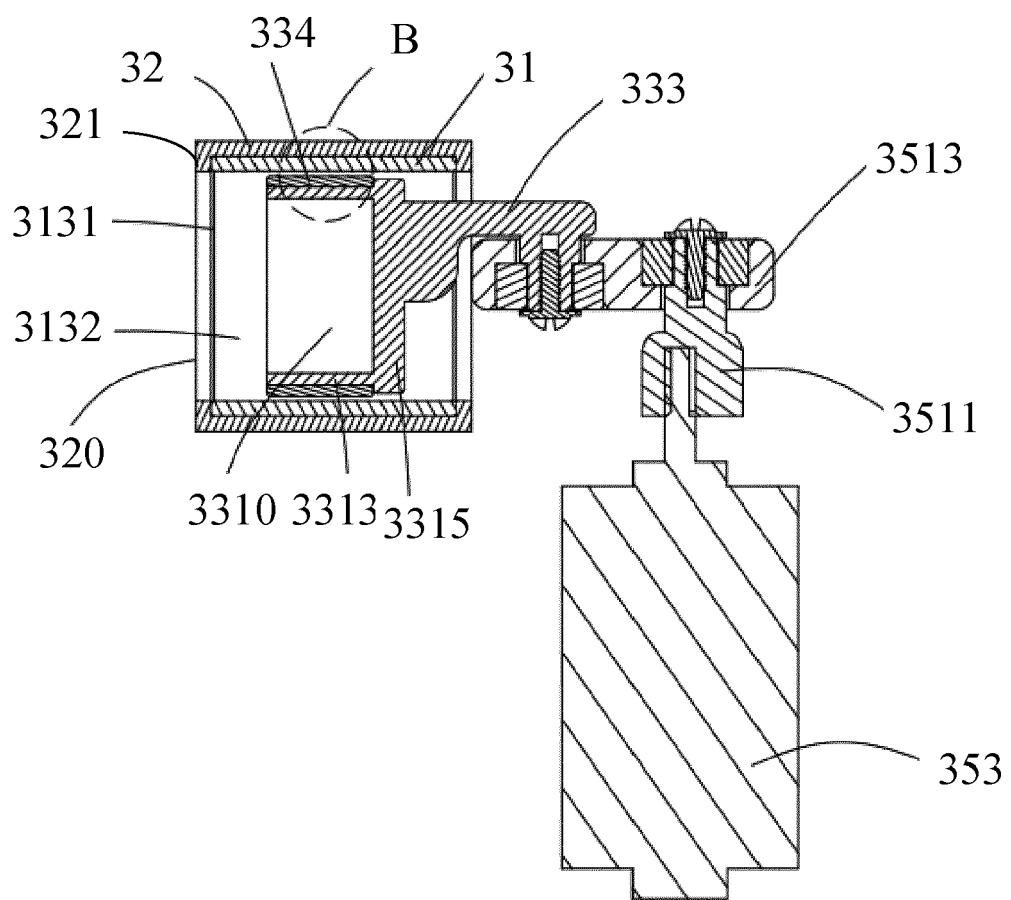


FIG. 20

B

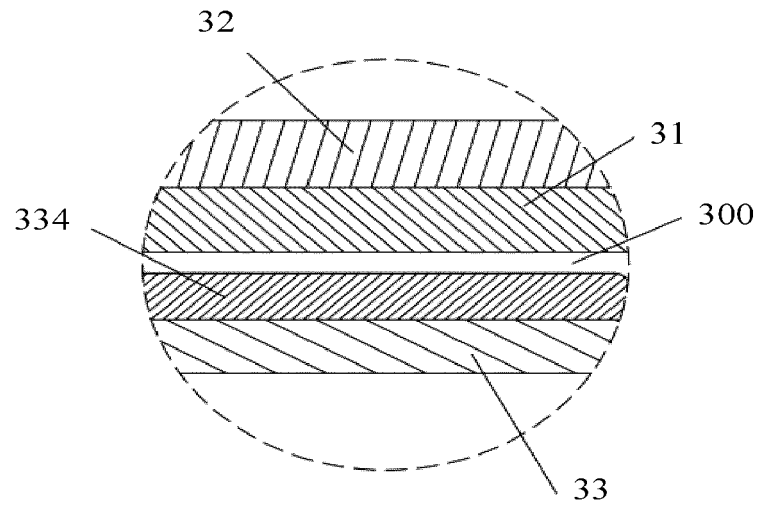


FIG. 21

B

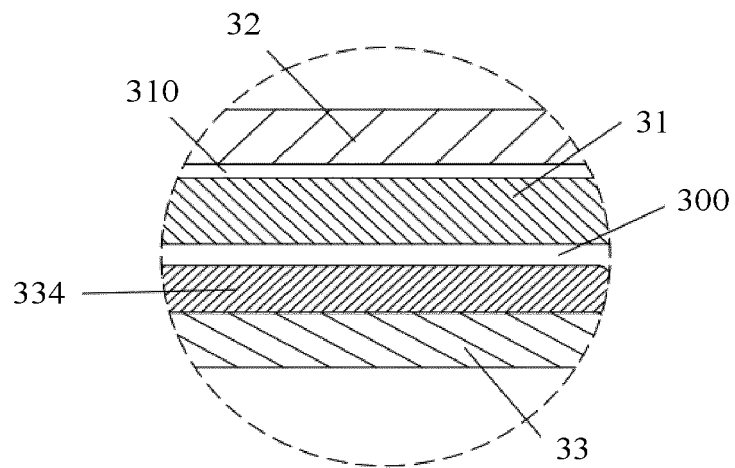


FIG. 22

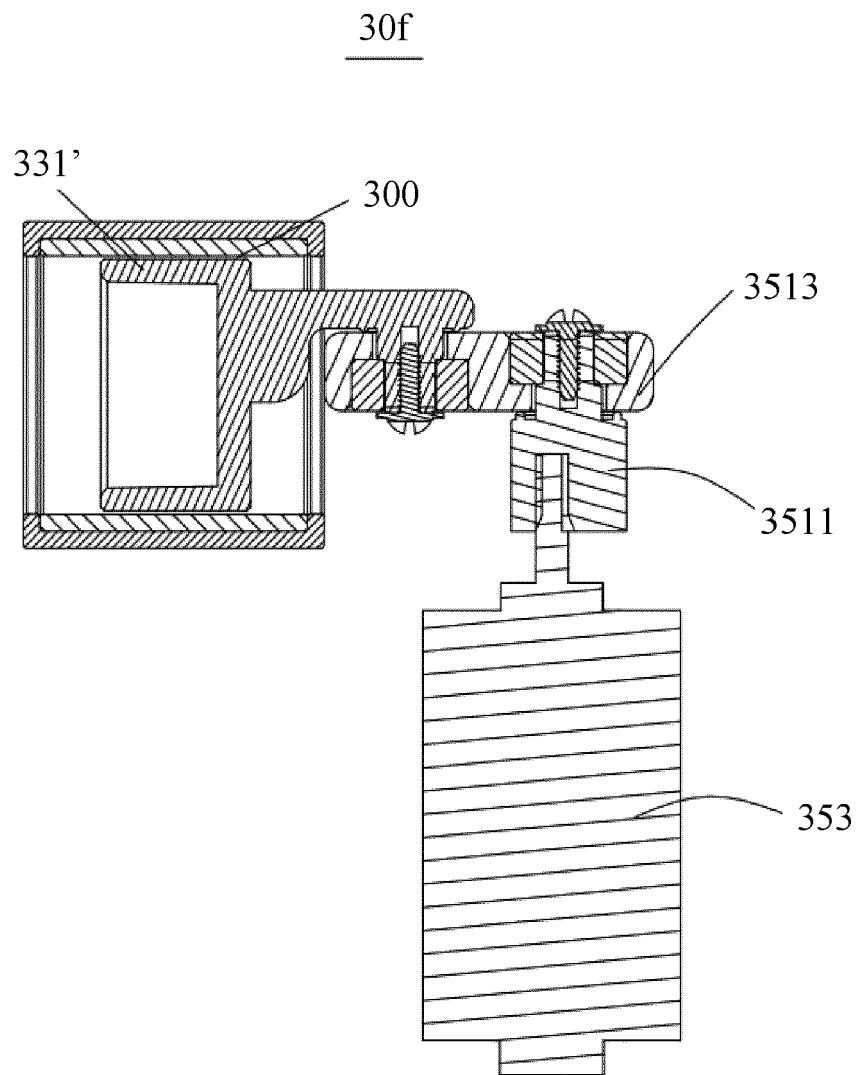


FIG. 23

30g

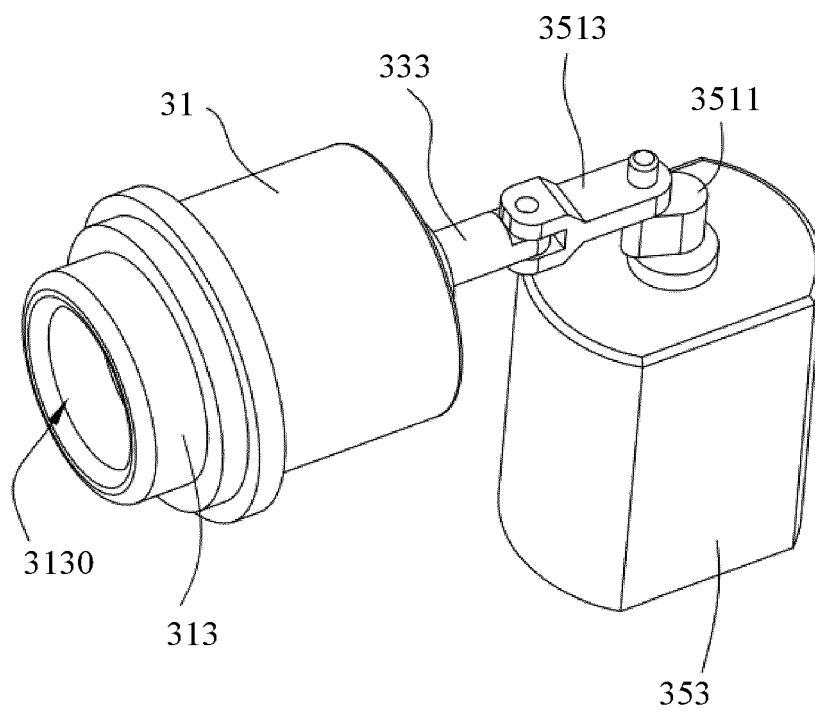


FIG. 24

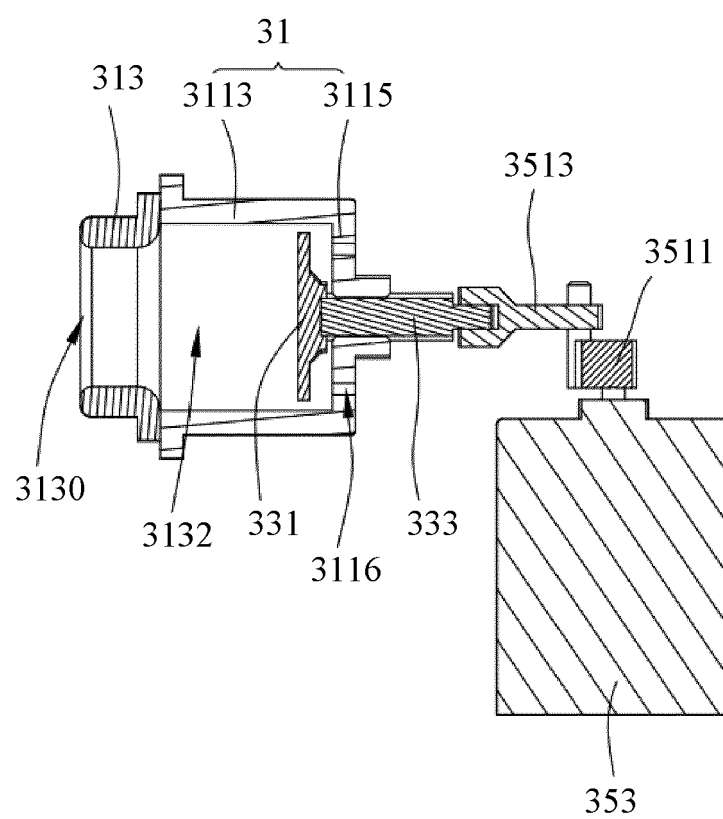
30g

FIG. 25

30h

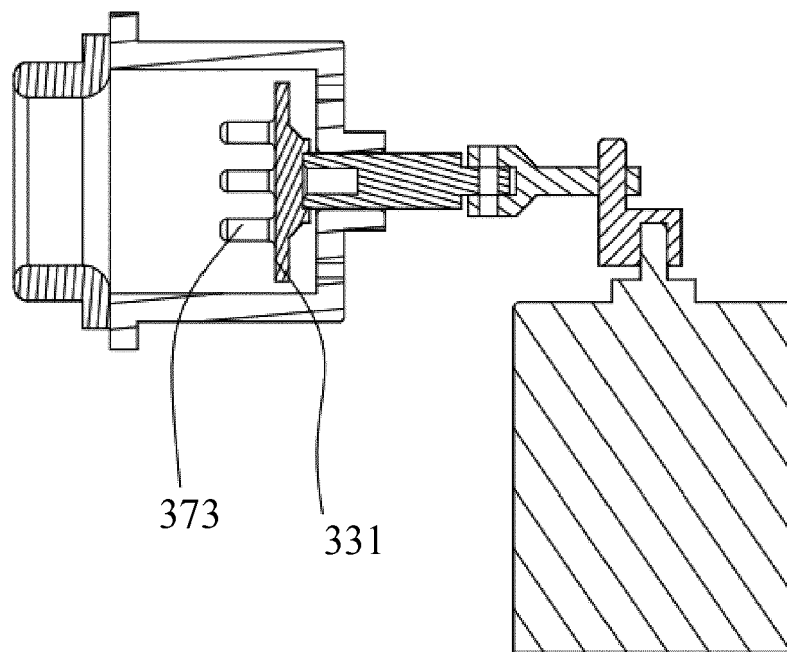


FIG. 26



EUROPEAN SEARCH REPORT

Application Number

EP 22 15 8147

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	KR 2002 0059570 A (K T A CO [KR]) 13 July 2002 (2002-07-13) * paragraphs [0001] - [0016]; figures 1,2 * -----	1-13	INV. A61H7/00 A61H23/00
X	KR 200 167 073 Y1 (YU TAE WOO [KR]) 15 February 2000 (2000-02-15) * pages 1,2; figures * -----	1-3, 5, 6, 14	
X	DE 93 09 142 U1 (D&P COSMETICS) 12 August 1993 (1993-08-12) * pages 9-18; figures * -----	1	
X	DE 20 2017 104021 U1 (FUN FACTORY GMBH [DE]) 9 October 2018 (2018-10-09) * paragraphs [0048] - [0094]; figures * -----	1, 2, 15	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) A61H
Place of search Munich			Date of completion of the search 17 August 2022
			Examiner Teissier, Sara
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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

EP 22 15 8147

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-08-2022

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 20020059570 A	13-07-2002	NONE	
KR 200167073 Y1	15-02-2000	NONE	
DE 9309142 U1	12-08-1993	DE 4320328 A1	22-12-1994
		DE 4320329 C1	14-07-1994
		DE 9309142 U1	12-08-1993
DE 202017104021 U1	09-10-2018	CN 110831562 A	21-02-2020
		DE 202017104021 U1	09-10-2018
		DE 202018006342 U1	03-02-2020
		EP 3648728 A2	13-05-2020
		US 2020214932 A1	09-07-2020
		WO 2019007988 A2	10-01-2019

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