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(54) **HAND AIR PUMP INTEGRATING A LARGE PUMP AND A SMALL PUMP**

(57) A hand air pump is provided with a main body (10) including a base (11) and a top cover (12); an outer cylinder (20) including a cavity (21), a plurality of second air intake holes (22), and a second circular hole (23); an inner cylinder (30), a handle (40), an air tube (50), and a switch mechanism (60). A first air chamber (70) is formed between the outer cylinder (20) and the main body (10) and communicates with the first air intake hole (122). A second air chamber (80) is formed between the inner cylinder (30) and the outer cylinder (20) and communicates with the second air intake holes (22). Therefore, the switch mechanism (60) switches between the large pump and the small pump, and convenience of inflating is improved.

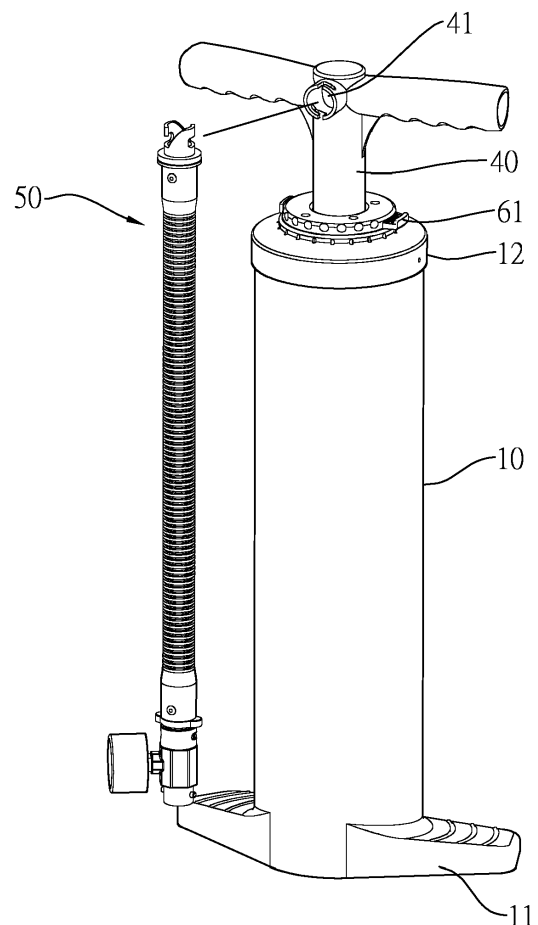


FIG. 1

Description**BACKGROUND**

1. Field of the Invention

[0001] The present invention relates to a hand air pump, especially to a hand air pump integrating a large pump and a small pump.

2. Description of the Prior Arts

[0002] It is commonly known that use of hand air pumps is widespread in everyday life for providing convenience by inflating tires of bicycles or motorcycles, balls, etc. In the beginning of inflating an inflatable product, the product is at a shrunk stage. At this time, resistance force of the product is low so that the product should be inflated by a large pump which has high efficiency. When the product is almost fully inflated, because of the high pressure in the product, the resistance force becomes huge, which makes the inflating with the large pump become hard. At this time, inflating the product with a small pump may encounter smaller resistance force.

[0003] Thus, it is needed that a pump switchably integrates a large pump and a small pump, thereby improving convenience of inflating.

SUMMARY OF THE INVENTION

[0004] The main objective of the present invention is to provide a hand air pump integrating a large pump and a small pump that switches between the large pump and the small pump. Therefore, a user can choose the working model of the hand air pump in accordance with the inflating condition so that the convenience of inflating is improved.

[0005] The hand air pump has:

a main body comprising:

a base on a bottom portion of the main body, and a top cover mounted on a top portion of the main body, the top cover comprising

a first circular hole, and
at least one first air intake hole;

an outer cylinder upward and downward movably mounted in the main body, a top end of the outer cylinder mounted in the first circular hole, the outer cylinder comprising:

a cavity formed on a top portion of the outer cylinder and forming

a first gap on one side of the cavity, and an opening on another side of the cavity,

a plurality of second air intake holes formed on the top portion of the outer cylinder;

a second circular hole formed on the top portion of the outer cylinder, and

a piston mounted on a bottom end of the outer cylinder and matched with an inner wall of the main body; a first air chamber formed between an outer wall of the outer cylinder and the inner wall of the main body, and the first air chamber communicating with the at least one first air intake hole; the large pump forming the first air chamber;

an inner cylinder upward and downward movably mounted in the outer cylinder, a top end of the inner cylinder mounted through the second circular hole, the inner cylinder comprising:

a piston mounted on a bottom end of the inner cylinder and matched with an inner wall of the outer cylinder, and

a one-way valve mounted on the bottom end of the inner cylinder;

a second air chamber formed between an outer wall of the inner cylinder and the inner wall of the outer cylinder and communicating with the second air intake holes; the small pump forming the second air chamber;

a handle, a lower end of the handle mounted on the top end of the inner cylinder, the handle comprising:

a vent, and
an engaging recess;

an air tube connected to the vent; and
a switch mechanism for switching between the large pump and the small pump, the switch mechanism comprising:

a slider laterally movably mounted in the cavity of the outer cylinder, and comprising

a third circular hole in a middle portion of the slider, the handle mounted through the third circular hole and the engaging recess of the handle matched with a side wall of the third circular hole, and
two holding portions mounted on two ends of the slider respectively and extending out of the first gap and the opening, and

a fixing cover mounted on the top end of the outer cylinder and above the slider, covering an outer portion of the cavity, and comprising

a fourth circular hole in a middle portion of the fixing cover and through which the han-

dle is mounted, and two second gaps on two sides of the fixing cover respectively and corresponding in location to the first gap and the opening of the cavity respectively, and the two holding portions extending out of the two second gaps respectively.

[0006] As the hand air pump integrates a large pump and a small pump and is capable of switching between the large pump and the small pump through the switch mechanism, the user can choose the working model in accordance with the inflating condition. Besides, the structure of the switch mechanism is simple so that the switch mechanism is convenient for assembling. When operating, the user can just adjust a position of the slider to switch between the large pump and the small pump. In other words, the switch method is easy and effective.

[0007] Other objectives, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The invention will be elucidated on the basis of an exemplary embodiment shown in the attached drawings, in which:

Fig. 1 is a perspective view of a hand air pump in accordance with the present invention;
 Fig. 2 is an exploded view of the hand air pump in Fig. 1;
 Fig. 3 is an airflow schematic view when a small pump of the hand air pump in Fig. 1 works;
 Fig. 4 is an enlarged view of an upper portion of the hand air pump in Fig. 3;
 Fig. 5 is an enlarged view of a lower portion of the hand air pump in Fig. 3;
 Fig. 6 is an airflow schematic view when a large pump of the hand air pump in Fig. 1 works;
 Fig. 7 is a perspective view a slider and an outer cylinder of the hand air pump in Fig. 1;
 Fig. 8 is a perspective view of a top portion of the outer cylinder of the hand air pump in Fig. 1;
 Fig. 9 is a perspective view of the slider in Fig. 1; and
 Fig. 10 is a bottom perspective view of a fixing cover of the hand air pump in Fig. 1.

DETAILED DESCRIPTION OF THE INVENTION

[0009] With reference to Figs. 1 to 10, a hand air pump integrating a large pump and a small pump in accordance with the present invention comprises a main body 10, an outer cylinder 20, an inner cylinder 30, a handle 40, an air tube 50, and a switch mechanism 60 for switching between a large pump and a small pump.

[0010] The main body 10 comprises a base 11 and a

top cover 12. The base 11 is mounted on a bottom portion of the main body 10, and the top cover 12 is mounted on a top portion of the main body 10. The top cover 12 comprises a first circular hole 121, a plurality of first air intake holes 122, and a round flange 123. The first air intake holes 122 are formed around a top portion of the top cover 12.

[0011] The outer cylinder 20 is upward and downward movably mounted in the main body 10, and a top end of the outer cylinder 20 is mounted in the first circular hole 121. The outer cylinder 20 comprises a cavity 21, a plurality of second air intake holes 22, and a second circular hole 23, all of which are disposed on a top portion of the outer cylinder 20. The cavity 21 comprises a first gap 211, a sliding track 213, and an opening 212. The first gap 211 is formed on one side of the cavity 21, and the opening 212 is formed on the other side of the cavity 21. The sliding track 213 is formed in the cavity 21. The second air intake holes 22 are formed in the sliding track 213 and comprise a plurality of elongated grooves 221 and a plurality of third gaps 222. The third gaps 222 are formed around the second circular hole 23. A first air chamber 70 is formed between an outer wall of the outer cylinder 20 and an inner wall of the main body 10 and communicates with the first air intake holes 122. The large pump forms the first chamber 70. The outer cylinder 20 comprises a piston 90. The piston 90 is mounted on the bottom of the outer cylinder 20 and matches the inner wall of the main body 10.

[0012] The inner cylinder 30 is upward and downward movably mounted in the outer cylinder 20, and a top end of the inner cylinder 30 is mounted through the second circular hole 23. A second air chamber 80 is formed between an outer wall of the inner cylinder 30 and an inner wall of the outer cylinder 20 and communicates with the second air intake holes 22. The small pump forms the second chamber 80. The inner cylinder 30 comprises a piston 90 and a one-way valve 31. The piston 90 is mounted at a bottom end of the inner cylinder 30 and matches the inner wall of the outer cylinder 20. Each one of the pistons 90 on the bottom portions of the outer cylinder 20 and the inner cylinder 30 comprises a circular recess 91 and a sealing ring 92. The sealing ring 92 is mounted in the circular recess 91. The one-way valve 31 is located above the piston 90 of the inner cylinder 30 and comprises a breather hole 311 and a movable board 312. The breather hole 311 is formed on the bottom portion of the inner cylinder 30. The movable board 312 selectively covers the breather hole 311.

[0013] A lower end of the handle 40 is mounted on the top end of the inner cylinder 30 and comprises a vent 41 and an engaging recess 42.

[0014] The air tube 50 is connected to the vent 41.

[0015] The switch mechanism 60 comprises a slider 61 and a fixing cover 62. The slider 61 is right and left movably mounted on the sliding track 213 of the outer cylinder 20 and comprises a substrate 611 and two holding portions 612. The two holding portions 612 obliquely

and outward extend from two sides of the substrate 611 respectively. The substrate 611 matches the sliding track 213 and the opening 212 on the side of the sliding track 213 so that the substrate 611 is movably mounted in the sliding track 213, and one end of the substrate 611 can extend out of the outer cylinder 20 through the opening 212. The substrate 611 comprises two camber protrusions 613. The two camber protrusions 613 are formed on two edges of the substrate 611. Besides, the sliding track 213 comprises two restriction round pins 2132. Two side walls of the sliding track 213 each comprise two curved notches communicating with each other. Each one of the curved notches 2131 matches a corresponding one of the camber protrusions 613, and the corresponding camber protrusion 613 is alternately located in the two communicating curved notches 2131. The substrate 611 of the slider 61 further comprises two elongated round holes 614. The two restriction round pins 2132 correspond in location to the two elongated round holes 614 and are mounted through the two elongated round holes 614 respectively. With cooperating of the restriction round pins 2132 and the elongated round holes 614, the position of the slider 61 is restricted so that the movement of the slider becomes steadier. The slider 61 further comprises a third circular hole 615 in a middle thereof. The handle 40 is mounted through the third circular hole 615. The engaging recess 42 of the handle 40 matches a side wall of the third circular hole 615. The substrate 611 comprises an extending board 616. The extending board 616 is formed on and extends outward from one end of the substrate 611 and movably abuts the round flange 123 at a lower part of the round flange 123.

[0016] The two holding portions 612 extend out of the first gap 211 and the opening 212 of the outer cylinder 20 respectively. Each one of the holding portions 612 comprises a restricting board 617. Each restricting board 617 is mounted on the corresponding holding portion 612 and extends upward so that the restricting board 617 obstructs an outer side of the fixing cover.

[0017] The fixing cover 62 is mounted on the top end of the outer cylinder 20 and covers an outer portion of the cavity 21. The fixing cover 62 comprises a fourth circular hole 621, two second gaps 622, a plurality of connecting pins 623, two curved restricting boards 624, and a plurality of dimples 625. The fourth circular hole 621 is in a middle of the fixing cover 61. The handle 40 is mounted through the fourth circular hole 621. The two second gaps 622 are formed on two sides of the fixing cover 62 and correspond in location to the first gap 211 and the opening 212 respectively. The slider 61 is located under the fixing cover 62. The two holding portions 612 extend through and out of the two second gaps 622 respectively. The connecting pins 623 are mounted on a bottom portion of the fixing cover 62 and connect with the top end of the outer cylinder 20. Each curved restricting board 624 is in front of the holding portions 612 of the slider 61, above the substrate 611 of the slider 61, and is located between the two connecting pins 623 for restricting the position of

the slider 61 in longitudinal and lateral directions. The restricting boards 617 of the holding portions 612 of the slider 61 obstruct an outer side of the fixing cover 62. The dimples 625 are disposed around the outer wall of the fixing cover 62.

[0018] The working principle of the hand air pump is as follows: for using the large pump, the slider 61 is pushed to the right (when the slider 61 is pushed to the right or left, the curved restricting boards 624 of the fixing cover 62 can prevent the slider 61 from moving beyond a predetermined distance, and a cooperation of the two communicating curved notches 2131 of the sliding track 213 and the camber protrusions 613 of the slider 61 can prevent the slider 61 positioned on the regular position from offset), the inner wall of the third circular hole 615 of the slider 61 is engaged with the engaging recess 42 of the handle 40. Because the fixing cover 62 and the top portion of the outer cylinder 20 are securely fixed together by the connecting pins 623 and the slider 61 is located between the top portion of the outer cylinder 20 and the fixing cover 62, the outer cylinder 20 and the inner cylinder 30 can move along with the slider 61 driven by the handle 40, which makes the airflow flow into the first air chamber 70 through the first air intake holes 122 of the top cover 12. Then, along with pressing down of the outer cylinder 20 and the inner cylinder 30, airflow under the pistons 90 of the outer cylinder 20 and the inner cylinder 30 forces open the one-way valve 31 of the inner cylinder 30, and then flows out from the air tube 50 through the vent 41 of the handle 40.

[0019] When the small pump is used, the slider 61 is pushed to the left, and the inner wall of the third circular hole 615 of the slider 61 detaches from the engaging recess 42 of the handle 40. And then, driven by the handle 40, the inner cylinder 30 moves in the outer cylinder 20, which causes air to enter the second air chamber 80 through the second air intake holes 22 of the outer cylinder 20. Then, after the inner cylinder 30 is pressed down, airflow rushes through a bottom of the piston 90 of the inner cylinder 30 and forces open the one-way valve 31, so that the airflow flows through the one-way valve 31 and the inner cylinder 30, and flows out through the inner cylinder 30, the vent 41, and the air tube 50.

[0020] The advantages of the present invention are that: as the hand air pump integrates with a large pump and a small pump and is capable of switching between the large pump and the small pump through the switch mechanism, the user can choose the working model in accordance with the inflating condition. Besides, the structure of the switch mechanism is simple so that the switch mechanism is convenient for assembling. When operating, the user can just adjust a position of the slider to switch between the large pump and the small pump. In other words, the switch method is easy and effective.

Claims

1. A hand air pump integrating a large pump and a small pump, and **characterized in that** the hand air pump comprise:

a main body (10) comprising:

a base (11) on a bottom portion of the main body (10), and
a top cover (12) mounted on a top portion of the main body (10), the top cover (12) comprising

a first circular hole (121), and
at least one first air intake hole (122);

an outer cylinder (20) upward and downward movably mounted in the main body (10), a top end of the outer cylinder (20) mounted in the first circular hole (121), the outer cylinder (20) comprising:

a cavity (21) formed on a top portion of the outer cylinder (20) and forming

a first gap (211) on one side of the cavity (21), and
an opening (212) on another side of the cavity (21),

a plurality of second air intake holes (22) formed on the top portion of the outer cylinder (20);

a second circular hole (23) formed on the top portion of the outer cylinder (20), and
a piston (90) mounted on a bottom end of the outer cylinder (20) and matched with an inner wall of the main body (10);

a first air chamber (70) formed between an outer wall of the outer cylinder (20) and the inner wall of the main body (10), and the first air chamber (70) communicating with the at least one first air intake hole (122); the large pump forming the first air chamber (70);

an inner cylinder (30) upward and downward movably mounted in the outer cylinder (20), a top end of the inner cylinder (30) mounted through the second circular hole (23), the inner cylinder (30) comprising:

a piston (90) mounted on a bottom end of the inner cylinder (30) and matched with an inner wall of the outer cylinder (20), and
a one-way valve (31) mounted on the bottom end of the inner cylinder (30);

a second air chamber (80) formed between an outer wall of the inner cylinder (30) and the inner wall of the outer cylinder (20) and communicating with the second air intake holes (22); the small pump forming the second air chamber (80);

a handle (40), a lower end of the handle (40) mounted on the top end of the inner cylinder (30), the handle (40) comprising:

a vent (41), and
an engaging recess (42);

an air tube (50) connected to the vent (41); and
a switch mechanism (60) for switching between the large pump and the small pump, the switch mechanism (60) comprising:

a slider (61) laterally movably mounted in the cavity (21) of the outer cylinder (20), and comprising

a third circular hole (615) in a middle portion of the slider (61), the handle (40) mounted through the third circular hole (615) and the engaging recess (42) of the handle (40) matched with a side wall of the third circular hole (615), and
two holding portions (612) mounted on two ends of the slider (61) respectively and extending out of the first gap (211) and the opening (212), and

a fixing cover (62) mounted on the top end of the outer cylinder (20) and above the slider (61), covering an outer portion of the cavity (21), and comprising

a fourth circular hole (621) in a middle portion of the fixing cover (62) and through which the handle (40) is mounted, and

two second gaps (622) on two sides of the fixing cover (62) respectively and corresponding in location to the first gap (211) and the opening (212) of the cavity (21) respectively, and the two holding portions (612) extending out of the two second gaps (622) respectively.

2. The hand air pump integrating a large pump and a small pump as claimed in claim 1, wherein the slider (61) further comprises:

a substrate (611), the two holding portions (612) of the slider (61) obliquely and outward extending from two sides of the substrate (611) respectively.

tively, the substrate (611) matched with the opening (212) of the cavity (21) of the outer cylinder (20) and comprising

two camber protrusions (613) formed on two edges of the substrate (611) respectively; and

the outer cylinder (20) further comprises:

a sliding track (213) in the cavity (21) of the outer cylinder (20), the sliding track (213) matched with the substrate (611) and comprising

two side walls of the sliding track (213) each comprising two curved notches (2131) communicating with each other, each one of the curved notches (2131) matched with a corresponding one of the camber protrusions (613), and the corresponding camber protrusion (613) alternately located in the two communicating curved notches (2131).

3. The hand air pump integrating a large pump and a small pump as claimed in claim 2, wherein the slider (61) further comprises

two elongated round holes (614) formed on the substrate (611); and

the sliding track (213) further comprises

two restriction round pins (2132) corresponding in location to the two elongated round holes (614) and mounted into and through the two elongated round holes (614) respectively.

4. The hand air pump integrating a large pump and a small pump as claimed in claim 2, wherein the substrate (611) of the slider (61) comprises

an extending board (616) formed on and extending outwardly from one end of the substrate (611); and

the top cover (12) further comprises

a round flange (123), the extending board (616) movably abutting the round flange (123) at a lower part of the round flange (123).

5. The hand air pump integrating a large pump and a small pump as claimed in claim 2, wherein the second air intake holes (22) are formed in the sliding track (213) of the outer cylinder (20); and the sliding track (213) comprises

a plurality of elongated grooves (221), and

a plurality of third gaps (222) formed around the second circular hole (23).

6. The hand air pump integrating a large pump and a small pump as claimed in claim 2, wherein the at least one first air intake hole (122) comprises a plurality of first air intake holes (122), and the first air intake holes (122) are formed around a top portion of the top cover (12).

7. The hand air pump integrating a large pump and a small pump as claimed in claim 1, wherein the fixing cover (62) comprises:

a plurality of connecting pins (623) mounted on a bottom portion of the fixing cover (62) and connected to the top end of the outer cylinder (20), and

a plurality of curved restricting boards (624) in front of the holding portions (612) of the slider (61), above the substrate (611) of the slider (61), and located between two adjacent connecting pins (623) for restricting the position of the slider (61) in longitudinal and lateral directions; and

the slider (61) further comprises:

two restricting boards (617) mounted on the two holding portions (612) respectively, the restricting boards (617) extending upward and obstructing an outer side of the fixing cover (62).

8. The hand air pump integrating a large pump and a small pump as claimed in claim 1, wherein the one-way valve (31) comprises a breather hole (311) disposed under a bottom portion of the inner cylinder (30), and a movable board (312) selectively covering the breather hole (311).

9. The hand air pump integrating a large pump and a small pump as claimed in claim 1, wherein each one of the piston (90) under the bottom end of the outer cylinder (20) and the piston (90) under the bottom end of the inner cylinder (30) comprises

a circular recess (91), and a sealing ring (92) mounted in the circular recess (91); and

the one-way valve (31) of the inner cylinder (30) is above the piston (90) of the inner cylinder (30).

10. The hand air pump integrating a large pump and a small pump as claimed in claim 1, wherein the fixing cover (62) comprises a plurality of dimples (625) formed around an outer wall of the fixing cover (62) for holding the fixing cover (62).

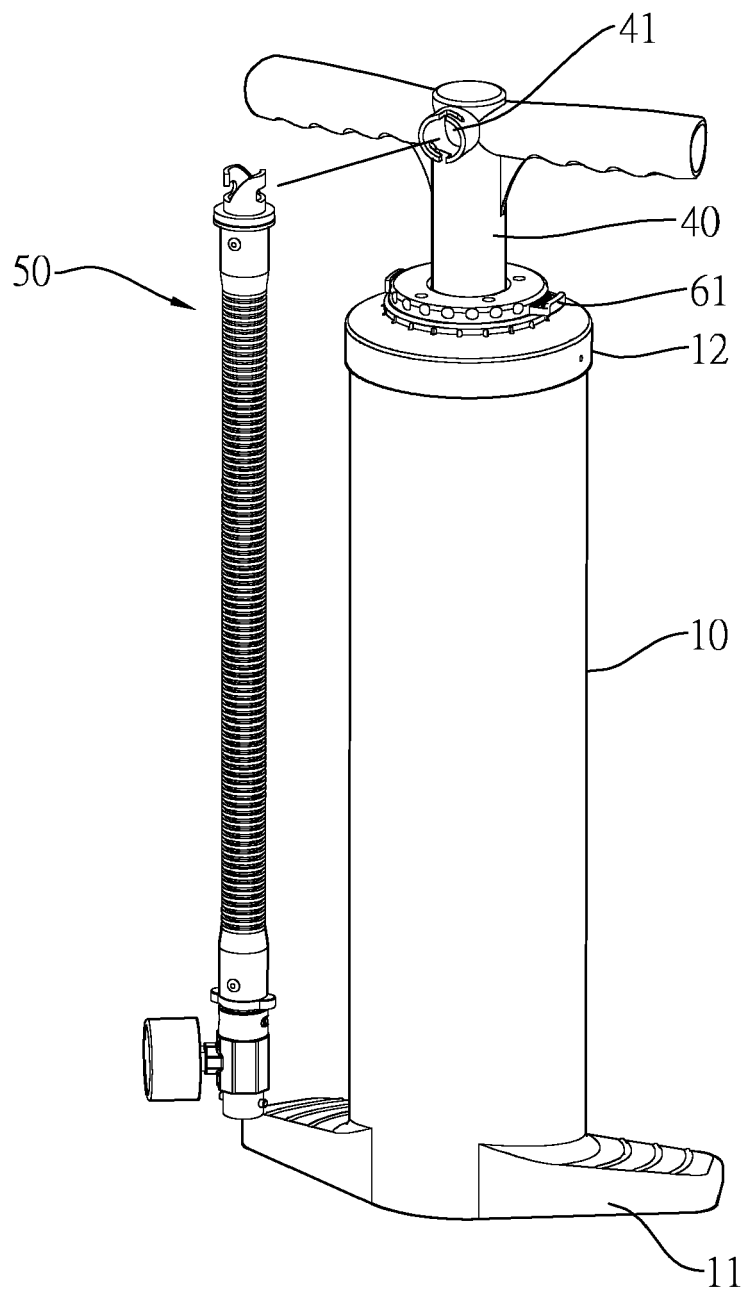


FIG. 1

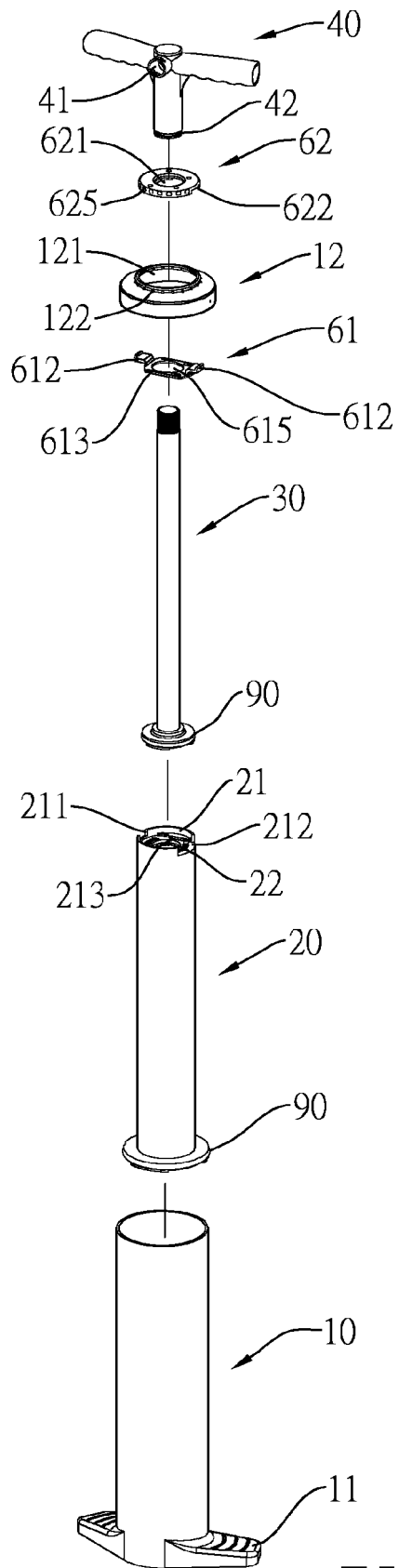


FIG. 2

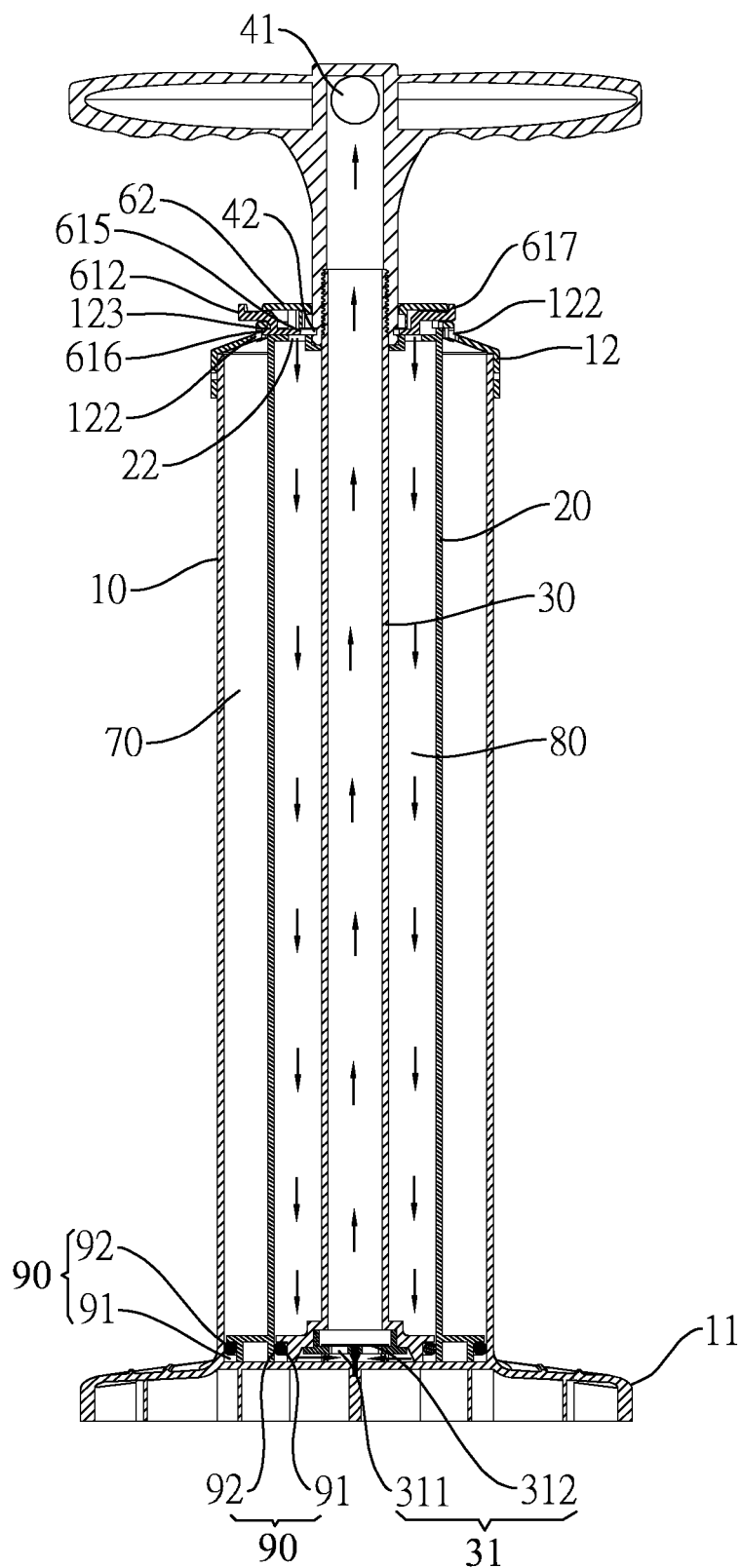


FIG. 3

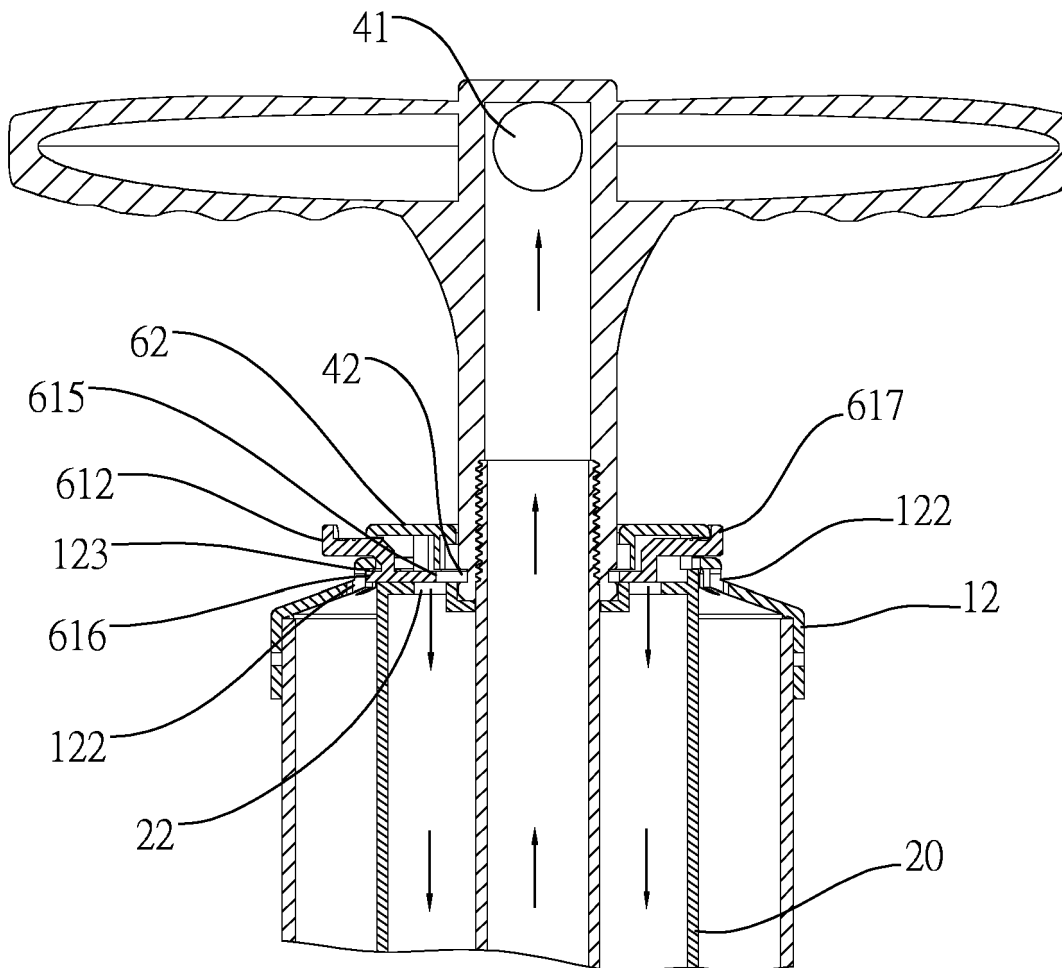


FIG. 4

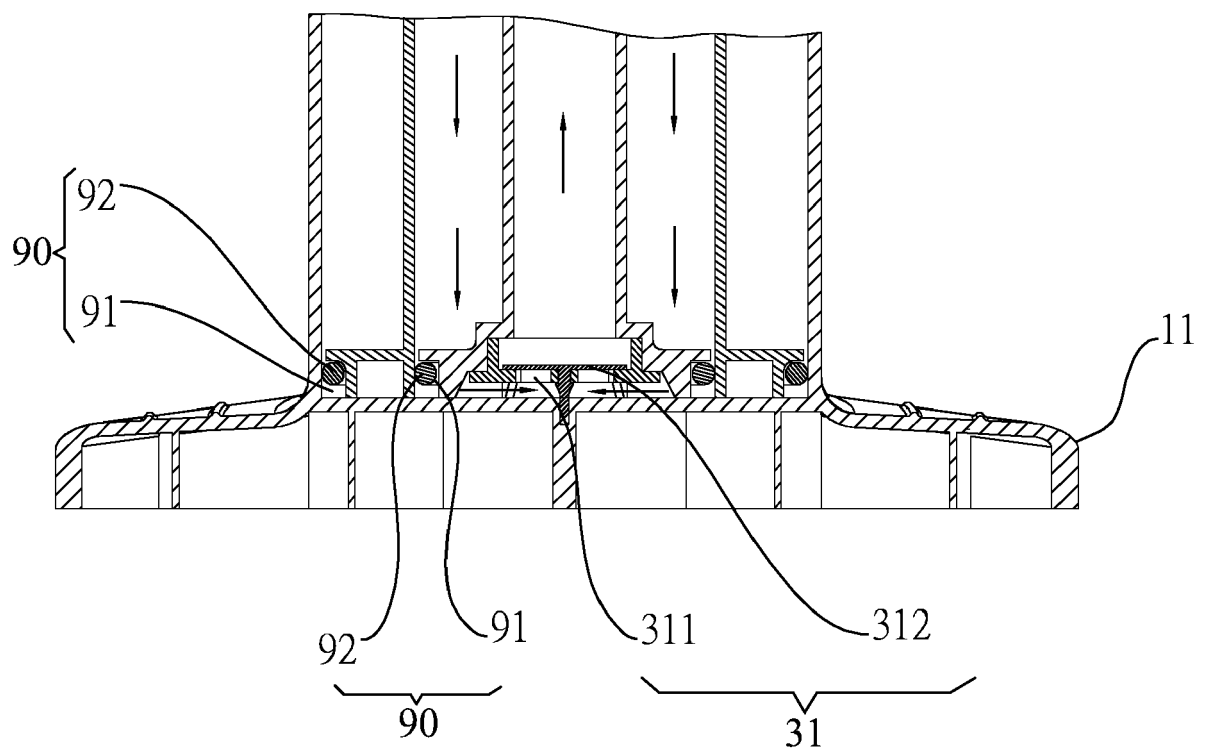


FIG. 5

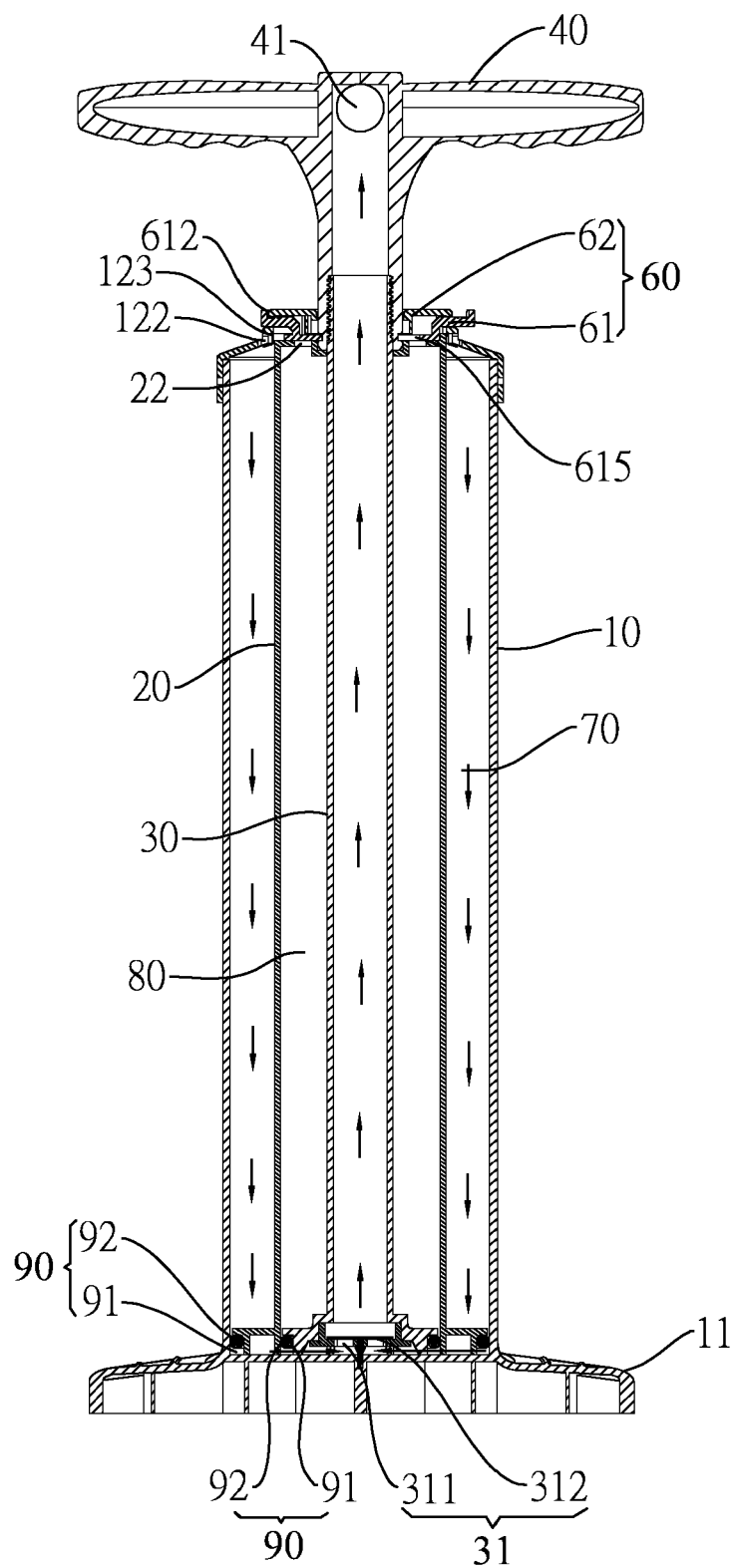


FIG. 6

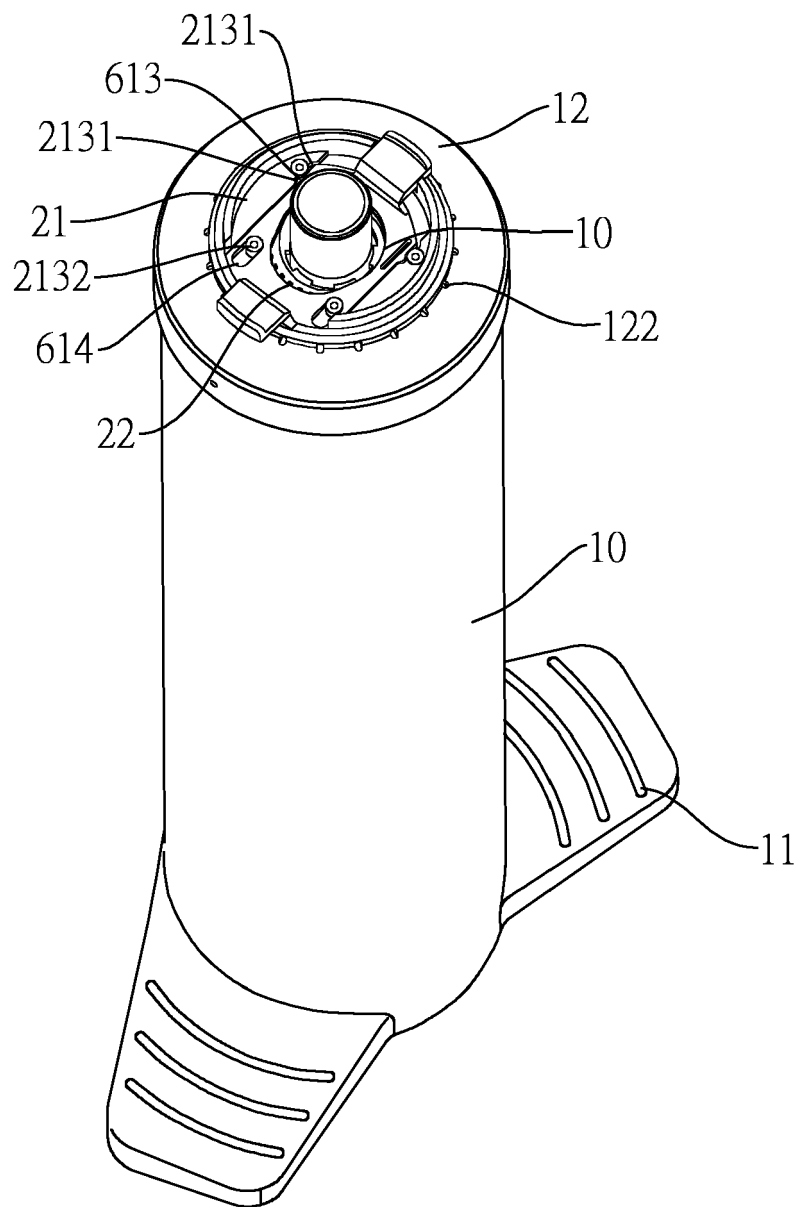


FIG. 7

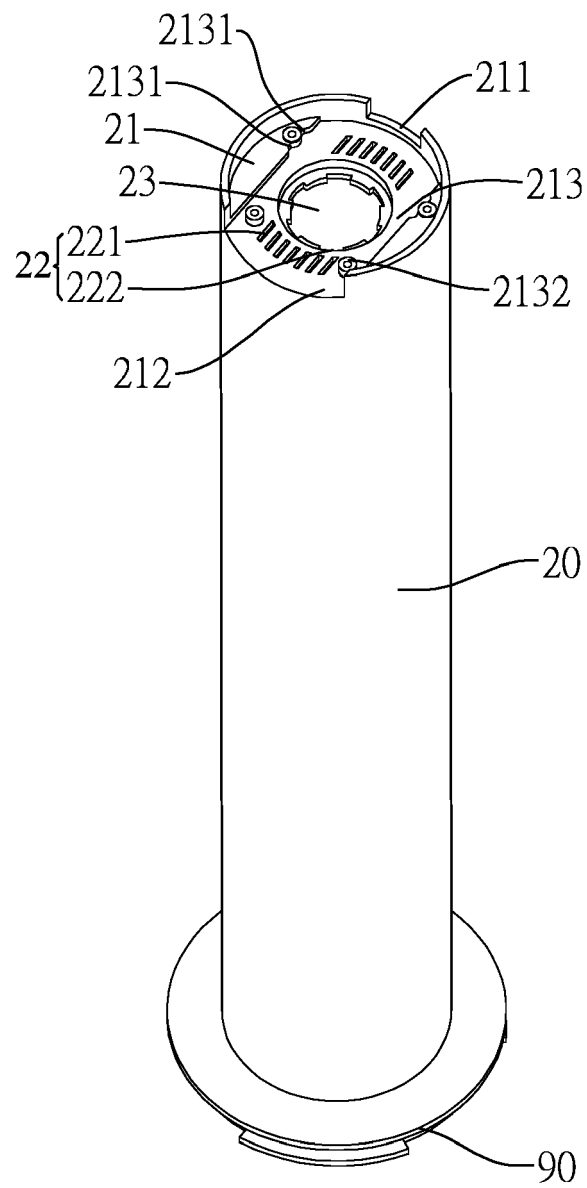


FIG. 8

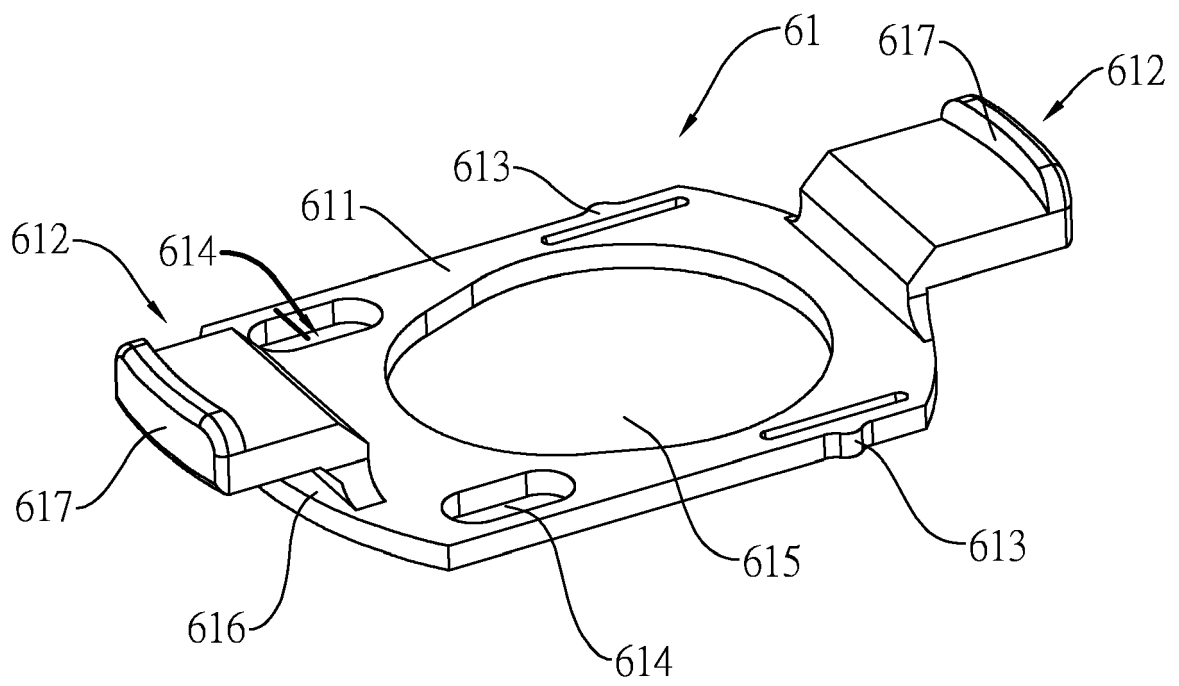


FIG. 9

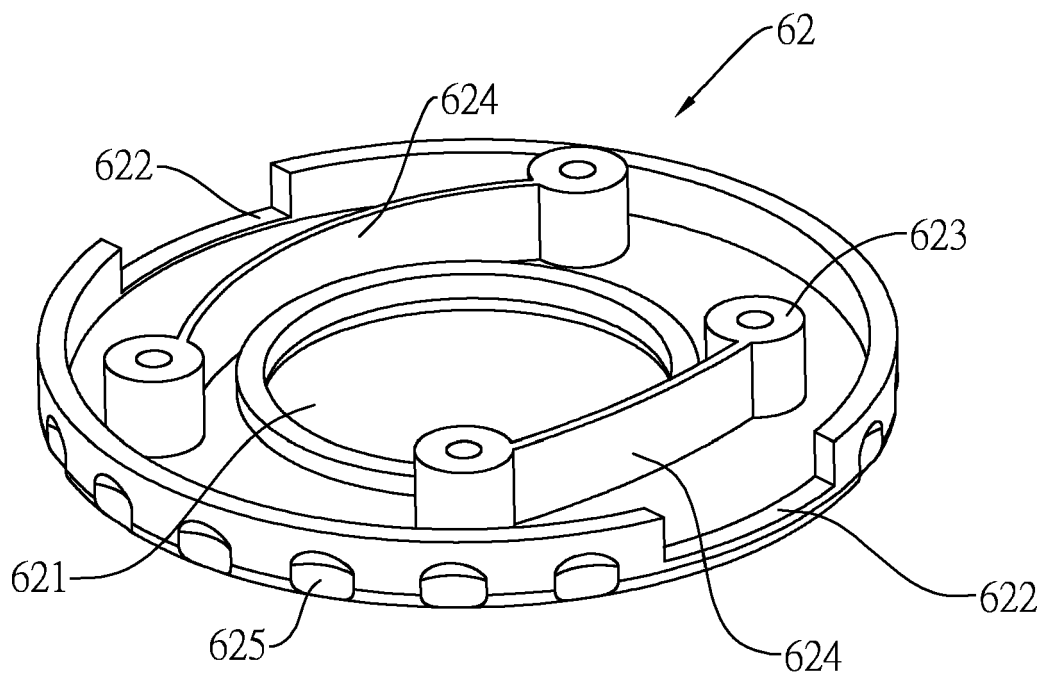


FIG. 10



EUROPEAN SEARCH REPORT

 Application Number
 EP 16 18 2150

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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Place of search Munich		Date of completion of the search 18 January 2017	Examiner Homan, Peter
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 18 2150

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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
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