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(54) **ONE-WAY VALVE AND SCROLL COMPRESSOR**

(57) A one-way valve (200) and scroll compressor, wherein the one-way valve (200) comprises: a valve seat (210) in which a valve hole (216) for fluid to pass through is formed; a valve plate (220) provided above the valve seat (210) and configured to selectively open or close the valve hole (216); a valve stop (230) provided above the valve plate (220) and fixedly connected to the valve seat (210), the valve stop (230) comprising a stop portion (234) for limiting the maximum displacement range of the valve plate (220) and a guide portion (236) used for guid-

ing the valve plate (220) to move; and a flow guide member (240) configured to guide the fluid flowing through the one-way valve (200), thereby controlling the force applied by the fluid to the valve plate (220). According to the one-way valve (200), the flow guide member (240) is utilized to control the flow direction of the fluid, thereby reducing the working noise and shutdown noise of the scroll compressor, and improving the efficiency and working reliability of the scroll compressor.

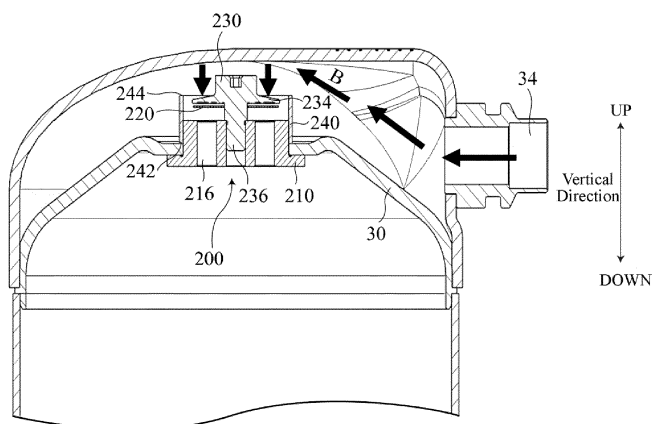


Fig. 5

Description

[0001] The present disclosure claims the benefit of priorities to the following Chinese patent applications: Chinese Patent Application No. 201811074864.2, titled "ONE-WAY VALVE AND SCROLL COMPRESSOR", filed with the Chinese National Intellectual Property Administration on September 14, 2018; and Chinese Patent Application No. 201821509943.7 titled "ONE-WAY VALVE AND SCROLL COMPRESSOR", filed with the Chinese National Intellectual Property Administration on September 14, 2018, which are incorporated herein by reference in their entireties.

FIELD

[0002] The present disclosure relates to a one-way valve and a scroll compressor having the same.

BACKGROUND

[0003] The contents of this section only provide background information related to the present disclosure, which may not constitute the prior art.

[0004] In the scroll compressor field, in order to prevent the scroll compressor from rotating reversely when the scroll compressor is shut down, a one-way valve is generally installed in the scroll compressor. Such one-way valve includes a valve seat formed with a valve hole, a valve flap capable of opening or closing the valve hole, and a valve stop that limits a displacement range of the valve flap and guides the movement of the valve flap. When the scroll compressor operates, the fluid discharged from the valve seat below the valve flap acts on the valve flap and drives the valve flap to move upward, so that the valve hole is opened and the fluid is allowed to flow through the one-way valve. When the scroll compressor is shut down, the valve flap moves downward under the pressure of the return fluid to close the valve hole, thereby preventing the fluid from flowing back.

[0005] However, in some circumstances, when the scroll compressor is shut down, the valve flap may be subjected to the adhesion of lubricating oil or the pressure difference between the two sides of the valve flap is insufficient, so that the valve flap cannot move quickly downward to close the valve hole, resulting in reverse rotation noise during shutdown and the risk of wearing and damage of parts. In addition, when the scroll compressor operates, the valve flap may not be able to be stably maintained in the above opened position, thereby generating operating noise and adversely affecting the reliability of the scroll compressor.

[0006] Therefore, there is a desire for a one-way valve structure that can at least partially solve the above-mentioned problems.

SUMMARY

[0007] An object of one or more embodiments of the present disclosure is to provide a one-way valve which is able to reduce the working noise and improve the reliability of a scroll compressor.

[0008] Another object of one or more embodiments of the present disclosure is to provide a one-way valve that has a shorter response time, and is able to prevent backflow of fluid and reduce the noise of the scroll compressor.

[0009] Another object of one or more embodiments of the present disclosure is to provide a one-way valve that is able to prevent the reduced working efficiency of the scroll compressor caused by excessive pressure drop loss while reducing noise and preventing backflow of fluid.

[0010] Another object of one or more embodiments of the present disclosure is to provide a one-way valve with improved stability and reliability.

[0011] In order to achieve one or more of the above objects, according to an aspect of the present disclosure, the one-way valve includes: a valve seat, in which a valve hole allowing the fluid to flow through is formed; a valve flap, which is arranged to be located above the valve seat and configured to selectively open or close the valve hole; a valve stop, which is arranged to be located above the valve flap and fixedly connected to the valve seat, the valve stop includes a stopping portion configured to limit a maximum displacement range of the valve flap and a guiding portion configured to guide the movement of the valve flap; and a flow guide member, which is configured to guide the fluid flowing through the one-way valve to control the force applied by the fluid to the valve flap.

[0012] According to an aspect of the present disclosure, the flow guide member is configured to enclose the stopping portion on an outer side of the stopping portion, and the flow guide member extends at least between the valve seat and the stopping portion in a vertical direction.

[0013] According to an aspect of the present disclosure, the flow guide member is configured as a hollow cylindrical structure.

[0014] According to an aspect of the present disclosure, the flow guide member extends upward from a first end portion to a second end portion in the vertical direction, wherein the first end portion is flush with an upper surface of the valve seat or located below the upper surface of the valve seat in the vertical direction, and the second end portion is flush with the stopping portion or located above the stopping portion in the vertical direction.

[0015] According to an aspect of the present disclosure, the flow guide member is fixed to an outer peripheral surface of the valve seat by interference fit, or the flow guide member is integrally formed with the valve seat.

[0016] According to an aspect of the present disclosure, the flow guide member extends downward from the first end portion to the second end portion in the vertical direction, wherein the first end portion is flush with the

stopping portion or located above the stopping portion in the vertical direction, and the second end portion is flush with the upper surface of the valve seat or located below the upper surface of the valve seat in the vertical direction.

[0017] According to an aspect of the present disclosure, the flow guide member is integrally formed with the valve stop, or the flow guide member is fixed to an outer peripheral surface of the valve stop by interference fit.

[0018] According to an aspect of the present disclosure, a clearance allowing fluid to flow through is formed between the flow guide member and the stopping portion.

[0019] According to an aspect of the present disclosure, the guiding portion is inserted through a central hole of the valve flap and fixedly connected into the valve seat, and the valve flap is movable along the guiding portion.

[0020] According to another aspect of the present disclosure, a scroll compressor having the one-way valve is provided.

[0021] According to yet another aspect of the present disclosure, another scroll compressor is provided, this scroll compressor includes a partition plate that separates the scroll compressor into a suction side and a discharge side, the partition plate has an opening in fluid communication with a discharge port of a scroll compression mechanism of the scroll compressor, and the scroll compressor is provided with a one-way valve at the opening, where the one-way valve includes: a valve seat, in which a valve hole allowing the fluid to flow through is formed; a valve flap, which is arranged to be located above the valve seat and configured to selectively open or close the valve hole; a valve stop, which is arranged to be located above the valve flap and fixedly connected to the valve seat, the valve stop includes a stopping portion configured to limit a maximum displacement range of the valve flap and a guiding portion configured to guide the movement of the valve flap; and a flow guide member, which is fixed to the partition plate and configured to guide the fluid flowing through the one-way valve to control the force applied by the fluid to the valve flap.

[0022] According to another aspect of the present disclosure, a clearance is formed between the flow guide member and the valve seat.

[0023] With the one-way valve according to the present disclosure, the flow direction of the fluid flowing through the one-way valve can be guided and controlled due to the arrangement of the flow guide member, so that the fluid at least partially exerts a corresponding force on the valve flap in a desired direction, the valve flap is stably maintained in the above opened position when the scroll compressor is running, and the valve flap could move quickly downward to the closed position when the scroll compressor is shut down, thereby reducing the working noise and shutdown noise, and improving the efficiency and working reliability of the scroll compressor. In addition, the flow area of the fluid can be increased by providing a clearance between the flow guide member and the valve stop to allow fluid to flow through, so that the

reduced working efficiency of the scroll compressor caused by excessive pressure drop loss can be avoided while reducing noise and preventing backflow of fluid.

5 BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The features and advantages of one or more embodiments of the present disclosure will become more readily understood from the following description with reference to the accompanying drawings. The drawings described herein are for illustration only and are not intended to limit the scope of the present disclosure in any way. The drawings are not drawn to scale, and some features may be enlarged or minified to show the details of a particular member. In the drawings:

Fig. 1 schematically shows an exploded perspective view of a one-way valve according to a comparative example;

Fig. 2 schematically shows a cross-sectional view of a scroll compressor having the one-way valve shown in Fig. 1;

Fig. 3 schematically shows a backflow path of fluid in the scroll compressor having the one-way valve shown in Fig. 1;

Fig. 4 schematically shows an exploded perspective view of a one-way valve according to a first embodiment of the present disclosure;

Fig. 5 schematically shows a partial cross-sectional view of a scroll compressor having the one-way valve according to the first embodiment of the present disclosure;

Fig. 6 schematically shows a partial cross-sectional view of a scroll compressor having the one-way valve according to a second embodiment of the present disclosure;

Fig. 7 schematically shows a partial cross-sectional view of a scroll compressor having the one-way valve according to a third embodiment of the present disclosure;

Fig. 8 schematically shows a perspective view of an integrated member formed by a flow guide member and a valve seat of the one-way valve according to the third embodiment of the present disclosure;

Fig. 9 schematically shows a partial cross-sectional view of a scroll compressor having the one-way valve according to a fourth embodiment of the present disclosure;

Figs. 10(a) and 10(b) schematically show perspec-

tive views of an integrated member formed by a flow guide member and a valve stop of the one-way valve according to the fourth embodiment of the present disclosure; and

Figs. 11(a) to 11(d) show pressure-time diagrams of pressures on the upper and lower sides of a valve flap of the one-way valve structure provided with a flow guide member according to the present disclosure, and of pressures on the upper and lower sides of a valve flap of the one-way valve structure according to the comparative example as shown in Fig. 1, when the scroll compressor working under different working conditions is shut down.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0025] The following description of various embodiments of the present disclosure is only illustrative and is by no means intended to limit the present disclosure and the application or usage thereof. The same reference numerals are used to designate like parts throughout the drawings, and the construction of the same parts will not be repeated.

[0026] In addition, the structure of a one-way valve according to the present disclosure will be described in the following by an example of the application of the one-way valve in a scroll compressor. However, it can be understood that the one-way valve structure according to the present disclosure is not limited to the application in the scroll compressor, and can be used in any feasible application.

[0027] A one-way valve 100 according to a comparative example will be described below with reference to Figs. 1 to 3, wherein, Fig. 1 schematically shows an exploded perspective view of the one-way valve 100 according to the comparative example; Fig. 2 schematically shows a cross-sectional view of a scroll compressor having the one-way valve 100 shown in Fig. 1; and Fig. 3 schematically shows a backflow path of fluid in the scroll compressor having the one-way valve shown in Fig. 1.

[0028] As shown in Fig. 2, the scroll compressor includes a substantially closed housing 20. The housing 20 may be formed by a substantially cylindrical body portion 22, a top cover 24 arranged at one end of the body portion 22, and a bottom cover 26 arranged at the other end of the body portion 22. A partition plate 30 is provided between the top cover 24 and the body portion 22. The partition plate 30 is generally fixed onto the top cover 24 and the body portion 22 by welding. Obviously, those skilled in the art can conceive other suitable fixing methods. The partition plate 30 divides the internal space of the housing 20 into a suction side and a discharge side, where the space between the partition plate 30 and the top cover 24 forms the discharge side, and the space between the partition plate 30 and the bottom cover 26 forms the suction side. A discharge port 34 for discharging the compressed fluid is formed on the discharge side.

A scroll compression mechanism including a non-orbiting scroll member 40 and an orbiting scroll member 50 is provided below the partition plate 30.

[0029] The one-way valve 100 may be provided at an opening 32 of the partition plate 30. The opening 32 of the partition plate 30 is in fluid communication with the discharge port of the non-orbiting scroll member 40, thereby allowing the compressed fluid to flow from the discharge port of the scroll compression mechanism to the discharge port 34 of the scroll compressor via the one-way valve 100 provided at the opening 32.

[0030] Fig. 1 shows a structural schematic view of the one-way valve 100 according to the comparative example. As shown in Fig. 1, the one-way valve 100 includes a valve seat 110, a valve flap 120 and a valve stop 130. The valve seat 110 may be fixed to the partition plate 30 in any suitable manner, such as welding, screwing, and so on. Preferably, the valve seat 110 may be fixed to the partition plate 30 by interference fit for ease of installation and disassembly. The valve seat 110 includes a substantially annular outer wall 112 and a substantially annular inner wall 114, several partitions 113 are connected between the outer wall 112 and the inner wall 114. Valve holes 116 that allow fluid to flow through are formed between the adjacent partitions 113 and the outer wall 112. The annular inner wall 114 is formed with a central hole 118. The valve seat 110 may optionally include a bottom flange 117, and the bottom flange 117 may be engaged with the partition plate 30 so that the valve seat 110 is firmly attached to the partition plate 30. The central hole 118 of the valve seat 110 is connected with the valve stop 130. The valve stop 130 may include a stopping portion 134 and a guiding portion 136. The stopping portion 134 may be formed with a flange extending circumferentially around the guiding portion 136, and through holes 135 that allow fluid to flow therethrough are formed in the stopping portion 134. The guiding portion 136 may extend downward from a lower surface of the stopping portion 134, and the guiding portion 136 may be fixed into the central hole 118 of the valve seat 110 by, for example, screwing. The guiding portion 136 is configured to allow the valve flap 120 to move up and down along the guiding portion to selectively close or open the valve holes 116, thereby allowing or preventing fluid from passing through the valve holes 116. The valve flap 120 may be formed as an annular plate having a central hole 125, wherein, the guiding portion 136 may be inserted through the central hole 125 into the central hole 118 of the valve seat 110. The diameter of the central hole 125 may be slightly greater than the diameter of the guiding portion 136, so that a clearance is formed between the valve flap 120 and the guiding portion 136, which allows the valve flap 120 to slide along the guiding portion 136. The maximum displacement range of the valve flap 120 is limited by the stopping portion 134 above the guiding portion 136.

[0031] Referring to Fig. 2, when the scroll compressor operates, the compressed fluid from the scroll compres-

sion mechanism flows upward through the valve holes 116 of the one-way valve 100 and acts on the valve flap 120 to move the valve flap 120 upward, thereby opening the valve holes 116, so that the fluid can be discharged through the one-way valve 100 toward the discharge port 34. When the scroll compressor is shut down, the fluid flows back to the one-way valve 100 through the discharge port 34, and the valve flap 120 moves downward due to its own gravity and the pressure of the backflow fluid, thereby closing the valve holes 116 to prevent the fluid from flowing back to the suction side.

[0032] However, the fluid discharged from the scroll compressor is generally mixed with some lubricating oil, and the lubricating oil together with the fluid flows through the one-way valve 100 and the lubricating oil may adhere to the one-way valve 100. When the scroll compressor is shut down, the valve flap 120 is affected by the adhesive force of the lubricating oil, so that the time for the valve flap 120 to fall onto the valve seat 110 is prolonged. In particular, in the case of using high-viscosity lubricating oil, the falling time of the valve flap 120 will be further prolonged. In addition, in the case of a low mass flow, the force of the fluid acting on the valve flap 120 may be small and insufficient to drive the valve flap 120 to fall quickly, so the one-way valve 100 cannot immediately respond to the shutdown of the scroll compressor to close the valve holes 116. In these cases, as shown by the arrow A in Fig. 3, the fluid flows horizontally below the valve flap 120, and flows back through the valve holes 116 to the scroll compression mechanism. Since the fluid below the valve flap 120 generates a certain lift force on the valve flap 120, the time for the valve flap 120 to respond to the shutdown of the scroll compressor is further prolonged, thereby generating obvious noise, and deteriorating the noise level of the scroll compressor. Furthermore, high-speed gas backflow causes the compressor to reversely rotate at a high speed, and the internal parts of the compressor are prone to damage under such high-speed reverse rotation. On the other hand, when the scroll compressor operates, the force of the fluid acting on the valve flap 120 may be insufficient to maintain the valve flap 120 firmly in the opened position away from the valve seat 110, thereby causing the valve flap 120 to sway, generating working noise, and reducing the working reliability of the scroll compressor, especially in the case of low-frequency variable-speed scroll compressors or low mass flow.

[0033] In order to solve the above-mentioned problems, the present inventor conceived an improved one-way valve structure, which includes a flow guide member. The flow guide member is able to guide and control the flow direction of the fluid when the fluid flows through the one-way valve, so that the fluid at least partially exerts a force on the valve flap in a desired direction, and the response time of the one-way valve is thereby shortened. As a result, the objects of noise reduction and improvement of efficiency and working reliability of the scroll compressor are achieved.

[0034] Hereinafter, the structure of the one-way valve according to the present disclosure will be described in further detail in conjunction with Figs. 4 to 10(b).

[0035] Fig. 4 schematically shows an exploded perspective view of a one-way valve 200 according to a first embodiment of the present disclosure. Fig. 5 schematically shows a partial cross-sectional view of a scroll compressor having the one-way valve 200 according to the first embodiment of the present disclosure. As shown in Fig. 4, the one-way valve 200 according to one embodiment of the present disclosure includes a valve seat 210, a valve flap 220 and a valve stop 230. The structures of the valve seat 210, the valve flap 220, and the valve stop 230 according to the present embodiment are similar to the structures of the corresponding components of the one-way valve 100 shown in Fig. 1, and will not be described herein again.

[0036] Unlike the structure of the one-way valve 100 shown in Fig. 1, the one-way valve 200 of the embodiment shown in Fig. 4 may include a flow guide member 240 arranged around the valve seat 210. In the embodiment shown in Fig. 5, the flow guide member 240 is fixed to the valve seat 210 by interference fit. Of course, any other suitable fixing methods such as threading, welding, etc. could also be used. The flow guide member 240 may be formed in a cylindrical shape enclosing the valve seat 210. Of course, the flow guide member 240 is not limited to the shape as shown, and may be oval, rectangular, triangular, or in any other suitable shape. When the scroll compressor operates, due to the restriction of the flow guide member 240, the compressed fluid discharged from valve holes 216 can be concentrated on a region of the valve flap 220, thereby increasing the lift force applied to the valve flap 220, shortening the response time of the one-way valve 200, and firmly maintaining the valve flap 220 in the opened position away from the valve seat 210 so as to reduce the working noise and improve the working reliability of the scroll compressor.

[0037] As shown in Fig. 5, the flow guide member 240 extends upward from a first end portion 242 to a second end portion 244 in a vertical direction. Herein, the first end portion 242 is exemplarily illustrated as being located below an upper surface of the valve seat 210 and on the partition plate 30. However, the present disclosure is not limited to this, and the first end portion 242 may be arranged at other positions below the upper surface of the valve seat 210. The second end portion 244 of the flow guide member 240 may be arranged to be flush with a lower surface of the stopping portion 234 of the valve stop 230. More preferably, as shown in Fig. 5, the second end portion 244 of the flow guide member 240 may be arranged to be flush with the upper surface of the stopping portion 234, or the second end portion 244 may be arranged to be located above the upper surface of the stopping portion 234. In this case, when the scroll compressor is shut down, as shown by arrow B in Fig. 5, the backflow fluid from the discharge port 34 is guided by the flow guide member 240 to flow to a position above the

stopping portion 234, and then flows downward through the through holes 235 of the stopping portion 234, so that the fluid exerts a downward pressure on the valve flap 220. Therefore, the valve flap 220 can quickly move downward to the valve seat 210 to close the valve hole 216, thereby achieving the objects of reducing noise and improving the working efficiency of the scroll compressor. Although the size of the valve flap 220 in the Fig. 5 is shown as being basically corresponding to the size of the stopping portion 234 of the valve stop 230, those skilled in the art should understand that the size of the stopping portion 234 may be larger or smaller than the size of the valve flap 220. In a case that the size of the stopping portion 234 is smaller than the size of the valve flap 220, the backflow fluid can directly act on the valve flap 220 on an outer edge of the valve flap 220 without passing through the through holes 235.

[0038] Preferably, a clearance may be provided between the flow guide member 240 and the stopping portion 234, so that when the scroll compressor operates, the compressed fluid can be discharged through the clearance, thereby increasing the flow area of the fluid and avoiding the drop of working efficiency of the scroll compressor caused by excessive pressure drop loss. Although it is shown in this exemplary embodiment that four through holes 235 are formed in the stopping portion 234, those skilled in the art should understand that the stopping portion 234 may be formed with more or fewer through holes. Preferably, the through holes 235 are arranged symmetrically with respect to a guiding portion 236, so that the force of the fluid is symmetrically applied to the valve flap 220, thereby improving the stability and reliability of the movement of the valve flap 220. Similarly, the valve seat 210 may be formed with at least one valve hole 235. In addition, the valve seat 210, the valve flap 220, and the valve stop 230 are not limited to the shapes shown, but may have any other suitable shapes such as shapes having a square or rectangular cross section.

[0039] Optionally, the flow guide member 240 may be provided on only one side of the valve seat 210, that is, arranged around the valve seat 210 partially. For example, in the scroll compressor shown in Fig. 5, the flow guide member 240 could be formed only on the right side of the valve seat 210, that is, the side where the discharge port 34 is located.

[0040] Fig. 6 schematically shows a partial cross-sectional view of a scroll compressor having a one-way valve 300 according to a second embodiment of the present disclosure. As shown in Fig. 6, the one-way valve 300 according to the second embodiment of the present disclosure includes a valve seat 310, a valve flap 320, a valve stop 330 and a flow guide member 340. The structures of the valve seat 310, the valve flap 320, the valve stop 330, and the flow guide member 340 according to the present embodiment are similar to the structures of the corresponding components of the one-way valve 200 shown in Fig. 5, and will not be described herein again. Unlike the structure of the one-way valve 200 shown in

Fig. 5, the flow guide member 340 of the one-way valve 300 of the embodiment shown in Fig. 6 is fixed to the partition plate 30, rather than the valve seat 310. The flow guide member 340 may be fixed to the partition plate 30 by, for example, welding. In this embodiment, the flow guide member 340 is spaced apart from an outer edge of the valve seat 310, thereby increasing the clearance between the flow guide member 340 and the valve stop 330. Thus, in the one-way valve 300 according to the present embodiment, the flow area of the fluid flowing through the one-way valve 300 can be increased without affecting the guiding of the fluid by the flow guide member 340, thereby further avoiding excessive pressure drop loss.

[0041] Fig. 7 schematically shows a partial cross-sectional view of a scroll compressor having a one-way valve 400 according to a third embodiment of the present disclosure. The structures of a valve flap 420 and a valve stop 430 according to the present embodiment are similar to the structures of the corresponding components of the one-way valves 200, 300 shown in Figs. 5 and 6, and will not be described herein again. Unlike the structure of the one-way valves 200, 300 shown in Figs. 5 and 6, a flow guide member 440 of the one-way valve 400 of the embodiment shown in Fig. 7 is integrated with the valve seat 410 to form an integrated member. It should be understood that the term "integrated member" herein refers to an integrally formed part, rather than two separate parts that are mechanically connected or fixed to each other. Fig. 8 schematically shows a perspective view of the integrated member formed by the flow guide member 440 and the valve seat 410 of the one-way valve 400 according to the third embodiment of the present disclosure. As shown in Fig. 8, the flow guide member 440 may extend upward from an upper surface of the valve seat 410 to enclose the valve stop 430. In this case, a first end portion 442 of the flow guide member 440 is arranged to be flush with the upper surface of the valve seat 410. Optionally, the flow guide member 440 extends upward along an outer edge of an upper surface of the valve seat 410 to separate from the valve stop 430 and the valve flap 420 with a sufficient clearance while being able to guide the flow direction of the fluid, thereby facilitating the assembly and use of the one-way valve 400 and avoiding excessive pressure drop loss.

[0042] Fig. 9 schematically shows a partial cross-sectional view of a scroll compressor having a one-way valve 500 according to a fourth embodiment of the present disclosure. The structures of a valve seat 510 and a valve flap 520 according to the present embodiment are similar to the structures of the corresponding components of the one-way valves 200, 300 shown in Figs. 5 and 6, and will not be described herein again. Unlike the structure of the one-way valves 200, 300 shown in Figs. 5 and 6, a flow guide member 540 of the one-way valve 500 of the embodiment shown in Fig. 9 is integrated with a valve stop 530 to form an integrated member. Figs. 10(a) and 10(b) schematically show perspective views of the integrated

member formed by the flow guide member 540 and the valve stop 530 of the one-way valve 500 according to the fourth embodiment of the present disclosure. As shown in Figs. 10(a) and 10(b), the valve stop 530 may be formed with extension portions 532 extending outward from a stopping portion 534, and the flow guide member 540 may extend downward from an outer edge of the extension portions 532. Moreover, as shown in Fig. 9, the flow guide member 540 extends downward from a first end portion 542 to a second end portion 544 in the vertical direction. Although Fig. 9 exemplarily shows that the first end portion 542 is arranged to be flush with an upper surface of the stopping portion 534 and the second end portion 544 is arranged to be flush with an upper surface of the valve seat 510, those skilled in the art should understand that the first end portion 542 may be arranged to be located above the stopping portion 534 and the second end portion 544 may be arranged to be located below the upper surface of the valve seat 510. In this embodiment, the holes 538 are formed between the adjacent extension portions 532 and the flow guide member 540 to increase the flow area of the fluid. The multiple holes 538 may be symmetrically arranged on the integrated member, so that the force exerted by the fluid is evenly distributed, the valve flap 520 can move stably, and the stability and reliability of the one-way valve and the scroll compressor are improved. Although it is shown in this embodiment that four extension portions 532 are provided between the flow guide member 540 and the stopping portion 534 of the formed integrated member, it is conceivable that the integrated member may be formed with more or fewer extension portions 532. In addition, the number of through holes 535 of the valve stop 530 shown in Fig. 10(a) is also only exemplary. Although the embodiment in which the flow guide member 540 and the valve stop 530 are formed as an integrated member is specifically described herein, the configuration in which the flow guide member is fixed to the valve stop by other means such as interference fit obviously shall still fall in the scope of the present disclosure.

[0043] Figs. 11(a) to 11(d) show pressure-time diagrams of pressures on the upper and lower sides of the valve flap of the one-way valve when the scroll compressor is shut down. Because the valve flap moves downward to close the valve hole when a significant pressure difference occurs, the time when the significant pressure difference occurs can be considered as the response time of the one-way valve in response to the shutdown of the scroll compressor. Figs. 11(a) and 11(b) show the pressure change of the one-way valve in the compressor working under a large pressure difference, where Fig. 11(a) shows the pressure change of the one-way valve of the comparative example shown in Fig. 1, and Fig. 11(b) shows the pressure change of the one-way valve having the flow guide member according to the embodiment of the present disclosure. Besides, Figs. 11(c) and 11(d) show the pressure change of the one-way valve in the compressor working under a small pressure differ-

ence, where Fig. 11(c) shows the pressure change of the one-way valve of the comparative example shown in Fig. 1, and Fig. 11(d) shows the pressure change of the one-way valve having the flow guide member according to the embodiment of the present disclosure. By comparing Figs. 11(a) and 11(b), it can be seen that, in a case that the scroll compressor is shut down under a large pressure difference, the one-way valve of the comparative example without the flow guide member requires a response time of 0.2s, while the one-way valve having the flow guide member according to the present disclosure requires a response time of 0.1s, that is, the response time is shortened. In a case that the scroll compressor is shut down under a small pressure difference, as shown in Fig. 11(c), the one-way valve of the comparative example without the flow guide member requires a response time of up to 0.5s, while the one-way valve having the flow guide member according to the present disclosure as shown in Fig. 11(d) requires a response time of 0.2s, compared with the one-way valve of the comparative example, the response time is significantly shortened. It can be seen that the one-way valve structure according to the present disclosure has a shorter response time, which is beneficial to reducing the noise level of the scroll compressor. Besides, since the one-way valve quickly closes the valve hole, the fluid is prevented from flowing back to the scroll compression mechanism, which avoids the internal parts of the compressor from being damaged due to high-speed reverse rotation.

[0044] Those skilled in the art should understand that the features described in relation to one aspect of the present disclosure are also applicable to other aspects of the present disclosure. While various embodiments of the present disclosure have been described herein in detail, it is conceivable that the present disclosure is not limited to the specific embodiments described and illustrated herein in detail, and other variations and modifications can be implemented by the person skilled in the art without departing from the essence and scope of the present disclosure. All the variations and modifications are within the scope of the present disclosure. Moreover, all of the components described herein can be replaced by other technically equivalent components.

Claims

1. A one-way valve (200, 300, 400, 500), comprising:
 - a valve seat (210, 310, 410, 510) in which a valve hole (216, 316, 416, 516) allowing fluid to flow through is formed;
 - a valve flap (220, 320, 420, 520), which is arranged to be located above the valve seat (210, 310, 410, 510) and configured to selectively open or close the valve hole (216, 316, 416, 516);
 - a valve stop (230, 330, 430, 530), wherein the

- valve stop is arranged to be located above the valve flap and fixedly connected to the valve seat, the valve stop comprises a stopping portion (234, 334, 434, 534) configured to limit a maximum displacement range of the valve flap and a guiding portion (236, 336, 436, 536) configured to guide movement of the valve flap; and a flow guide member (240, 340, 440, 540), which is configured to guide the fluid flowing through the one-way valve (200, 300, 400, 500) to control a force applied by the fluid to the valve flap (220, 320, 420, 520).
2. The one-way valve according to claim 1, wherein the flow guide member (240, 340, 440, 540) is configured to enclose the stopping portion (234, 334, 434, 534) on an outer side of the stopping portion, and the flow guide member extends at least between the valve seat (210, 310, 410, 510) and the stopping portion in a vertical direction.
 3. The one-way valve according to claim 2, wherein the flow guide member (240, 340, 440, 540) is configured as a hollow cylindrical structure.
 4. The one-way valve according to claim 2, wherein the flow guide member (240, 340, 440, 540) extends upward from a first end portion to a second end portion in the vertical direction, wherein the first end portion is flush with an upper surface of the valve seat or located below the upper surface of the valve seat in the vertical direction, and the second end portion is flush with the stopping portion or located above the stopping portion in the vertical direction.
 5. The one-way valve according to claim 4, wherein the flow guide member (240) is fixed to an outer peripheral surface of the valve seat (210) by interference fit, or the flow guide member (440) is integrally formed with the valve seat (410).
 6. The one-way valve according to claim 2, wherein the flow guide member (540) extends downward from a first end portion to a second end portion in the vertical direction, wherein the first end portion is flush with the stopping portion or located above the stopping portion in the vertical direction, and the second end portion is flush with an upper surface of the valve seat or located below the upper surface of the valve seat in the vertical direction.
 7. The one-way valve according to claim 6, wherein the flow guide member (540) is integrally formed with the valve stop (530), or the flow guide member is fixed to an outer peripheral surface of the valve stop by interference fit.
 8. The one-way valve according to any one of claims
 9. The one-way valve according to any one of claims 1 to 7, wherein the guiding portion (236, 336, 436, 536) is inserted through a central hole of the valve flap (220, 320, 420, 520) and fixedly connected into the valve seat (220, 320, 420, 520), and the valve flap (220, 320, 420, 520) is movable along the guiding portion (236, 336, 436, 536).
 10. A scroll compressor, comprising the one-way valve according to any one of claims 1 to 9.
 11. A scroll compressor, comprising a partition plate (30) configured to separate the scroll compressor into a suction side and a discharge side, wherein the partition plate has an opening (32) in fluid communication with a discharge port of a scroll compression mechanism of the scroll compressor, and the scroll compressor is provided with a one-way valve (300) at the opening (32), wherein the one-way valve comprises:
 - a valve seat (310) in which a valve hole (316) allowing fluid to flow through is formed;
 - a valve flap (320), which is arranged to be located above the valve seat (310) and configured to selectively open or close the valve hole (316);
 - a valve stop (330), wherein the valve stop is arranged to be located above the valve flap and fixedly connected to the valve seat, and the valve stop comprises a stopping portion (334) configured to limit a maximum displacement range of the valve flap and a guiding portion (336) configured to guide movement of the valve flap; and
 - a flow guide member (340), which is fixed to the partition plate (30) and configured to guide the fluid flowing through the one-way valve (300) to control a force applied by the fluid to the valve flap (320).
 12. The scroll compressor according to claim 11, wherein a clearance is formed between the flow guide member (340) and the valve seat (310).

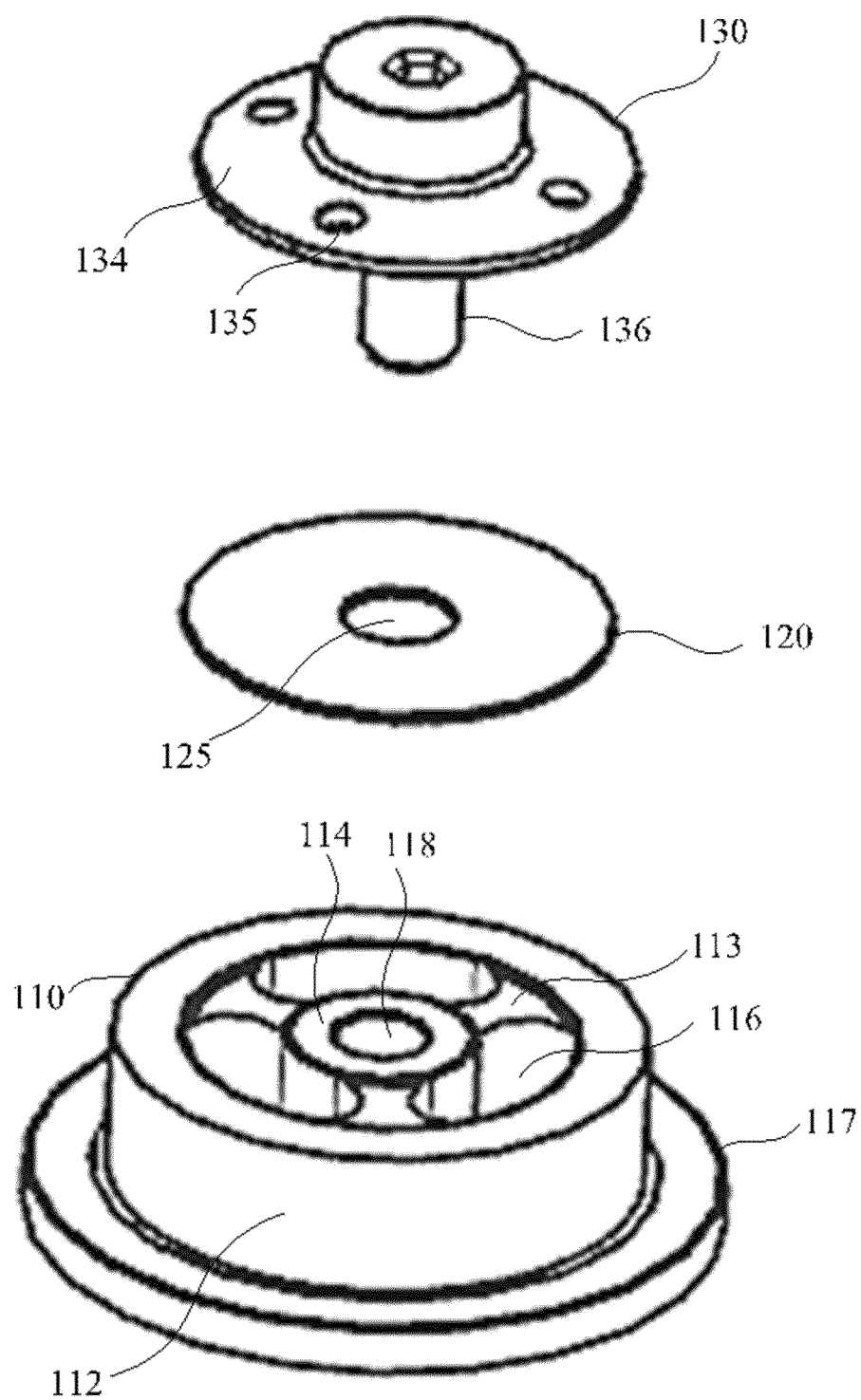


Fig. 1

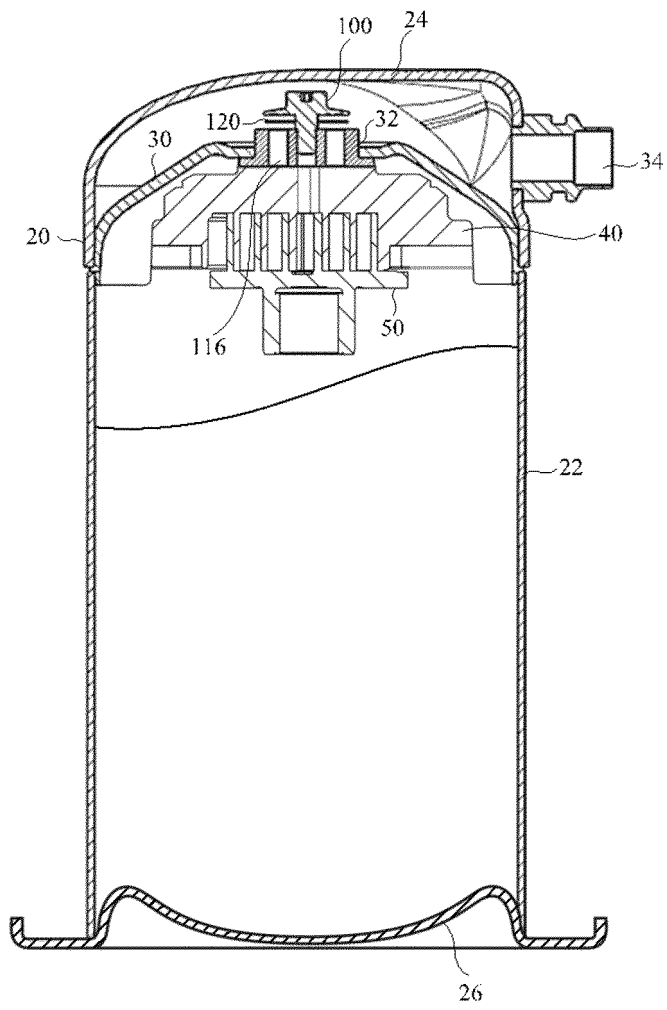


Fig. 2

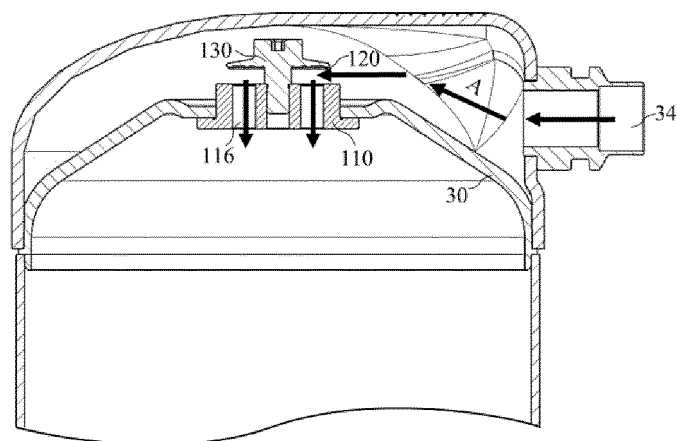


Fig. 3

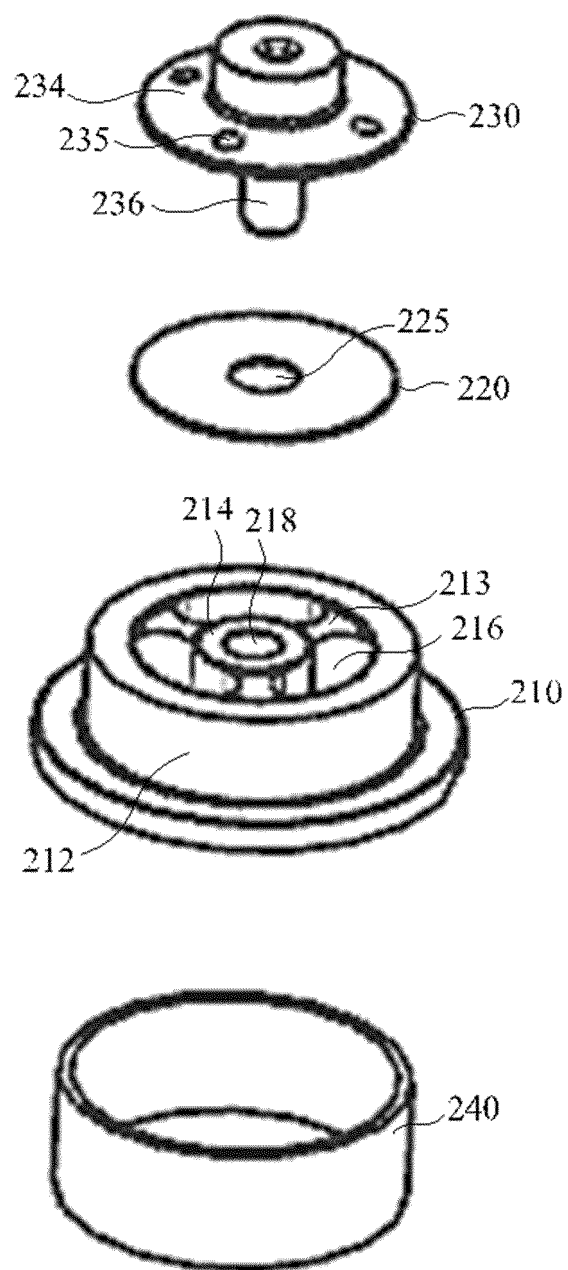


Fig. 4

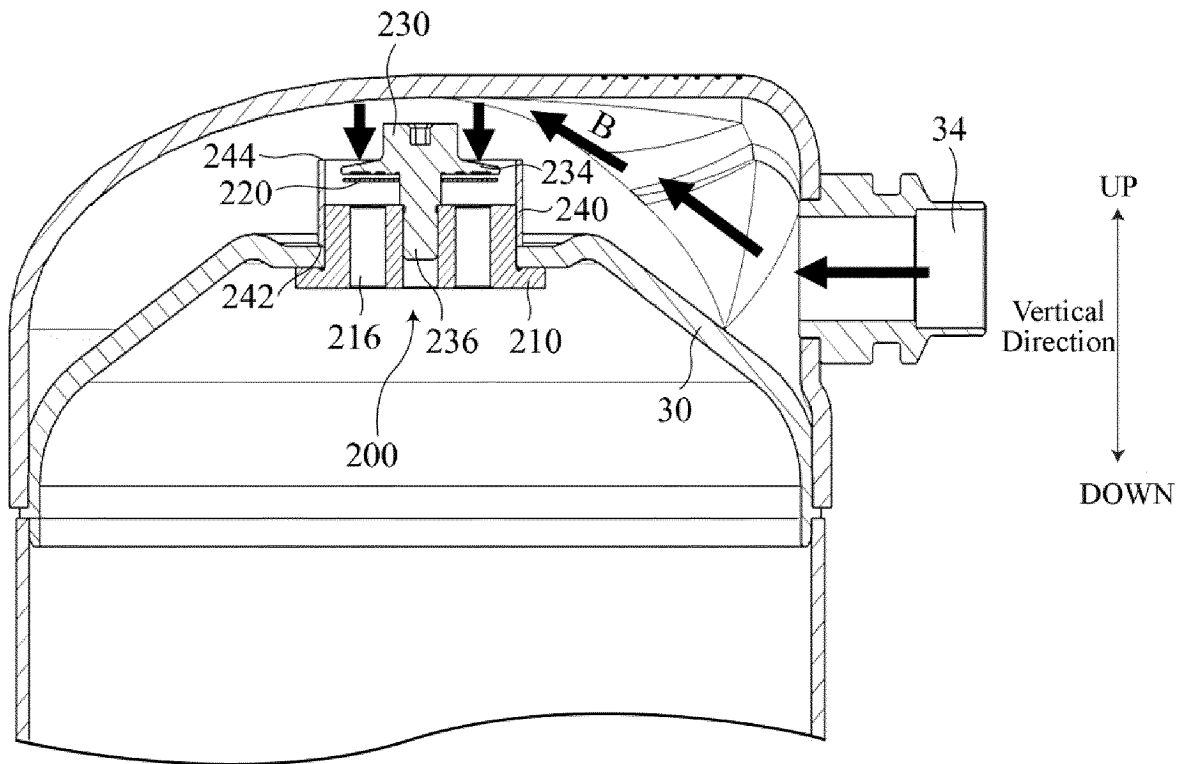


Fig. 5

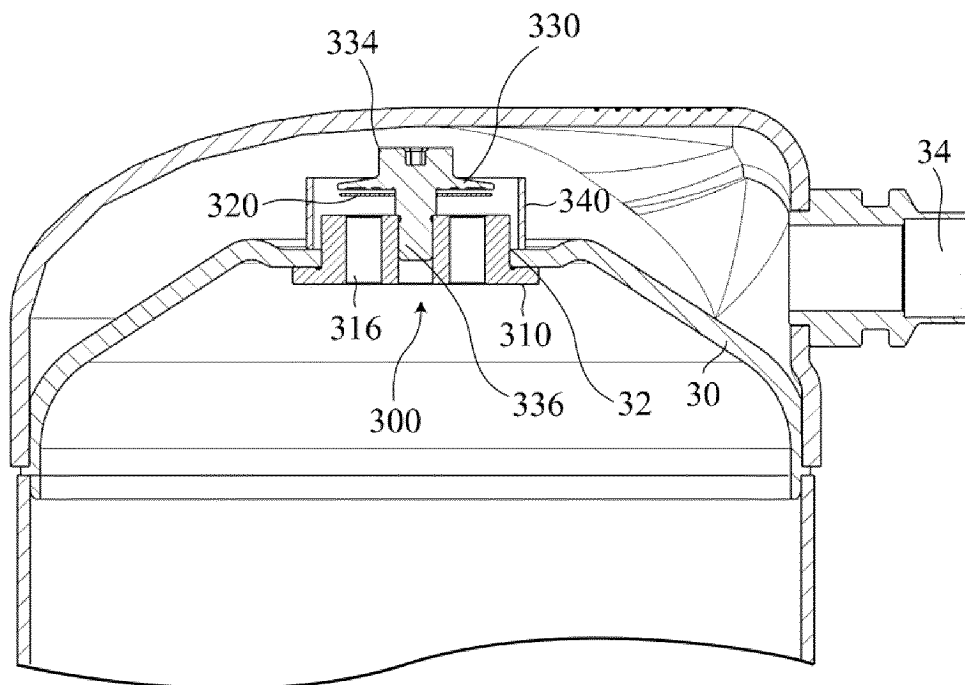


Fig. 6

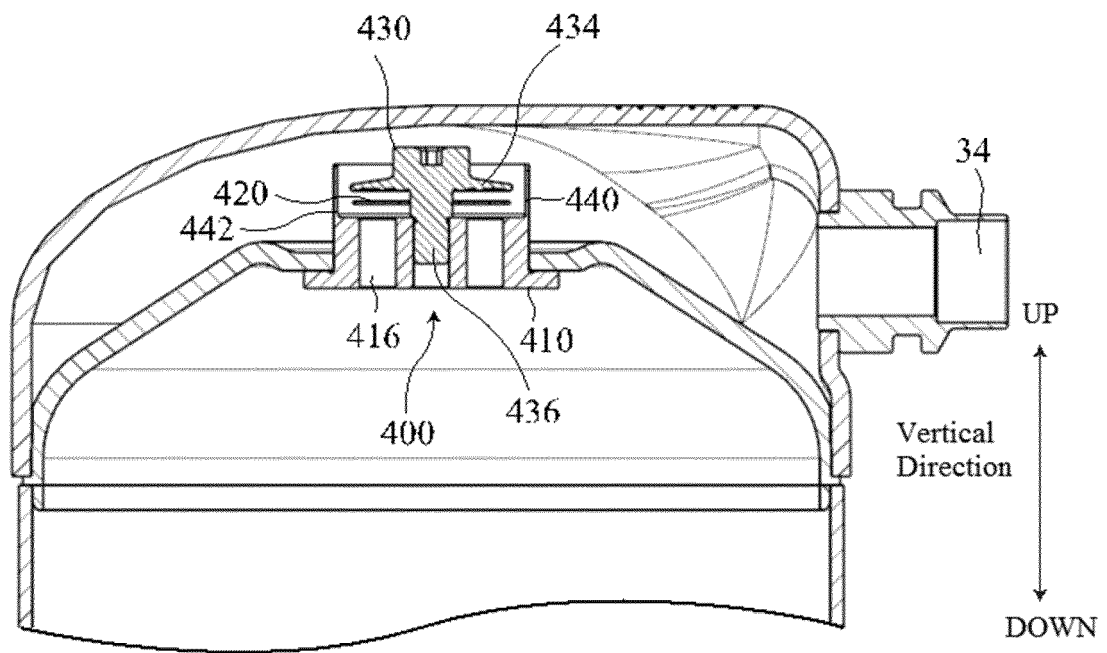


Fig. 7

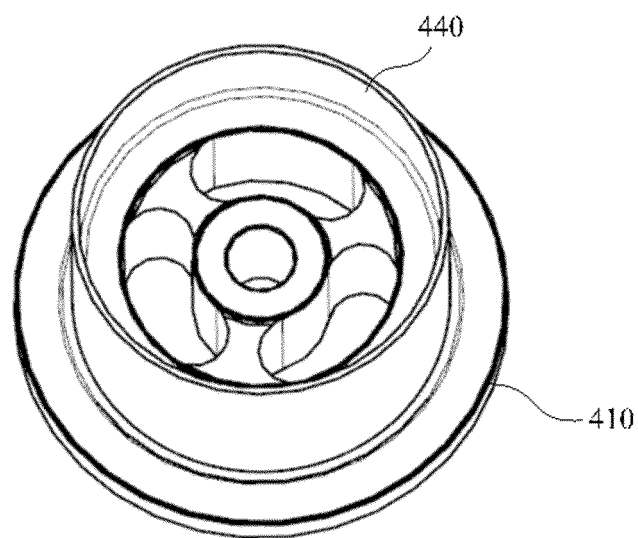


Fig. 8

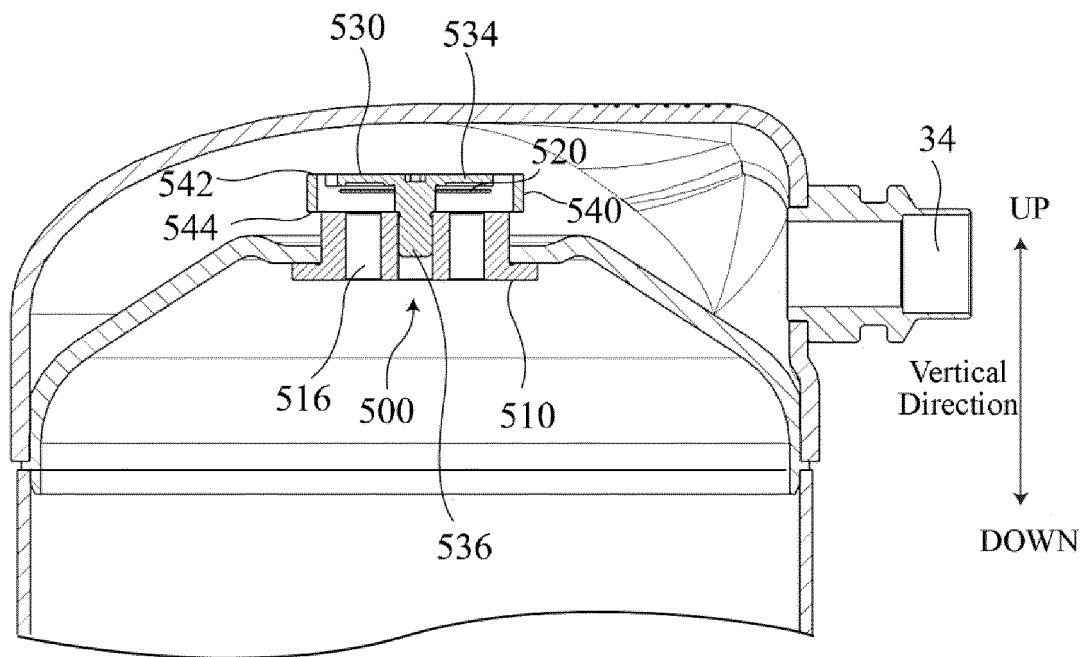


Fig. 9

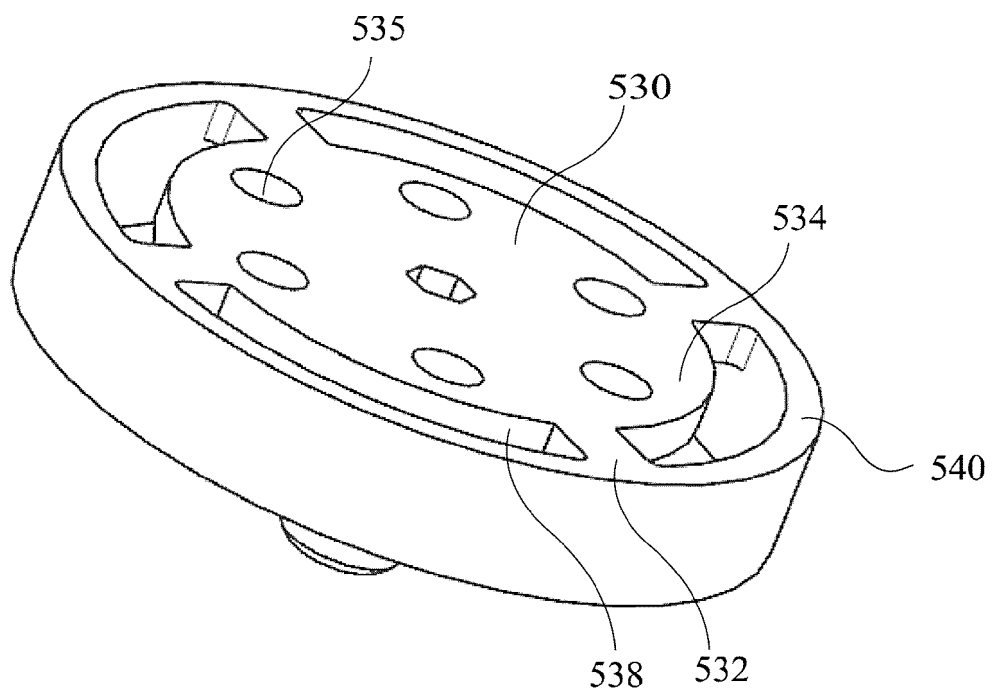


Fig. 10(a)

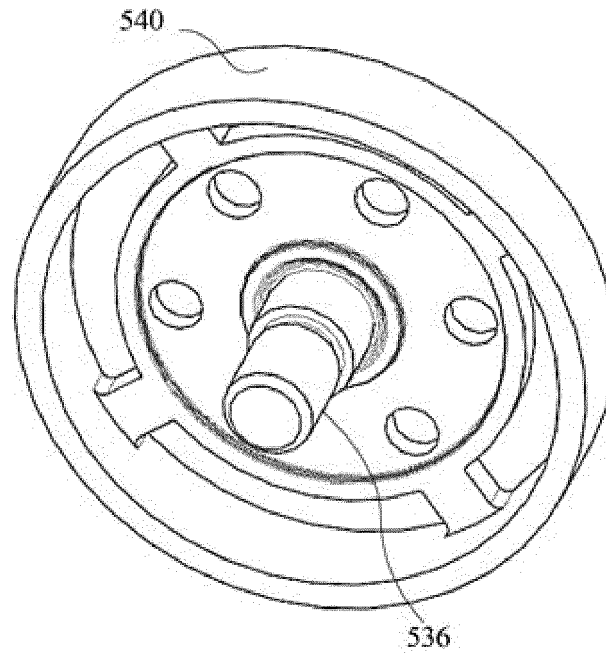


Fig. 10(b)

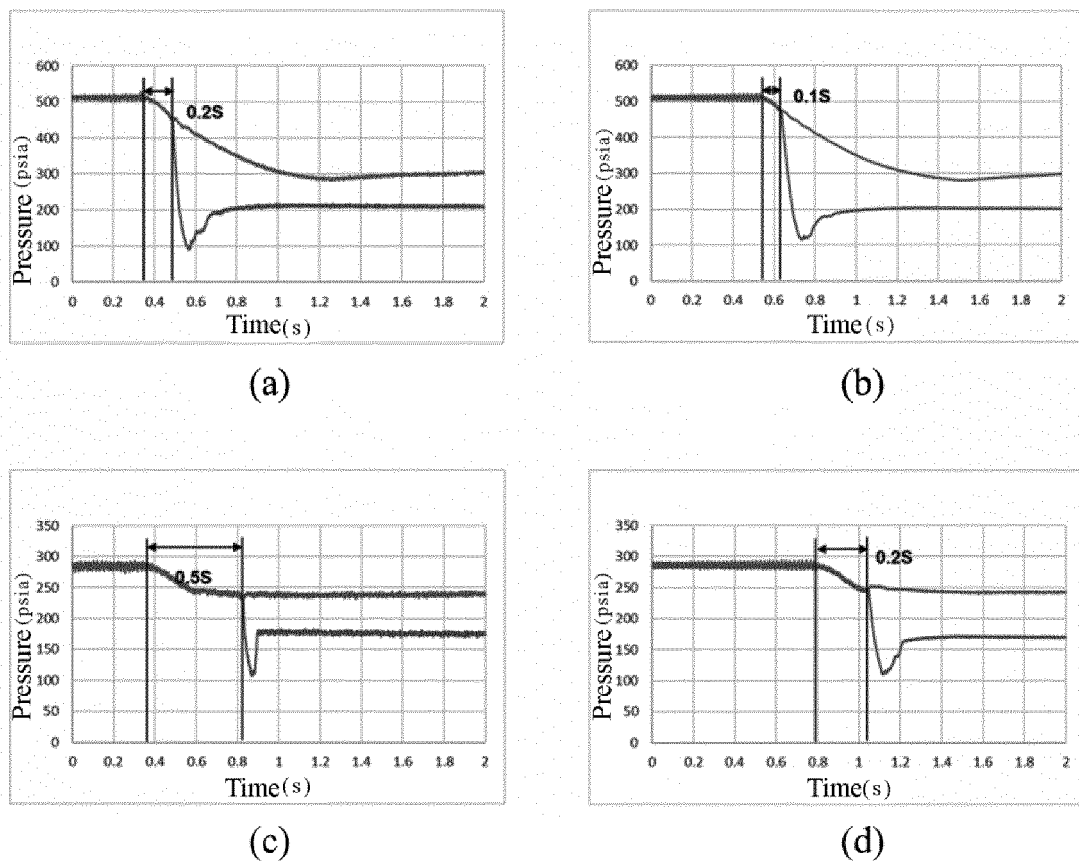


Fig. 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2019/099969

A. CLASSIFICATION OF SUBJECT MATTER

F04C 18/02(2006.01)i; F04C 18/00(2006.01)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)

F04C

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)

CNABS, VEN, CNKI: 涡旋, 压缩机, 阀, 导流, scroll, compress+, vavle, guide

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 208966580 U (EMERSON CLIMATE TECHNOLOGIES (SUZHOU) CO., LTD.) 11 June 2019 (2019-06-11) see description, paragraphs [0035]-[0054], and figures 1-11	1-12
X	CN 202926643 U (EMERSON CLIMATE TECHNOLOGIES (SUZHOU) CO., LTD.) 08 May 2013 (2013-05-08) see description, paragraphs [0050]-[0070], and figures 1-7	1-12
A	CN 102116291 A (MIDEA GROUP CO., LTD.) 06 July 2011 (2011-07-06) see entire document	1-12
A	CN 207795587 U (EMERSON CLIMATE TECHNOLOGIES (SUZHOU) CO., LTD.) 31 August 2018 (2018-08-31) see entire document	1-12
A	WO 2018036380 A1 (EMERSON CLIMATE TECHNOLOGIES (SUZHOU) CO., LTD.) 01 March 2018 (2018-03-01) see entire document	1-12
A	JP 11166488 A (SAMSUNG ELECTRONIC CO., LTD.) 22 June 1999 (1999-06-22) see entire document	1-12

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

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“P” document published prior to the international filing date but later than the priority date claimed

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“&” document member of the same patent family

Date of the actual completion of the international search

11 October 2019

Date of mailing of the international search report

31 October 2019

Name and mailing address of the ISA/CN
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/099969

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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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A	EP 1291529 A2 (COPELAND CORPORATION) 12 March 2003 (2003-03-12) see entire document	1-12
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Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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KR 20180058514 A	01 June 2018	None	

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REFERENCES CITED IN THE DESCRIPTION

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