April 18, 1939. E. TWIGG 2,154,880

VALVE

Filed Dec. 24, 1935

Fig. 1

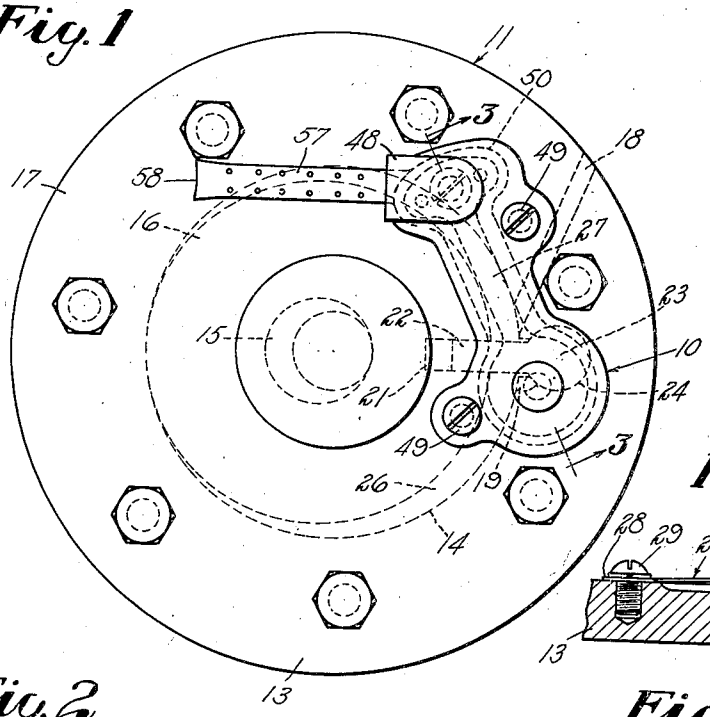


Fig. 5

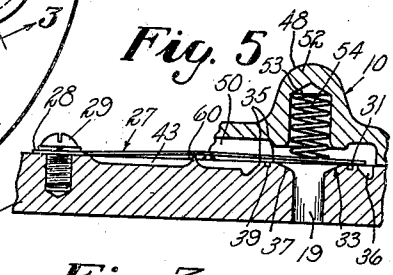


Fig. 2

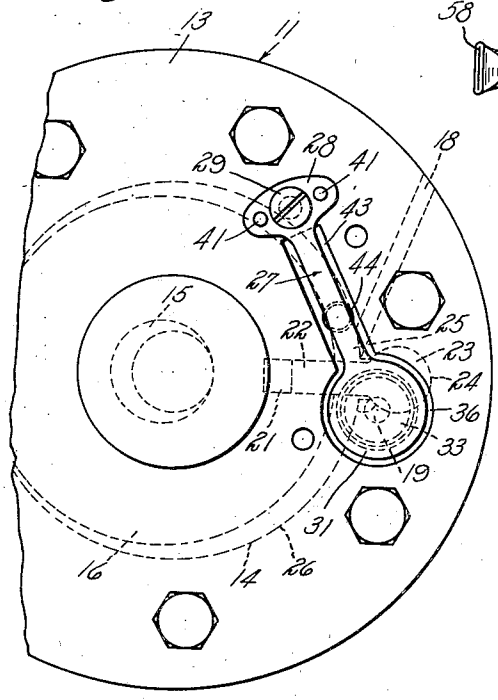


Fig. 3

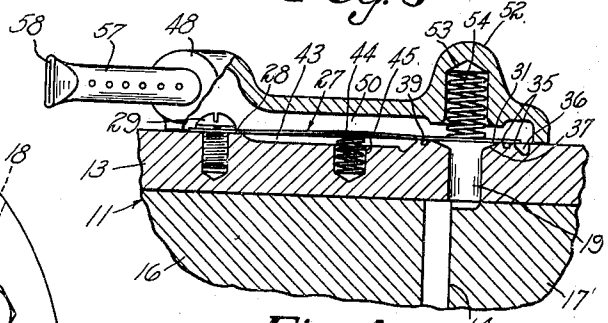
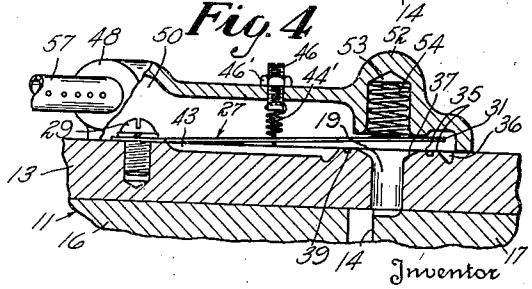


Fig. 4



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VALVE

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Application December 24, 1935, Serial No. 56,074

8 Claims. (Cl. 251—119)

This invention relates to valves and, more particularly, to an automatic pressure actuated valve used in conjunction with a compressor pump as employed in a refrigerating system.

Heretofore, various types of pressure actuated valves have been employed in the discharge port or outlet of a compressor pump in a refrigerating system, but these valves have been found to be noisy in operation and particularly objectionable when used in connection with home refrigerating units.

It is, therefore, the primary object of my invention to provide an automatic pressure operated valve which is simply constructed, quiet acting, and efficient in operation.

It is a further object of this invention to provide a flapper type of valve which is arranged to quickly and positively close with a combined swinging and sliding movement.

To the accomplishments of these and other objects which will be apparent from the following description of my invention, I have provided an automatic pressure controlled valve arranged to be connected to the high pressure side of a compressor pump and to automatically and quietly close, thereby preventing compressed gases or vapor from re-entering the pump chamber of the compressor and thus maintaining high and quiet operating efficiency.

My invention further resides in the features of construction, combination of elements, and arrangement of parts which will be exemplified in the construction hereinafter disclosed and the scope of the application which will be indicated in the appended claims.

In the accompanying drawing, wherein similar parts are indicated by like numerals:

Figure 1 is a plan view of my valve and its associated parts as employed to control the discharge of a rotary compressor pump;

Fig. 2 is a fragmentary plan view of my invention having certain parts removed to illustrate the operative valve head;

Fig. 3 is a sectional view taken substantially along the line 3—3 of Fig. 1 and showing the valve head in closed position;

Fig. 4 is a view similar to Fig. 3 but showing a slightly different arrangement and the valve head being illustrated in open position during a discharge of gases from the compressor pump; and

Fig. 5 is a fragmentary sectional view taken substantially along the lines 3—3 of Fig. 1 and illustrating a modified form of the present invention.

As illustrated, my invention comprises a pressure actuated valve, generally indicated at 10, adapted to be employed in a refrigerating system in conjunction with a compressor pump 11 and which, in the present instance, is shown as a rotary pump of the type disclosed in the patent to Badger No. 1,977,109 issued October 16, 1934. The compressor pump, as herein shown, includes a casing 13 having a cylinder 14 in which is journalled an eccentric 15 which supports a piston 16 of smaller diameter than the cylinder. The cylinder 14 is provided with an inlet port 18 and a discharge port 19. The piston is provided with a substantially radial slot 21 slidably engaging a partition member 22 positioned between ports 18 and 19 and having an enlarged cylindrical head 23 supported for pivotal movement in a substantially cylindrical groove 24 of casing 13. It will thus be evident that gas or vapor may enter port 18 into a low pressure chamber 25, and the eccentric movement of piston 16 will compress said gas between the piston and cylinder 14 into a compression chamber 26 and force it out through discharge port 19. During the eccentric piston movement, chambers 25 and 26 will gradually enlarge and diminish and merge into each other in cooperative relation so that the gas or vapor will be sucked from the low pressure side of a refrigerating system through the inlet port 18 into the casing where it is compressed and then discharged through the port 19 and valve 10 into the high pressure side of the system. During this operation, the valve will repeatedly open and close to permit the compressed vapors to escape from the compression chamber 26 after said vapors reach a predetermined pressure and prevent the vapors thus discharged from flowing back into the pump.

Heretofore, automatically operated valves employed for this purpose have tended to close into seating position with an objectionable clicking or slapping noise which is practically continuous since these valves tend to open and close many times a minute. I have overcome this difficulty inherent in prior types of valves by constructing a valve wherein a pressure actuated member is automatically and quietly moved into a valve seating position with a combined progressively swinging and sliding movement so that the seating portion of said member does not momentarily and simultaneously engage all portions of a valve seat with an instantaneous slapping contact.

My valve essentially comprises a flat member such as a flapper 27 preferably composed of a relatively thin flat strip of flexible resilient sheet

metal having an enlarged head 28 at one end secured to casing 13, as by a screw 29, and a substantially cylindrical enlarged flat head 31 at its other end arranged to be resiliently urged into positive closing engagement with a valve seat 33 communicating with port 19. The valve seat 33, as herein shown, preferably comprises a plane annular surface 35 surrounded by a substantially cylindrical depressed cavity 36 and enclosing an inner tapering face 37 merging with port 19. To further aid in causing head 31 to close against face 35 and completely cut off port 19 against an inflow of gases therethrough, I have also provided an annular groove 39 in surface 35 substantially concentric therewith and having sharp top edges which aid in the sealing of the valve closure. If desired, the outer face of the head may be coated with a soft metal such as a solder to aid in dampening and quieting its closing action, although this is not necessary to the present invention. Head 28 and valve member 27 are maintained in proper alignment by means of two suitable locating pins 41 mounted in casing 13 and extending therefrom.

As illustrated in Fig. 3, the portion of casing 13 between heads 28 and 31 is provided with a longitudinal recess 43 so that the resilient closing and opening movement of valve member 27 will not be impeded. Intermediate of the ends of depression 43 and between heads 28 and 31, I have provided a coiled spring 44 mounted within a cavity 45 and resiliently engaging the inner side of member 27 and urging it outwardly, tending to open the valve. Surrounding valve member 27, I have further provided a housing 48 secured to casing 13 in any suitable manner, as by screws 49. The housing is provided with a cavity 50 having such a peripheral contour that free movement of valve member 27 is permitted therein. One end of housing 48 is provided with a boss 52 having a cavity 53 therein adapted to receive a coiled spring 54 resiliently engageable with the outer face of head 31 and urging it into closed position against seat face 35. Cavity 50 also communicates with the open end of a tube 57 which is rigidly secured to housing 48 in any suitable manner, for example, as by soldering. The outer end 58 of the tube is closed, and its side walls are perforated as shown.

Spring 54 is sufficiently stronger than spring 44 to overcome the compressive movement thereof. However, it will be noted that spring 54 tends to close flapper member 27, deflecting said member adjacent head 28. Since spring 44 impedes the closing movement of valve member 27, it will be appreciated that this member will be temporarily deflected about said spring as a fulcrum during its closing movement, and the forward end of head 31, as urged inwardly by spring 54, will first engage seat 33, and thereafter further movement of head 31 under the influence of spring 54 will cause the valve member to straighten out and slide into positive closed position against surface 35. Hence, it will be apparent that the closing of the valve will not be a slapping movement of head 31 against surface 35, but the valve member will rapidly and quietly move into a final closed position with a somewhat sliding movement.

Instead of the compression spring 44 of Fig. 3, a tension spring 44' shown in Fig. 4 may be employed. One end of the spring 44' is connected to the central portion of the flapper, and its other end to a screw 46 adjustably supported in the housing 50 by a nut 46'.

As illustrated in Fig. 5, I have shown a further modified construction of the present invention wherein the spring 44 of my preferred construction is replaced by an outwardly projecting fulcrum member 60 engaging an intermediate portion of valve member 27 and deflecting it in its closing movement, thereby causing a sliding closure of member 27 in the same general manner as previously explained.

In the operation of my device, spring 54 which overbalances the pressure of spring 44 urges valve head 31 into seating position against valve seat 33. During the movement of piston 16, gas or vapor is drawn in through port 18 and compressed between the piston and cylinder 17 into discharge port 19, causing an opening movement of flapper member 27 to the position shown in Fig. 4, at which point the gases or vapors are free to flow out through chamber 50 and perforated tube 57. It will be appreciated that the moment the discharge pressure is reduced, spring 54 again serves to quickly and quietly close the valve, preventing any inflow of gases back into the compression chamber.

It will be appreciated that my valve member 27 could be arranged in other ways to operate as herein disclosed. For example, the member 27 could be so bent as to normally assume a deflected form so that its closing action under the influence of spring 54 would cause head 31 to slide into position, or spring 44 could be replaced by other types of flat springs. Although it is not deemed necessary to show these many slight modifications of construction which would serve to cause the same operation of valve member 27, it is believed that the scope of the invention as herein described and illustrated in the accompanying drawings is sufficient to cover them.

It will further be apparent that the extent of valve movement as herein illustrated has been exaggerated to better disclose the operation of my invention, and during usual operation, the valve flapper member tends to rapidly open and close with a somewhat fluttering action.

It is also to be understood that the language as used in the following claims is intended to cover all generic and specific features of my invention as above described and all statements of the scope of the invention which, as a matter of language might be said to fall therebetween.

I claim as my invention:

1. A pressure actuated valve for regulating the flow of gas under pressure through a port, a valve seat at the end of the port, an elongated resilient member rigidly supported at one end and having an enlarged portion at the other end adapted to move into and out of engagement with said seat to close and open said port, thereby controlling the flow of gas therethrough, a spring engageable with said member and tending to urge it into a seated position, and yieldable means engageable with said member in opposed relation to said spring causing the member to move into seating position with a combined swinging and sliding motion.

2. A pressure actuated valve for regulating the flow of gas under pressure through a port, a valve seat communicating with said port, an elongated resilient strip, a support rigidly locating one end thereof and an enlarged portion at the other end adapted to be moved into opening and closing engagement with the valve seat, yieldable means tending to flex said strip into a closed position, and separate yieldable means engageable with the strip intermediate of its ends in

opposed relation to but of lesser strength than said first mentioned yieldable means whereby the strip will be deflected intermediate of its ends during its closing movement and seated with a final sliding movement.

3. A pressure actuated valve for regulating the flow of gas under pressure through a port, an annular valve seat at the end of the port, a substantially flat elongated resilient member rigidly supported at one end and having an enlarged portion at the other end adapted to move into and out of closing engagement with said seat to control the flow of gas through said port, a spring engageable with said enlarged portion and tending to normally move the member into seating position, and a spring resiliently engaged intermediate of the ends of said member in opposed relation to said first mentioned spring and arranged to deflect said member during its seating movement whereby it will be moved into seating position with a combined swinging and sliding motion.

4. A pressure actuated valve comprising a substantially flat resilient strip rigidly supported at one end, said strip being adapted to be flexed into opening and closing engagement with a port to control the flow of gas therethrough, a yieldable means arranged to urge said strip into closing engagement, a member between said port and the rigidly supported end engageable with said strip in opposed relation to the yieldable means, and means to adjust said member relative to the strip whereby the strip will be deformed a predetermined but adjustable extent during its closing movement and quietly flexed into closed position with a combined swinging and sliding motion.

5. A pressure actuated valve for regulating the flow of gas under pressure through a port, a valve seat at the end of the port, an elongated resilient member rigidly supported at one end and having an enlarged portion at the other end adapted to move into and out of engagement with said seat to close and open said port and control the flow of gas therethrough, a spring engageable with said member and tending to urge it into a seated position, a yieldable member engageable with the elongated resilient member intermediate of its ends and in opposed relation to said spring, and adjustable means to position said yieldable member relative to the resilient member whereby said enlarged portion will move into seated position with a controlled swinging and sliding motion.

6. A pressure actuated valve for regulating the flow of gas under pressure through a port, a valve seat communicating with said port, an elongated resilient strip, a support rigidly locating one end of said strip, an enlarged portion at the other end thereof adapted to be moved into opening and closing engagement with the valve seat, a spring engageable with said enlarged portion and tending to normally move it into seating position, a spring resiliently engaged with the strip intermediate of its ends and in opposed relation to said first mentioned spring and arranged to deflect said strip during seating movement, and means to adjust the tension of said second named spring whereby the deflection of said strip may be regulated so that it will be moved into seating position under a controlled swinging and sliding movement.

7. In a pressure actuated discharge valve for controlling the flow of gas through a port in a casing, an elongated resilient member rigidly secured at one end to the casing, said casing having a seat at one end of the port, the elongated member being provided with an enlarged portion at its other end and adapted to move into and out of engagement with said seat to regulate the flow of gas through said port, a spring urging said member into seated position, and yieldable means engageable with the resilient member between its secured end and said port and during its seating movement whereby said member will be deflected and progressively and quietly move into a seating position with a combined swinging and sliding movement.

8. A pressure actuated discharge valve comprising a casing having a discharge port extending therethrough, said port having a valve seat at one end, an elongated substantially flat resilient member rigidly secured at one end to said casing and having an enlarged portion at its other end adapted to fit against said seat and cut off the flow of gas through said port, a spring tending to urge the resilient member into a seating position, a second spring engageable with the resilient member between its ends and acting in yieldably opposed relation to said first-named spring to deflect the resilient member during its closing movement, and means to adjustably position said second-named spring whereby the resilient member will be controlled in its deflecting movement and progressively and quietly move into a seated position with a combined swinging and sliding movement.

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