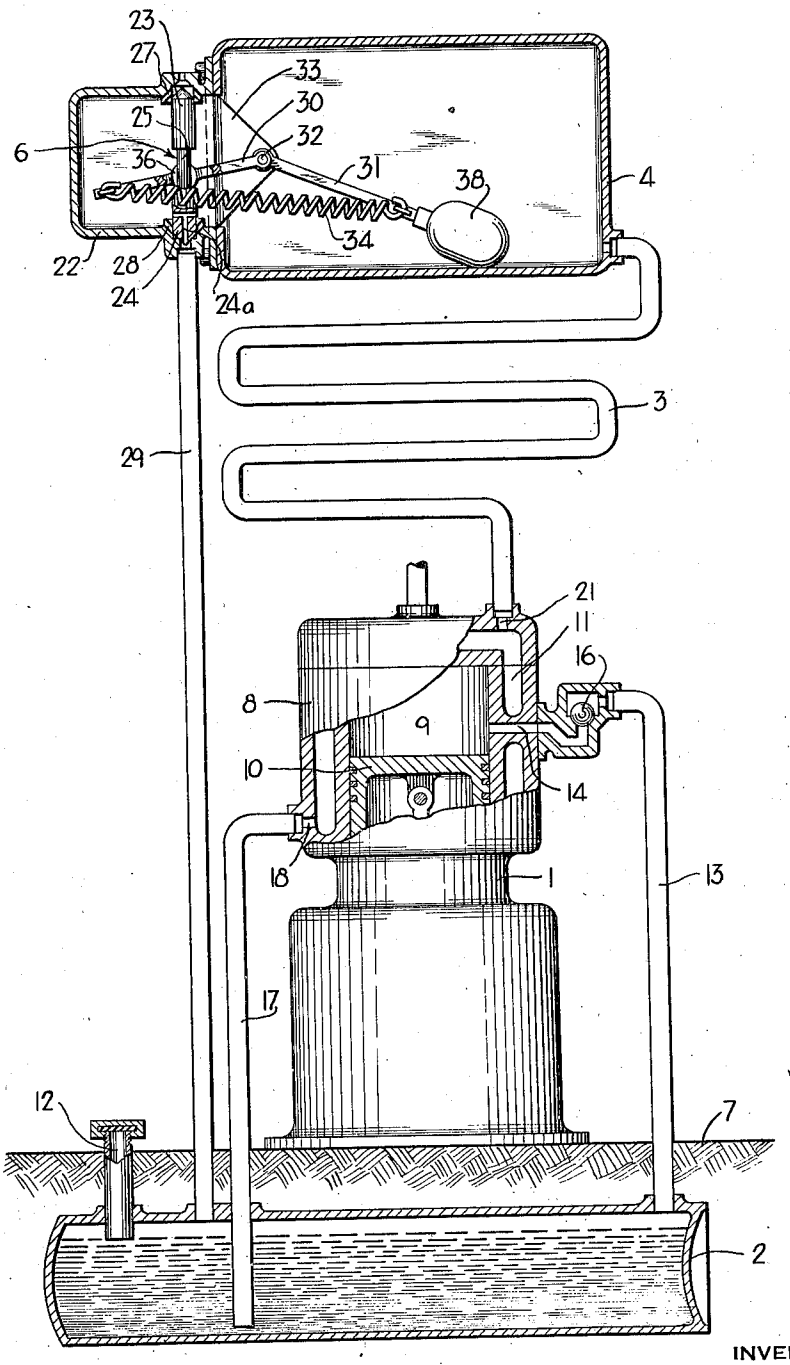
Feb. 22, 1938. B. S. AIKMAN 2,108,785

COMPRESSOR COOLING SYSTEM

Filed April 11, 1936



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Patented Feb. 22, 1938 2,108,785

UNITED STATES PATENT OFFICE

2,108,785

COMPRESSOR COOLING SYSTEM

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Application April 11, 1936, Serial No. 73,854

8 Claims. (Cl. 230—212)

This invention relates to fluid compressors, and more particularly to a cooling system for a fluid compressor.

The principal object of my invention is to provide improved means for circulating a cooling fluid, such as water, through suitable cooling chambers of a compressor, and for controlling the temperature of said fluid.

Another object of my invention is to provide an improved circulating fluid cooling system for a compressor, having means for automatically draining the cooling fluid from exposed portions of the system when the compressor is inoperative, so as to avoid the possibility of freezing.

In the accompanying drawing, the single figure is a diagrammatic sectional view of a fluid compressor showing associated therewith a cooling system embodying my invention.

As shown in the drawing, a cooling system is provided for cooling a compressor 1, said system comprising a lower supply reservoir 2, a cooling manifold pipe 3, an upper reservoir 4 and an automatic draining valve mechanism 6 associated with said upper reservoir. The compressor 1, which is adapted to rest on a floor or foundation 7, may be of any suitable design having the usual inlet and discharge valves controlling the flow of fluid to and from a compression chamber, and as illustrated comprises a cylinder casing 8 having a compression chamber 9, and a fluid compressing piston 10 mounted to reciprocate therein, which piston may be operated in the usual manner through the medium of a crankshaft (not shown). A cooling chamber 11 is formed within the cylinder casing 8 and surrounds the compression chamber 9.

The lower supply reservoir 2 is disposed below the level of the cooling chamber 11 of the compressor 1, being preferably buried beneath the frost line or otherwise protected from freezing temperatures, and is provided with a normally closed filling tube 12, through which water or other cooling liquid is initially supplied to the reservoir, said tube opening into said reservoir below the upper wall thereof so as to limit the level to which the reservoir may be filled with the cooling liquid.

In order to subject the cooling liquid in the reservoir to fluid under pressure, a pipe 13 is provided, the lower end of which is connected to said supply reservoir above the level of the cooling liquid therein, and the other end of which communicates with a port 14 formed in the cylinder casing 8 and opening into the compression chamber 9. The location of the port 14 intermediate the limits of travel or stroke of the piston 10 is such as to permit said port to remain open while the piston is moving on its compression stroke until the pressure desired for operation of the cooling system has been built up in chamber 9, the further movement of the piston then operating to close the port. It will be understood that only a part of the fluid compressed in chamber 9 will flow through the pipe 13 to the reservoir 2, the communication between the chamber and pipe being cut off when piston 10 blanks port 14. A ball check valve 16 is interposed between the pipe 13 and the port 14 for preventing back flow of fluid under pressure from said pipe to the compression chamber.

Extending into the supply reservoir 2 below the level of the cooling liquid therein is a supply pipe 17, which leads to the cylinder casing 8 of the compressor and is connected through a passage 18 with the lower portion of the cooling chamber 11. The upper portion of the cooling chamber 11 is connected by way of a passage 21 with the lower end of the cooling manifold pipe 3, the other end of said pipe being connected with the upper reservoir 4.

A casing 22 is secured to the reservoir 4 and carries the automatic draining valve mechanism 6, comprising a member 25 having valves 23 and 24 at its opposite ends, which are slidably mounted in suitable bores in said casing, the valve 23 being adapted to control communication from the reservoir 4 by way of passages 27 to the atmosphere and the valve 24 being adapted to control communication from said reservoir to a discharge pipe 29 which leads to the lower supply reservoir 2. The valve 24 has a restricted passage 24a for permitting gradual equalization of the pressures on opposite sides thereof when the compressor is inoperative, as hereinafter more fully described.

For operating the valves 23 and 24 a toggle lever mechanism is provided comprising oppositely extending levers 30 and 31, the adjacent ends of which are pivotally mounted on a pin 32, which is carried by a lug 33 on the casing 22 which projects into the reservoir 4. A spring 34 connects together the outer ends of said levers. The lever 30 has a slotted portion 36 intermediate its ends for receiving a reduced portion of the member 25 intermediate the valves 23 and 24, said intermediate reduced portion providing shoulders adapted to be engaged by the portion 36 according to the position of the lever 30. The lever 31 extends into the reservoir 4 and carries a float 38, which normally maintains the valve mechanism

in the position shown in the drawing, wherein the valve 24 is seated and the valve 23 is open.

In operation, fluid compressed in the usual manner by the compressing piston 10 is supplied through the port 14, past the check valve 16 and through pipe 13 to the supply reservoir 2 at a faster rate than it can escape by way of the pipe 29 and the restricted passage 24a. As a result, a fluid pressure is built up in the rservoir 2 which acts on the body of the liquid therein so that liquid from said reservoir is forced to flow through the pipe 17 to the cooling chamber 11 of the compressor casing 8, thereby cooling the compressor. The cooling liquid having thus circulated through the cooling chamber in the cylinder head is then forced upwardly through the cooling manifold pipe 3, whereby most of the heat absorbed from the compressor is dissipated, and from said cooling pipe the liquid flows into the upper reservoir 4.

As the level of cooling liquid rises in the upper reservoir 4, the float 38 is moved upwardly, turning the lever 31 of the toggle lever mechanism about the pin 32 and causing the spring 34 to be stretched, the lever 30 remaining stationary due to its engagement with the seated valve 24. When the lever 31 and spring 34 are thus moved beyond the position in which the levers 30 and 31 are in alignment, said spring is then so positioned relatively to the levers, that it exerts its force so as to tend to pull the end of lever 30 in an upward direction, since the lever 31 is positioned by the weight of the float 38. This movement will thus cause the force of the spring to move the lever 30 with a quick snap-like action, so that the portion 36 engages the upper shoulder of the member 25 and thereby quickly moves the valve 23 to its seat while unseating the valve 24.

The valve 23 thus closes the atmospheric communication and the valve 24 establishes communication for effecting rapid equalization of the fluid pressure in the supply reservoir 2 with that in the upper reservoir 4, so as to permit cooling liquid to flow from said upper reservoir through the discharge pipe 29 into the supply reservoir. When the level of the liquid in the upper reservoir 4 has been lowered sufficiently, the float 38 will operate the toggle lever mechanism so as to return the valve 24 to its seat and unseat the valve 23, thereby venting said reservoir in order to permit continued flow thereto of cooling liquid forced from the manifeld pipe 3, as already described.

When operation of the compressor 1 is stopped, the fluid under pressure bottled up in the space above the cooling liquid in the supply reservoir 2 and in the discharge pipe 29 is permitted gradually to flow through the restricted port 24a in the valve 24 to the upper reservoir 4, and as equalization of the fluid pressures in said reservoirs is thus effected, the cooling liquid will drain from the upper reservoir downwardly through the cooling pipe 3, the cooling chamber 11 in the compressor, and through the pipe 17 into the lower supply reservoir.

It will thus be seen that my invention provides an efficient and economical compressor cooling system having improved means for effecting the circulation of cooling liquid therethrough during operation of the compressor, and constructed and arranged to permit the cooling liquid to be automatically drained from the system when said compressor is idle, so as to prevent freezing of the liquid.

While one illustrative embodiment of the invention has been described in detail, it is not my intention to limit its scope to that embodiment or otherwise than by the terms of the appended claims.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. The combination with a fluid compressor having a cooling chamber through which cooling liquid may flow for cooling the compressor, of a supply reservoir adapted to contain a supply of cooling liquid and having a communication through which liquid from the reservoir is supplied to said chamber, a second reservoir communicating with said chamber into which flows liquid supplied to said chamber, means for subjecting liquid in said supply reservoir to the pressure of fluid supplied by the compressor and means operative upon a predetermined increase in the supply of liquid in the second reservoir for draining liquid from the second reservoir into the supply reservoir.

2. The combination with a fluid compressor having a chamber through which cooling liquid may flow for cooling said compressor, of a cooling liquid supply reservoir communicating with said chamber, a second reservoir communicating with said chamber, valve means controlling communication from said second reservoir to said supply reservoir, means controlled according to the level of liquid in the second reservoir for operating said valve means, and means for supplying fluid under pressure to the supply reservoir for forcing liquid from said supply reservoir through said chamber into said second reservoir.

3. The combination with a fluid compressor having a chamber through which cooling liquid may flow for cooling said compressor, of a cooling liquid supply reservoir communicating with said chamber, a second reservoir communicating with said chamber, valve means operative according to the liquid level in the second reservoir for controlling communication from said second reservoir to the supply reservoir, and means for subjecting cooling liquid in said supply reservoir to the pressure of fluid compressed by the compressor for forcing liquid from said supply reservoir through said chamber into said second reservoir.

4. The combination with a fluid compressor having a chamber through which cooling liquid may flow for cooling said compressor, of a cooling liquid supply reservoir communicating with said chamber, a second reservoir communicating with said chamber, an exhaust valve controlling communication from said second reservoir to atmosphere, a drain valve controlling communication from said second reservoir to said supply reservoir, a float in the second reservoir, means including a toggle mechanism operable by said float upon a rise in the level of liquid in the second reservoir for opening the drain valve and closing the exhaust valve and upon a fall in the level of liquid for closing the drain valve and opening the exhaust valve, and means for supplying fluid under pressure to said supply reservoir for forcing cooling liquid therefrom through said chamber into said second reservoir.

5. The combination with a fluid compressor having a cooling chamber through which cooling liquid may flow, of a supply reservoir below said chamber adapted to contain cooling liquid, means for supplying fluid under pressure to said supply reservoir, a communication through which cooling liquid is forced from the supply reservoir through the cooling chamber by said fluid

under pressure, an upper reservoir disposed above and communicating with said cooling chamber, a conduit connected to the upper reservoir and the supply reservoir, and valve means controlled by cooling liquid forced into said upper reservoir for effecting gravity flow therefrom of cooling liquid to said supply reservoir.

6. The combination with a fluid compressor having a chamber through which cooling liquid may flow for cooling said compressor, of a cooling liquid supply reservoir below said chamber and communicating therewith, an upper reservoir communicating with said chamber, means for supplying fluid under pressure to said liquid supply reservoir during operation of the compressor for forcing cooling liquid from the supply reservoir through the chamber into said upper reservoir, and a restricted passage communicating with the liquid supply and upper reservoirs adapted to permit equalization of the fluid pressures therein for effecting drainage of cooling liquid from said upper reservoir to said liquid supply while the compressor is inoperative.

7. The combination with a fluid compressor having a chamber through which cooling liquid may flow for cooling said compressor, of a cooling liquid supply reservoir below said chamber and communicating therewith, an upper reservoir communicating with said chamber, means for communicating fluid pressure to the liquid supply during operation of the compressor for forcing cooling liquid therefrom through the chamber into the upper reservoir, valve means operative to establish communication for permitting flow of cooling liquid from said upper reservoir to said cooling liquid supply, and means for relieving said liquid supply from fluid pressure when the compressor is inoperative, to permit cooling liquid to drain from the upper reservoir and said chamber to the liquid supply.

8. The combination with a fluid compressor having a cooling chamber through which cooling liquid may flow for cooling the compressor, of a supply reservoir containing cooling liquid and having a communication through which liquid is supplied to said chamber, means for subjecting the liquid in said reservoir to fluid pressure for forcing liquid therefrom into said chamber, cooling means communicating with said chamber and adapted to receive and to cool liquid forced therethrough, and valve means operative by liquid supplied from the reservoir through the chamber to the cooling means to establish communication between said cooling means and said reservoir, whereby return flow of liquid to said reservoir may be effected.

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