

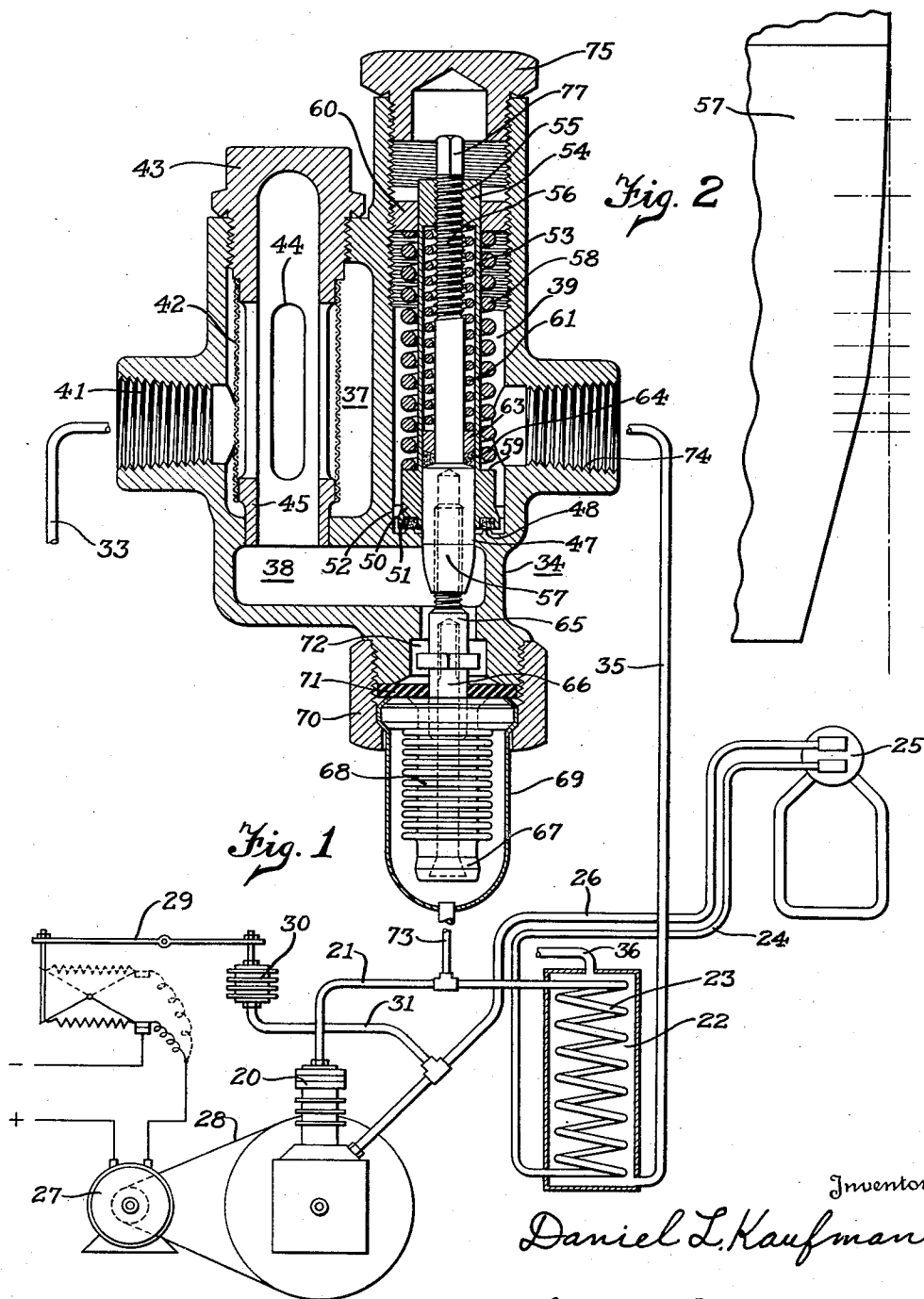
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REFRIGERATING APPARATUS

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REFRIGERATING APPARATUS

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9 Claims. (Cl. 62—3)

This invention relates in a general way to re-
frigerating apparatus and more particularly to
automatic water control valves for water cooled
condensers. The invention however, is not limit-
ed to such a use, but it is capable of wide general
application wherever it is desired to control the
flow of fluids automatically.

In refrigerating apparatus employing a water
or liquid cooled condenser, it has been found de-
sirable to control the flow of water to the con-
densing means according to the condenser pres-
sure, that is when the condenser pressure drops
below a certain predetermined amount, the flow
of water to the condenser is cut off, while, when
the condenser pressure increases above the pre-
determined amount, the water control valve is
opened to permit the water to flow through the
condenser to reduce the condenser pressure. A
simple valve of this type has been found satisfac-
tory where the capacity of the compressor and
the temperature of the water remains the same.
However, when the capacity of the compressor is
changed or a different size compressor is used
with the same control valve and the same con-
denser, such a valve has been found to be unsatis-
factory. Such a valve has also been found to be
unsatisfactory where the temperature of the
cooling water fluctuates to an appreciable ex-
tent from season to season. There have been
attempts to provide an adjustment for the valve
by changing the tension of the valve spring or
by changing the valve spring itself. This has
been found to be unsatisfactory since when the
spring is changed or the tension is changed, the
valve fails to open at the desired predetermined
pressure and fails to provide the proper amount
of water at different condenser or head pressures.

Consequently the objects of my invention in-
clude the providing of an improved automatic
control valve having means for adjusting the
flow of fluid through the valve while maintain-
ing the predetermined opening and closing points
of the valve.

Another object of the invention is to provide an
improved automatic control valve having a means
for metering the flow of water when the valve is
open.

A further object of the invention is to provide
a means for adjusting said metering means with-
out affecting the opening and the closing of the
valve.

Further objects and advantages of the present
invention will be apparent from the following de-
scription, reference being had to the accompany-

ing drawing, wherein a preferred form of the
present invention is clearly shown.

In the drawing:

Fig. 1 is a diagrammatic illustration of a refrig-
erating system including a water cooled con-
denser together with a sectional view of my im-
proved water control valve operatively connected
to the system, and

Fig. 2 is an enlarged fragmentary view of the
metering pin of my water control valve.

Referring to the drawing, there is shown for
the purpose of illustrating my invention, a refrig-
erating system of the compression type including
a compressor 20 for compressing the refrigerant
and for forwarding the compressed refrigerant
through the supply conduit 21 to a water cooled
condenser 22 containing a condenser coil 23 where
the compressed refrigerant is liquefied and for-
warded through a second supply conduit 24 to a
refrigerant evaporator 25, shown as an evaporator
of the float controlled type. The liquid refriger-
ant within the evaporator 25 vaporizes because
of the absorption of heat and is returned to the
compressor through the return conduit 26. The
compressor 20 is driven by an electric motor 27
through pulley and belt means 28. The opera-
tion of the electric motor is controlled by means
of a pressure responsive snap acting switch 29
which is actuated by the bellows 30 connected by
a conduit 31 to the return conduit 26 of the re-
frigerating system. The water for cooling the
water cooled condenser 22 is supplied to the con-
duit 33 from the external source to the water
control valve 34 which controls the flow of water
through the conduit 35 to the condenser 22 from
which the water is discharged through discharge
conduit 36.

The water control valve 34 has a valve body
provided with a straining chamber 37, an inter-
mediate chamber 38 and a valve chamber 39.
The water supplied by the water supply conduit
33 enters the filtering chamber 37 through the
threaded opening 41. Within the filtering cham-
ber 37 there is provided a fine screen 42 of a cy-
lindrical shape which surrounds a hollow filter
plug 43 which is threaded into the valve body
and extends from top to bottom of the straining
chamber 37. The straining plug has a plurality
of vertical slots 44 in its walls adjacent the strain-
ing screen 42. The slots 44 permit the water to
flow from the chamber 37 through the filtering
screen 42 into the water passage 45 within the
straining plug 43 which is closed at the upper
end and which discharges or opens into the hori-
zontal intermediate chamber 38.

At the opposite side of the horizontal intermediate chamber 38 there is provided an orifice 47 within a flange which is provided with a valve seat 48 on its upper face. Within the valve chamber 39 there is provided a generally cylindrical valve member 50 which has an annular insert 51 at its lower end adapted to rest upon and engage the valve seat 48 when in its closed position. The valve member 50 is provided with valve guides 52 in the form of lugs which guide the valve member 50 vertically by engaging the cylindrical walls of the valve chamber 39. A set screw or similar means, not shown, extends between the valve guides 52 for preventing the rotation of the valve member 50. A thin cylindrical wall 53 extends upwardly from the lower portion of the valve member 50 and has a closed upper end 54 provided with a threaded aperture 55 which receives the upper threaded shank 56 of a calibrated metering needle or pin 57 which extends within the orifice 47. Surrounding the thin cylindrical wall 53 of the upper portion of the valve member 50 is a valve spring 58 which has its lower end resting upon a shoulder 59 at the lower portion of the valve member and which has its upper end resting against a threaded adjusting plug 60 which surrounds the upper end of the valve member 50. By screwing the threaded adjusting plug 60 within the upper threaded wall of the valve chamber 39, the tension of the valve spring 58 may be varied.

Within the valve member 50 there is provided a smaller coil spring 61 which surrounds the shank 56 of the metering pin 57 and has its upper end resting against the closed end 54 of the valve member 50 and its lower end resting against the packing ring 63 which holds the packing 64 against the inner cylindrical walls of the valve member 50 to prevent the water from leaking past the metering pin into the interior of the valve member 50. The interior of the metering pin 57 is drilled and threaded to receive the upper threaded portion of a connecting member 65 located in the passage 72 which in turn is threaded to a bellows follower 66 which is fixed to the closed end 67 of a pressure responsive bellows 68. The bellows 68 is enclosed within an inverted cap member 69 which is sealed to the lower portion valve body by means of the gland nut 70 which holds the upper end of the cap member 69 tightly against the edge of a rubber diaphragm 71. The rubber diaphragm 71 prevents the water from the horizontal intermediate chamber 38 from gaining access through the passage 72 to the interior of the bellows 68.

The interior of the cap member 69 is connected by means of the fluid conduit 73 to the supply conduit 21 which supplies compressed refrigerant to the condenser coil 23 of the condenser 22. The conduit 73 permits the condenser or head pressure to gain access to the interior of the cap member so that its pressure is exerted upon the bellows 68. When the condenser pressure is sufficiently high, the force exerted upon the bellows 68 will be sufficient to overcome the tension of the valve spring 58 to raise the valve member 50 as well as the metering pin 57 to permit the flow of water from the intermediate chamber 38 into the valve chamber 39 and out through the threaded opening 74 into the water supply conduit 35. The calibrated metering pin 57 has such a shape, as shown in Fig. 2, to permit the proper amount of water to flow past the open valve for each head pressure. When the condenser or head pressure is reduced, the valve

spring 58 will overcome the force exerted on the bellows 68 and cause the valve member 50 together with its annular composition insert 51 to engage the valve seat 48 to prevent the flow of water therethrough. A threaded plug 75 provides access to the cylindrical valve chamber 39.

In order to vary the flow of water through the valve without varying the opening and closing pressures thereof, I have provided a square head 77 upon the upper end of the shank 56 of the metering pin 57 so that the metering pin 57 may be raised or lowered with respect to the valve member 50 by screwing it upwardly or downwardly. This is accomplished by reason of the fact that the threaded upper shank 56 which connects the metering pin with the valve member 50 has threads similar to the upper threaded portion of the threaded connecting member 65 which connects the metering pin 57 to the closed end of the bellows 68. When the metering pin 57 is rotated by means of its squared upper end 77, the metering pin alone is moved upwardly or downwardly by reason of its threaded connection with the connecting member 65 and the valve member 50. The metering pin 57 is given a peculiar shape as is better shown in Fig. 2, so as to provide the proper flow of water through the valve according to different head pressures. By adjusting the metering pin 57 upwardly or downwardly, the valve may be so controlled and regulated that it can be used with a compressor of a different capacity and yet maintain similar condenser pressures. By this adjustment means the metering pin 57 can be raised or lowered to take care of different variations in the temperature of the cooling water which are found in different localities. The adjustment of the metering pin can also be used to provide the proper flow of water to the condenser when the capacity of the compressor 20 is changed by driving the compressor 20 at a different speed. Inasmuch as the location of the metering pin is changed without changing the relation between the bellows 68 and the valve member 50, the opening and closing pressures of the valve member 50 are not affected by the adjustment of the metering pin. The metering pin 57 properly controls and regulates the flow of water at different condenser pressures so as to always supply the correct amount. Thus, by reason of the adjustment provided for in the metering pin, the valve is made suitable merely by adjusting the location of the metering pin for compressors of different capacities and cooling water of different temperatures without changing the opening and closing pressures of the valve member 50.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. Refrigerating apparatus including a closed refrigerating system comprising a compressor, a water cooled condenser, and an evaporator, a water control valve for controlling the flow of water to said condenser, said control valve having a valve body, said valve body containing valve means for permitting and shutting off the flow of water, said valve means including metering means for metering the flow of water through the valve means, pressure responsive means actuated by the refrigerant pressure within said condenser for controlling said valve means including said metering means to regulate the supply of cooling water

to the condenser according to its requirements, and adjusting means for said metering means to vary the flow of water for different capacities of the compressor while maintaining the condenser pressure range constant.

2. Refrigerating apparatus including a closed refrigerating system comprising a compressor, a water cooled condenser, and an evaporator, a water control valve for controlling the flow of water to said condenser, said control valve having a valve body, said valve body containing valve means for permitting and shutting off the flow of water, said valve means including metering means for metering the flow of water through the valve means, pressure responsive means actuated by the refrigerant pressure within said condenser for controlling said valve means including said metering means to regulate the supply of cooling water to the condenser according to its requirements, and adjusting means for said metering means to vary the flow of water for different capacities of the compressor while maintaining the condenser pressure range constant, and adjustment means for said pressure responsive means for varying the control of the flow of fluid through said valve means by said pressure responsive means.

3. Refrigerating apparatus including a closed refrigerating system comprising a compressor, a water cooled condenser, and an evaporator, a water control valve for controlling the flow of water to the condenser, said valve including a valve member for shutting off the flow of water, means responsive to refrigerant pressure for operating said valve member, and a metering means in series with said valve member for metering the flow of water to the condenser, said metering means including adjusting means to vary the flow of water for different compressor capacities while maintaining the condenser pressure range constant.

4. Refrigerating apparatus including a closed refrigerating system comprising a compressor, a liquid cooled condenser, and an evaporator, a liquid control valve for controlling the flow of cooling liquid to the condenser, said valve including a valve member for shutting off the flow of cooling liquid, means responsive to conditions of said closed system for operating said valve member, and means in series with said valve member for regulating the flow of cooling liquid through the valve.

5. Refrigerating apparatus including a closed refrigerating system comprising a compressor, a liquid cooled condenser, and an evaporator, a liquid control valve for controlling the flow of cooling liquid to the condenser, said valve including a valve member for shutting off the flow of cooling liquid, means responsive to conditions of said closed system for operating said valve member, means in series with said valve member for regulating the flow of cooling liquid through the valve, and means for adjusting said last mentioned means independently of said valve member.

6. Refrigerating apparatus including a closed refrigerating system comprising a compressor, a water cooled condenser, and an evaporator, a

water control valve for controlling the flow of water to said condenser, said control valve having a valve body, said valve body containing valve means for permitting and shutting off the flow of water, said valve means including regulating means for regulating the flow of water through the valve means, pressure responsive means actuated by the refrigerant pressure within said condenser for controlling said valve means including said regulating means to regulate the supply of cooling water to the condenser according to its requirements, and adjusting means for said regulating means to vary the flow of water for different capacities of the compressor while maintaining the condenser pressure range constant.

7. Refrigerating apparatus including a closed refrigerating system comprising a compressor, a water cooled condenser, and an evaporator, a water control valve for controlling the flow of water to said condenser, said control valve having a valve body, said valve body containing valve means for permitting and shutting off the flow of water, said valve means including regulating means for regulating the flow of water through the valve means, pressure responsive means actuated by the refrigerant pressure within said condenser for controlling said valve means including said regulating means to regulate the supply of cooling water to the condenser according to its requirements, and adjusting means for said regulating means to vary the flow of water for different capacities of the compressor while maintaining the condenser pressure range constant, and adjustment means for said regulating means for varying the control of the flow of fluid through said valve means by said pressure responsive means.

8. Refrigerating apparatus including a closed refrigerating system comprising a compressor, a liquid cooled condenser, and an evaporator, a liquid control means for controlling the flow of cooling liquid to the condenser, said liquid control means including a valve member for shutting off the flow of cooling liquid and a metering means independent of the valve means but in fluid series relationship with the valve member, and means responsive to conditions of said closed system for operating the valve member and the metering means for regulating the flow of cooling liquid through the valve.

9. Refrigerating apparatus including a closed refrigerating system comprising a compressor, a liquid cooled condenser, and an evaporator, a liquid control means for controlling the flow of cooling liquid to the condenser, said liquid control means including a valve member for shutting off the flow of cooling liquid, a regulating means for regulating the flow of cooling liquid through the valve, means responsive to conditions of said closed system for operating said valve member and said regulating means, and means for adjusting said regulating means independently of said valve means.

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