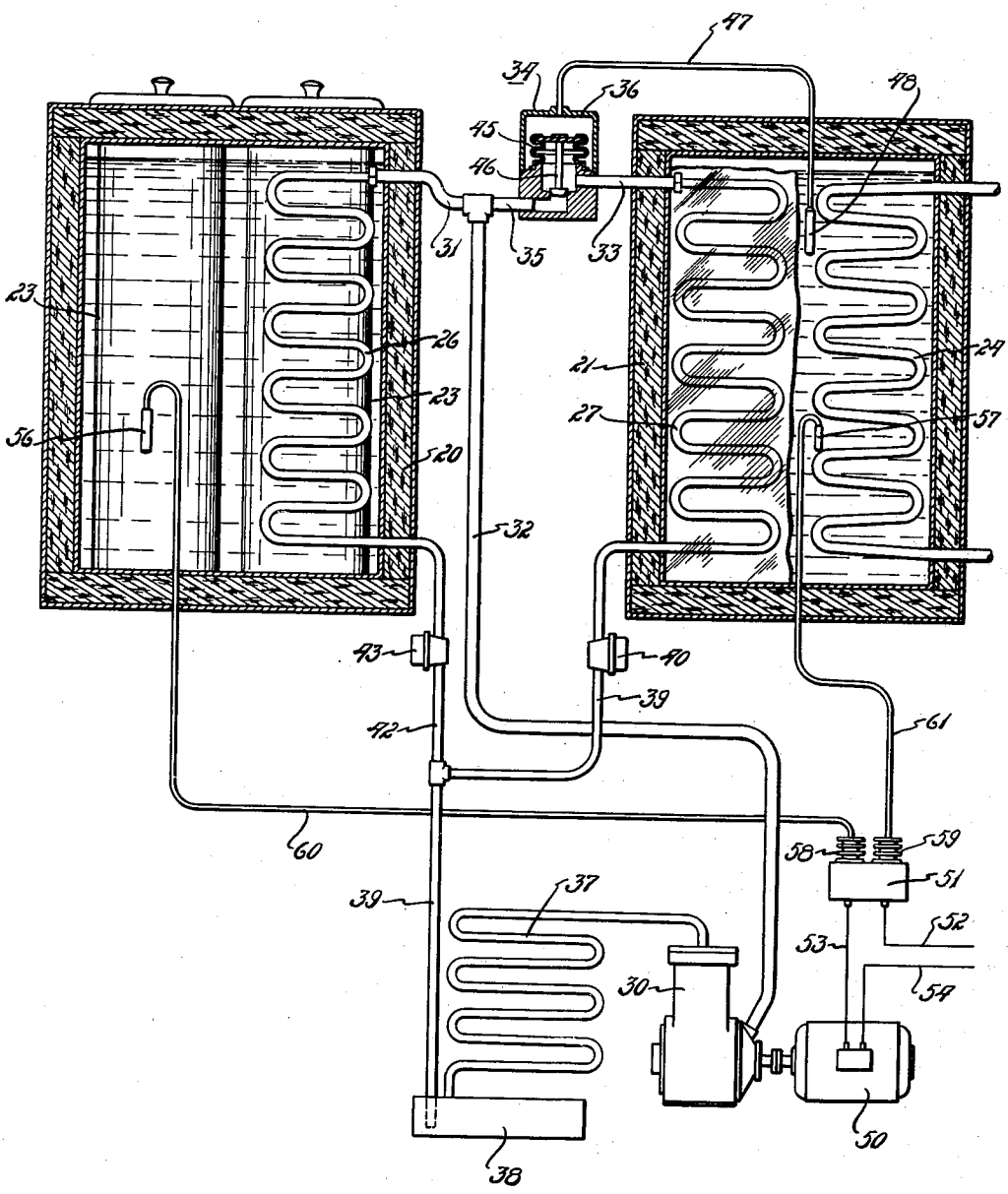
June 7, 1938. L. A. PHILIPP 2,120,185

REFRIGERATING APPARATUS

Filed Oct. 3, 1934



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Patented June 7, 1938 2,120,185

UNITED STATES PATENT OFFICE

2,120,185

REFRIGERATING APPARATUS

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Application October 3, 1934, Serial No. 746,682

3 Claims. (Cl. 62—2)

The present invention relates to refrigerating systems and particularly to refrigerating system known as the multiple system in which a plurality of evaporators are connected with a single compressor condenser unit.

One of the objects of the present invention is to provide a refrigerating system employing a plurality of evaporators and a single compressor condenser unit and employing mechanism for preventing the flow of refrigerant through one of the evaporators when the temperature of the medium cooled thereby is reduced to a desired predetermined minimum and employing mechanism which prevents the flow of refrigerant through another of the evaporators until gaseous refrigerant is no longer withdrawn from the first mentioned evaporator.

In carrying out this object it is a further object of the present invention to adjust the expansion valve of the colder or coldest of a plurality of evaporators in such a manner that it will not admit vaporizable refrigerant to its evaporator until refrigeration by the warmer evaporator or evaporators is completed.

Further objects and advantages will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred form of embodiment of the present invention is clearly shown.

The drawing is a diagrammatic view of the improved refrigerating system.

For the purpose of illustrating one form of the invention, I have provided two refrigerator cabinets, 20 and 21. The cabinet 20 is herein shown as an ice cream cabinet and the cabinet 21 as a water cooler. Brine is contained in the cabinet 20 and surrounds the ice cream can sleeves 23. The cabinet 21 contains water which is used as a heat exchange medium for conducting heat from the circulating water in water coil 24. An evaporator 26 is immersed in the brine in cabinet 20 and an evaporator 27 is immersed in the water in cabinet 21.

A compressor 30 is utilized for withdrawing gaseous refrigerant from evaporators 26 and 27. This gaseous refrigerant is conducted from evaporator 26 by a pipe 31 and a pipe 32. Gaseous refrigerant is conducted from evaporator 27 through a pipe 33, valve 34, pipe 35 and pipe 32. The refrigerant after being compressed by the compressor 30 is conducted to a condenser 37 wherein it is cooled and liquefied and then drains to a receiver 38. The liquefied refrigerant is conducted from the receiver 38 through a pipe 39 and an expansion valve 40 into the evaporator 27. The liquefied refrigerant is conducted from the receiver 38 through pipes 39 and 42 and an expansion valve 43 to the evaporator 26. The expansion valve 40 may be of any suitable type and is herein shown as the pressure type which is well known in the art. This type of valve tends to maintain a constant pressure within the evaporator, that is it opens when the pressure within the evaporator is reduced to a predetermined minimum by the compressor and increases and decreases the flow of refrigerant to the evaporator as the pressure decreases and increases respectively in the evaporator. One form of such expansion valve is shown in the patent to Slagel 1,742,323.

The flow of gaseous refrigerant from evaporator 27 is controlled by a shut off valve 34 and this valve is actuated by a pressure system. The valve includes a metallic bellows 45 inclosed in a casing 36. The bellows 45 is arranged to raise and lower the valve proper 46. When the pressure in the casing 36 is increased, the bellows 45 will collapse to close the valve 46 on its seat. The casing 36 is connected by a tube 47 with a bulb 48. The bulb 48 contains a freezing solution such as water and a quantity of oil is placed within the casing 36 and tube 47.

The operation of the compressor causes the water adjacent the evaporator 27 to freeze and the bulb 48 is disposed within the cabinet in such a position that the water therein will freeze before the water adjacent the coil 24 freezes. When the water in bulb 48 freezes and consequently expands, it will cause the oil in tube 47 and casing 36 to force the valve 46 downwardly and thereby positively shut off the flow of gaseous refrigerant from evaporator 27.

The expansion valve 43 is also the pressure operated type but it is adjusted so that it will not operate until a relatively low pressure is attained in evaporator 26. In fact no liquid refrigerant will pass therethrough as long as the valve 46 is open. After the valve 46 is closed and the compressor 30 is functioning to reduce the pressure on the low side of the refrigerating system, the pressure within the evaporator 26 will be decreased sufficiently to open the valve 43 substantially immediately and thereafter the valve 43 tends to maintain a constant low pressure within the evaporator 26.

From the foregoing it is apparent that I have provided a multiple refrigerating system in which the compressor-condenser unit need be of such size only for efficient cooling of the evaporator having the largest demand for refrigeration. The compressor condenser unit is connected first to one of the evaporators and satisfies the demand of that evaporator and, after that demand is satisfied, it is then connected to the other evaporator. For example if there is a demand for refrigeration by the water cooler, valve 46 will be opened and the compressor will withdraw the gaseous refrigerant from evaporator 27 only. At this time the gas generated is sufficient to demand the full attention of compressor 30. After the

demand is satisfied, the valve 46 closes the outlet of evaporator 27 and then the pressure within the low pressure side of the system will be reduced sufficiently to open the valve 43 and cause refrigeration within the evaporator 26. Under certain conditions there may be a simultaneous demand for refrigeration by evaporators 26 and 27. However under this condition the evaporator 27 is first satisfied and at no time is there a demand on the compressor for refrigerating both evaporators simultaneously. Although the valve 46 is closed and the refrigerating system is operating to cool evaporator 26 and then there is a demand for refrigeration by evaporator 27, the valve 46 will open and due to the fact that the pressure within evaporator 27 is higher than the pressure within evaporator 26, the opening of the valve 46 will cause an increase in pressure in evaporator 26 to close the valve 43. When the valve 43 is closed, the work done by the compressor is concentrated upon evaporator 27 and will remain in that state until the refrigeration demand is satisfied by evaporator 27 at which time the valve 46 will close and refrigeration will then be resumed on evaporator 26.

In order to maintain desired temperatures, the compressor is intermittently operated. Compressor 30 is driven by a motor 50 and the motor is started and stopped by a snap acting controller 51. The circuit to the motor includes wire 52, controller 51, wire 53, motor 50 and wire 54. This controller is operated to open and close the motor circuit individually either by the temperature prevailing in cabinet 20 or the temperature prevailing in cabinet 21 and likewise conjointly operated by the temperature prevailing in both cabinets. For this purpose there is provided a thermostat 56 in cabinet 20 and a thermostat 57 in cabinet 21. Two pressure operated bellows 58 and 59 are included in the controller. Either of these bellows is arranged to actuate the controller for starting and stopping the motor 50. A pressure tube 60 connects thermostat bulb 56 with bellows 58 and a pressure tube 61 connects thermostat bulb 57 with bellows 59. If there is a demand for refrigeration in cabinet 20, a volatile fluid in bellows 56 will expand and cause the bellows 58 to close the motor circuit. If there is no demand for refrigeration by evaporator 27, then the thermostatic system 56, 60 and 58, will break the motor circuit when the refrigeration demand in cabinet 20 is satisfied. Likewise, if there is a demand for refrigeration by cabinet 21, the thermostatic system containing volatile fluid including bulb 57, tube 61 and bellows 59 will cause the controller to complete the motor circuit and if there is no demand for refrigeration by cabinet 20, after the demand for refrigeration in cabinet 21 is satisfied, the thermostatic system 57, 61 and 59 will operate to interrupt the motor circuit. However, as previously explained, if there is a demand for refrigeration after completion or satisfying the demand of cabinet 21, the motor will remain operative until the refrigeration demand in cabinet 20 is satisfied. The thermostatic system 57, 61 and 59 is adjusted so that it will not actuate the controller to complete the motor circuit until after the valve 46 is open and it will interrupt the motor circuit, when there is no demand for refrigeration by cabinet 20, just prior to the closing of valve 46.

While the form of embodiment of the present invention as herein described 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:

I claim as my invention:

1. A refrigerating system comprising in combination, a plurality of evaporators each having an inlet for liquid refrigerant and an outlet for gaseous refrigerant, means for withdrawing gaseous refrigerant from the evaporators and for condensing the same and for conducting the condensed refrigerant to the evaporators, means at the outlet end of one of said evaporators for interrupting the flow of refrigerant through said evaporator after the medium cooled thereby is reduced to a predetermined temperature, the operation of the interrupting means causing said first means to direct its withdrawing action primarily to the other evaporator to decrease the refrigerant pressure therein to below the pressure in the first evaporator substantially immediately after the second means is rendered effective, and means responsive to said reduced pressure in said other evaporator for starting the flow of refrigerant through the said other evaporator.

2. A refrigerating system comprising in combination, a plurality of evaporators each having an inlet for liquid refrigerant and an outlet for gaseous refrigerant, means for withdrawing gaseous refrigerant from the evaporators and for condensing the same and for conducting the condensed refrigerant to the evaporators, means at the outlet end of one of said evaporators for interrupting the flow of refrigerant through said evaporator after the medium cooled thereby is reduced to a predetermined temperature, the operation of the interrupting means causing said first means to direct its withdrawing action primarily to the other evaporator to decrease the refrigerant pressure therein to below the pressure in the first evaporator substantially immediately after the second means is rendered effective, and an expansion valve responsive to said pressure within the said other evaporator operable to admit refrigerant from the first means only in response to said reduced pressure.

3. A refrigerating system comprising in combination, a plurality of evaporators each having an inlet for liquid refrigerant and an outlet for gaseous refrigerant, means for withdrawing gaseous refrigerant from the evaporators and for condensing the same and for conducting the condensed refrigerant to the evaporators, means at the outlet end of one of said evaporators for interrupting the flow of refrigerant through said evaporator after the medium cooled thereby is reduced to a predetermined temperature, the operation of the interrupting means causing said first means to direct its withdrawing action primarily to the other evaporator to decrease the refrigerant pressure therein to below the pressure in the first evaporator substantially immediately after the second means is rendered effective, means responsive to said reduced pressure in said other evaporator for starting the flow of refrigerant through the said other evaporator and means affected by the temperature of either of said evaporators for controlling the first mentioned means.

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