July 14, 1936. J. F. LAMB 2,047,827

CONTROL MECHANISM

Filed March 23, 1934 2 Sheets-Sheet 1

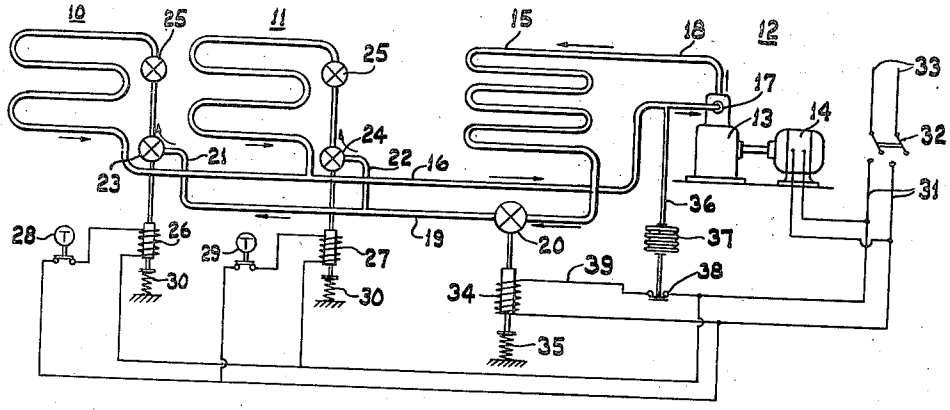


FIG. 1.

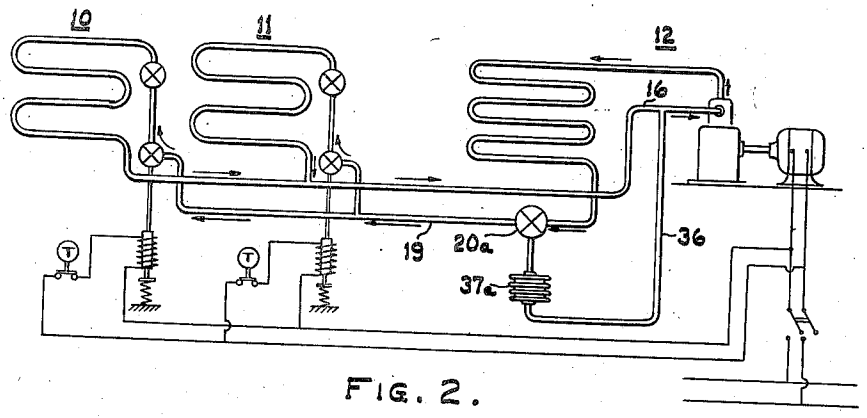
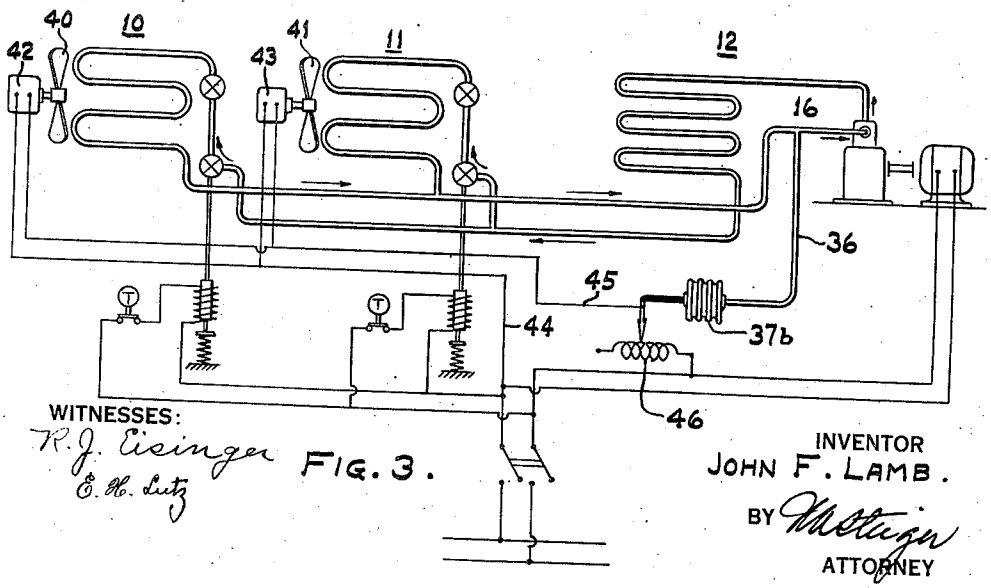


FIG. 2.



WITNESSES:
R. J. Eisinger
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FIG. 3.

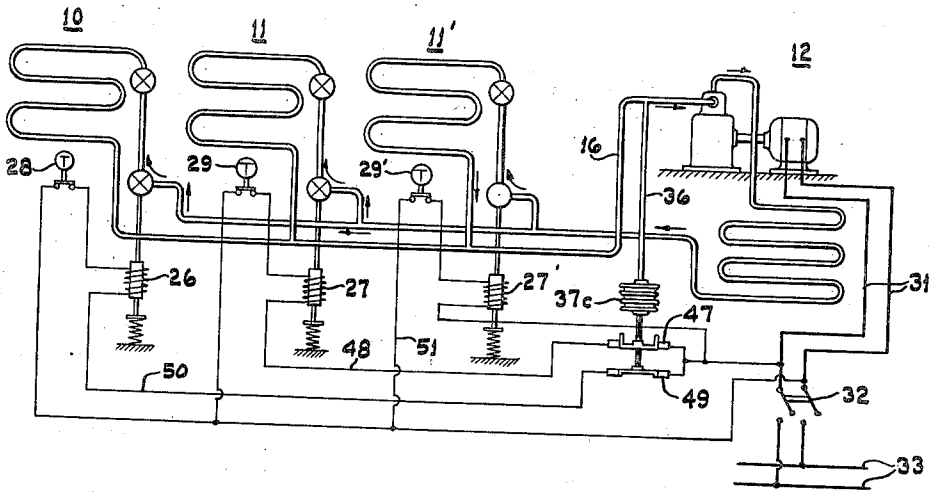
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CONTROL MECHANISM

Filed March 23, 1934 2 Sheets-Sheet 2

FIG. 4.



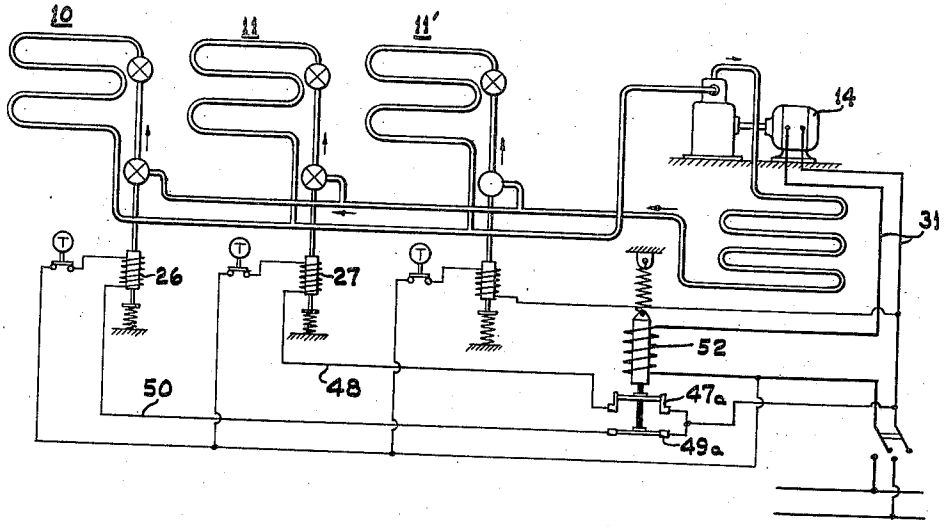


FIG. 5.

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Patented July 14, 1936 2,047,827

UNITED STATES PATENT OFFICE

2,047,827

CONTROL MECHANISM

John F. Lamb, Pittsburgh, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application March 23, 1934, Serial No. 716,982

18 Claims. (Cl. 62—4)

My invention relates to refrigerating apparatus, more particularly to refrigerating apparatus embodying a plurality of evaporators connected to a common motor-compressor unit and whose combined rated capacity is greater than the rated capacity of the motor-compressor unit.

Such apparatus may be employed, for example, in providing comfort cooling for a house, where unit or room coolers are provided in several rooms of a house. Since it is not necessary that all of the room coolers operate at one time, and in order to minimize cost of installation, a common refrigerating unit, that is, compressor, motor and condenser, may be used which is of less rated capacity than the combined rated capacity of the room coolers. For example, each room cooler and the refrigerating unit may have a rated capacity of 12,000 B. t. u.'s an hour; that is, each room cooler may provide 12,000 B. t. u.'s of refrigeration an hour when operating against severe conditions, as on a hot and humid day, and the refrigerating unit may provide the liquid refrigerant necessary for such operation of one room cooler.

When the refrigerating load is less than full load, as on days which are not as hot and humid as that for which the room coolers are designed, less refrigeration is required of each room cooler, and satisfactory operation may be obtained by operating several room coolers in connection with the one refrigerating unit. It is desirable, therefore, to provide an arrangement which permits such operation. However, if more than one room cooler is operated with the one refrigerating unit when the refrigerating load is near full load, as on a hot and humid day, a higher suction pressure will be obtained thereby overloading the motor-compressor unit, particularly the motor. While the pressure difference against which the motor compressor unit operates is less, the pounds of refrigerant per unit volume is much greater, and the resultant load is greatly increased. It is desirable, in such case, to limit the refrigerating action of the room coolers or evaporators as a whole, in order to avoid overloading of the compressor.

An object of my invention is to provide mechanism for preventing overloading of the motor-compressor unit.

A further object is to provide control mechanism for regulating the refrigerating action of the evaporators to prevent overloading of the motor compressor unit.

A particular object is to provide control mechanism which permits a number of evaporators of greater rated capacity than the motor compressor unit to operate at one time if the latter is not overloaded, but to restrict the refrigerating action of the evaporators when the motor compressor unit tends to become overloaded.

A further object is to provide a control mechanism which limits the number of evaporators in operation to an extent such as to obtain sufficient refrigerating action of the evaporators remaining in operation.

Another object is to provide a control mechanism which limits the number of evaporators in operation to an extent such that the evaporator remaining in operation may operate at a sufficiently low temperature.

In accordance with my invention, I provide a control mechanism for restricting or regulating the total refrigeration provided by the evaporator, as by limiting the supply of refrigerant thereto, in response to a load condition of the motor compressor unit, such as the current supplied to the motor or the suction pressure of the compressor. The total supply of liquid refrigerant to the evaporators as a group may be regulated, in which case each evaporator receives a restricted or regulated quantity of refrigerant, or the control mechanism may cut off the supply of refrigerant to individual evaporators successively in response to increase in the load on the motor compressor unit.

The above and other objects are effected by my invention, as will be apparent from the following description and claims, taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a diagrammatic view of one embodiment of my invention; and,

Figs. 2 to 5 are similar views of other embodiments.

Referring to Fig. 1, I show a plurality of evaporators 10 and 11, shown as coils, connected to a common refrigerating unit 12. The evaporators may be of any suitable construction now or hereafter known in the art, and of either the "dry expansion" or flooded type, or any other type. They may be used wherever cooling is required, for example, they may be the evaporator elements of room coolers or unit air conditioners such as disclosed and claimed in the application of Milton Kalischer, Serial No. 698,205, filed November 15, 1933. They are shown diagrammatically only since the present invention resides in the combination defined in the claims rather than in any specific form of evaporator.

The refrigerating unit 12 includes a compressor 13 driven by a motor 14 (constituting therewith a motor compressor unit), a condenser 15 and such other apparatus as is usually incorporated therewith, such as cooling fluid circulating means (not shown) for the condenser and a liquid receiver (not shown). The outlet ends of the evaporators are connected by a conduit 16 to the inlet 17 of the compressor 13, and the outlet of the compressor is connected through a conduit 18 with the condenser 15. The discharge end of the con-

denser is connected to a liquid refrigerant supply conduit 19, having a valve 20 therein, which conduit is in turn connected to the evaporators 10 and 11 through branch conduits 21 and 22 having valves 23 and 24, therein, respectively. Each of the evaporators is provided with an expansion valve 25 of any suitable construction. By expansion valve, I mean, in this case, any suitable flow control device between the high pressure and the low pressure side of the system, such as a thermostatic expansion valve, float valve or fixed flow resistance passage, or any other device serving the same general purpose.

The valves 23 and 24 are used to control the operation of the evaporators 10 and 11, respectively, preferably automatically in accordance with the respective refrigerating demands. They may be operated, for example, by solenoids 26 and 27 controlled by thermostats 28 and 29. The thermostats 28 and 29 are responsive to the refrigeration demands of the respective evaporators; for example, where the evaporators are embodied in room coolers, the thermostats may be responsive to the temperature of the air in the respective enclosures which are cooled by the room coolers. Each solenoid is arranged to be energized and to open its associated valve when the thermostat closes its contacts in response to increase in temperature, and a spring 30 biases the valve to closed position when the solenoid is not energized. The motor 14 is supplied with electrical energy through conductors 31 which are connected through a switch 32 to line conductors 33. The solenoids 26 and 27 may also derive their electrical energy through the conductors 31.

The valve 20, constituting the novel part of the apparatus so far described, is adapted to be actuated in opening direction by a solenoid 34 and to be closed by a spring 35 when the solenoid is not energized. The energization of the solenoid is controlled by the suction pressure of the refrigerating apparatus, which pressure is communicated from the conduit 16 through a tube 36 to a bellows 37. The latter controls contacts 38 in a circuit 39 in which the solenoid 34 is connected. The arrangement is such that, when the pressure is below a predetermined maximum value, the contacts 38 are closed and the solenoid 34 is energized to open the valve 20 and, when the pressure is above said predetermined maximum value, the contacts 38 are open to deenergize the solenoid 34 and cause the valve 20 to be closed.

The operation of the above described apparatus is as follows: The refrigerating unit operates in the conventional manner of such apparatus, refrigerant being withdrawn from one or both of the evaporators through the conduit 16 into the compressor wherein it is compressed. The compressed refrigerant is conveyed through the conduit 18 to the condenser 15 wherein it is condensed and delivered to the conduit 19 to be resupplied to one or both of the evaporators. The thermostats 28 and 29 control the valves 23 and 24, respectively, in accordance with the refrigeration demands, all as is well understood in the art. Assuming the refrigeration load not to be too great, refrigerant will be supplied to either one or both of the evaporators in accordance with their respective requirements, the refrigerating unit operating to supply refrigerant in accordance with such demands. In such case, the suction pressure will be maintained by the compressor at a relatively low value, so that the contacts 38 will be closed and the solenoid 34 energized to open the valve 20 as long as the refrigerating unit is operating.

When the refrigeration load is relatively great, however, as on a relatively hot and humid day, the increased amount of heat supplied to the refrigerant in the evaporators when both are operating will tend to increase the suction pressure to such an extent as to overload the motor compressor unit. In accordance with my invention, I avoid such a high suction pressure by controlling the supply of liquid refrigerant to the evaporators. This may be done in any one of a number of ways; in the embodiment in Fig. 1 it is accomplished by intermittently shutting off the common supply of refrigerant to the several evaporators.

As the suction pressure exceeds a predetermined maximum value, the bellows 37 operates in the manner described above to shut off the supply of liquid refrigerant to the evaporator by closing the valve 20. The motor-compressor unit continues to operate, serving first to evaporate the liquid refrigerant within the evaporators at the moment that the valve 20 is closed and then to lower the suction pressure. When the suction pressure has been reduced to said predetermined maximum value, or to a slightly lower value, the valve 20 is reopened to admit liquid refrigerant to the evaporators. As soon as the pressure again builds up to said predetermined maximum value, the valve 20 is again closed and the cycle of operation just described is repeated.

While the load on the motor-compressor unit may be increased from the moment that the valve 20 is closed until all of the liquid refrigerant is vaporized, this increased load is only temporary and may be compensated for by adjusting the bellows 37 to open the contacts 38 at a sufficiently low suction pressure.

It will thus be seen that the average rate of supply of liquid refrigerant to the evaporators over a period of time is limited and avoids such an overloading of the motor-compressor unit as would cause excessive heating of the motor.

The portion of the time that the valve 20 is open varies with the refrigerating demand, becoming greater as the refrigerating demand decreases until, when the combined refrigerating demand on the several evaporators is within the capacity of the refrigerating unit, the valve 20 will be open continuously.

Whenever the total number of evaporators in operation have a capacity not greater than the capacity of the refrigerating unit, the valve 20 will be open continuously, even though the evaporators in operation are carrying any load up to their capacity, since the refrigerating unit will be able to provide a sufficiently low suction pressure. In the present case, each evaporator has a capacity equal to that of the refrigerating unit, so that any one evaporator may be operated with the valve 20 continuously open.

It will be apparent that the control mechanism may be arranged to close the valves 23 and 24 and the corresponding valves of all additional evaporators, instead of the valve 20.

In Fig. 2, I show a second embodiment of my invention in which the bellows 37*a* is directly connected to the valve 20*a* in the liquid refrigerant supply conduit 19. In this case, the valve 20*a* is moved gradually or incrementally in response to variation in suction pressure throughout a slight range of pressure. The refrigerating apparatus to which this control is applied is identical with that shown in Fig. 1.

In the operation of this embodiment, as the combined refrigeration load on the evaporators 10 and 11 increases and effects a higher suction pressure, such as tends to overload the motor compressoor unit, the bellows 37a begins to move the valve 20a in closing direction to restrict the supply of liquid refrigerant to the evaporators and limit further increase in the suction pressure. Each evaporator, therefore, receives refrigerant continuously but at a restricted rate of supply. A constant value of the suction pressure is obtained in this arrangement, while the degree of superheat will be relatively high. When only one evaporator is in operation, the suction pressure will be sufficiently low to maintain the valve 20a in full open position, provided said one evaporator is not overloaded.

In Fig. 3, I show a third embodiment in which the refrigerating action is controlled by varying the rate of circulation of air over the evaporators 10 and 11 rather than by controlling the supply of refrigerant. Fans 40 and 41, driven by electric motors 42 and 43, circulate the air to be cooled in contact with the evaporators 10 and 11 respectively. The motors 42 and 43 are connected in parallel to conductors 44 and 45, in the latter of which there is interposed a variable resistance 46. The latter is controlled by a bellows 37b in response to the suction pressure in the conduit 16, communicated through the tube 36, similarly to the other embodiments.

In the operation of the embodiment shown in Fig. 3, as the refrigeration load on the evaporators tends to increase and to increase the suction pressure, the bellows 37b operates the variable resistance 46 to decrease the current supplied to the motors 42 and 43, thereby decreasing the speed of the fans 40 and 41. Since a smaller quantity of air is circulated over the evaporators, the refrigeration load on the evaporators is reduced. Further increase in suction pressure is thereby prevented. With this arrangement, as the total refrigerating demand on the evaporators in operation becomes less, a higher speed of the several fans is provided. When the total demand is within the capacity of the refrigerating unit, the fans will operate at full speed.

If only one evaporator is in operation and carrying any refrigerating load within the capacity of the refrigerating unit, the fans will operate at full speed.

In Fig. 4, I show evaporators 10, 11 and 11', similar to the evaporators 10 and 11 of the other embodiments, and connected to the common refrigerating unit 12. The several evaporators are controlled by thermostats 28, 29 and 29' as in the other embodiments. In this embodiment, the control mechanism is arranged to successively shut off supply of refrigerant to the evaporators as the suction pressure increases.

The bellows 37c is arranged to control contacts 47 in a circuit 48 extending through the thermostat 29 and the solenoid 27 of the evaporator 11, and similarly to control contacts 49 in a circuit 50 extending through the thermostat 28 and the solenoid 26 of the evaporator 10. The thermostat 29' and the solenoid 27' of the evaporator 11' are connected in a circuit 51 which is directly connected to the conductors 31 and has no contacts controlled by the bellows 37c.

The operation of this embodiment is as follows:

If the refrigerating demand on all of the evaporators is within the capacity of the refrigerating unit 12, a sufficiently low suction pressure is obtained and the bellows 37c closes the contacts 47 and 49. All of the thermostats are operable, therefore, to effect operation of their associated evaporators in response to the refrigerating demand. As the refrigerating demand tends to exceed the capacity of the refrigerating unit 12, the suction pressure increases and the bellows 37c operates first, in response to a first predetermined maximum pressure, to open the contacts 49, thereby opening the circuit 50 to deenergize the solenoid 26 and shut off the supply of refrigerant to the evaporator 10. The refrigerating apparatus continues in operation supplying refrigerant only to the evaporators 11 and 11'. If the refrigerating demand becomes still greater, the suction pressure increases still further and, in response to a second predetermined maximum pressure slightly higher than the first, the bellows 37c opens the contacts 47 to shut off the supply of refrigerant to the evaporator 11. The apparatus then continues in operation supplying refrigerant only to the evaporator 11', which is first in the order of preference and always receives refrigerant whenever its thermostat calls for cooling. It will thus be apparent that by this control mechanism, liquid refrigerant is supplied to as many evaporators as the refrigerating unit 12 has capacity to supply under the existing refrigerating demand, the refrigerating demand on the remaining evaporators being not satisfied.

When the thermostat of any evaporator in operation is satisfied and shuts off the supply of refrigerant to its evaporator, the control mechanism automatically operates to supply the liquid refrigerant thus made available to the next evaporator in order of preference. For example, assume all thermostats to be calling for cooling, the evaporator 11' to be in operation, and the thermostat 29' to open its contacts to shut off the supply of refrigerant to the evaporator 11'. Due to the termination of the operation of the evaporator 11', the suction pressure decreases and the bellows 37c closes the contacts 47, thereby effecting admission of refrigerant to the evaporator 11, which is next in order of preference. The refrigerating apparatus then continues in operation supplying refrigerant to the evaporator 11. Likewise if the thermostats of both evaporators 11 and 12 are satisfied, the suction pressure decreases until the bellows 37c closes contacts 49 to admit liquid refrigerant to the evaporator 10.

Similarly, assuming both evaporators 11 and 11' to be in operation and one of them to discontinue operation, the suction pressure begins to decrease until the contacts 49 are closed to admit the available liquid refrigerant to the evaporator 10. It will be apparent that any number of evaporators may be provided in such an arrangement, and the control mechanism arranged to shut off supply of refrigerant to the several evaporators successively.

With this arrangement, the refrigerating load may be such that the quantity of liquid refrigerant available is more than sufficient to supply, for example, one evaporator and insufficient to supply two evaporators. In this case, the supply of refrigerant to the second evaporator will be intermittent. For example, assuming thermostats 29 and 29' both to be calling for cooling, and both evaporators receiving refrigerant at the moment. The suction pressure slowly rises due to the fact that more refrigerant is being evaporated in the two evaporators 11 and 11' than can be withdrawn by the refrigerating unit at a sufficiently rapid rate to maintain the desired suc-

tion pressure. As the suction pressure exceeds said second predetermined maximum value, the contacts 47 are opened by the bellows 37c and the admission of liquid refrigerant to the evaporator 11 is shut off. The apparatus then operates supplying refrigerant only to the evaporator 11. As the amount of refrigerant evaporated in the evaporator 11' is slightly below the capacity of the refrigerating unit, the suction pressure slowly decreases until the contacts 47 are again closed to admit refrigerant to the evaporator 11. Under such conditions, therefore, the refrigerating demand of the preferred evaporator or evaporators is fully satisfied, while the refrigerating demand of the evaporator next in order of preference is only partially satisfied.

In Fig. 5 I show a fifth embodiment of my invention in which the supply of refrigerant to the several evaporators 10, 11 and 11' is controlled by contacts 47a and 49a in a manner similar to the embodiments of Fig. 4 but in response to the current used by the motor 14 instead of the suction pressure. The contacts 47a and 49a are actuated by a solenoid 52 connected in one of the conductors 31 extending to the motor 14. As the load on the motor compressor tends to exceed its capacity, the solenoid 52 operates first to open the contacts 49a in the circuit 50 in response to increase in the current flowing through the motor 14 above a first predetermined maximum value, and then to open the contacts 47a in the circuit 48 in response to a second predetermined maximum value of the current of the motor 14 which is slightly greater than the first predetermined maximum value. The value of the current will vary in a manner very similar to the variation in suction pressure inasmuch as increase in suction pressure supplies a greater quantity of refrigerant to the compressor and thus increases the load on the motor compressor unit. The value of the current supplied to the motor may thus be used as a measure of the load on the motor compressor unit instead of the suction pressure. The construction and operation of this embodiment is in other respects similar to that of the embodiment shown in Fig. 4, the control being effected in response to value of current rather than pressure, so that further description is not necessary.

It is to be understood that the thermostats for controlling individual evaporators are shown and described only by way of example, and that either more or less control mechanism may be used in connection with my novel control mechanism which regulates or controls the supply of liquid refrigerant in accordance with a load condition of a refrigerating unit. For example, my novel control mechanism may well be combined with the control mechanism described and claimed in the application of Lewis R. Smith, Serial No. 700,319, filed November 29, 1933, and assigned to the assignee of the present invention. On the other hand, manual control of the individual evaporators may be substituted for thermostatic control, or individual control of the evaporators other than in response to load condition may be omitted entirely. The present invention might also be used in connection with a bank of coils arranged in parallel for cooling a single stream of air, the coils being arranged either in parallel or in series with respect to the flow of air.

From the above description it will be seen that I have provided control mechanism whereby any combination of evaporators within the capacity of the refrigerating unit may be supplied with liquid refrigerant and whereby the total refrigerating action of the evaporators is controlled so as to limit the load on the motor compressor unit to the capacity thereof, thereby preventing overloading.

An important advantage of the present invention, in connection with air cooling for comfort, is that the evaporators operate at sufficiently low temperature to effect dehumidification of air. The temperature of the refrigerant within the evaporators is a function of its pressure, and since the latter is controlled to a low value, the temperature is also maintained at a desirably low value.

While I have shown my invention in five forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In refrigerating apparatus, the combination of a plurality of evaporator elements, a motor compressor unit common to said evaporator elements for withdrawing vaporous refrigerant therefrom and for compressing the same, means for condensing the compressed refrigerant, means for supplying the condensed refrigerant to said evaporator elements, and means for restricting the total evaporation of liquid refrigerant in said evaporators in response to a load condition of said motor compressor unit, the suction pressure being maintained within a predetermined maximum limit in consequence of said restriction of the evaporation of refrigerant, whereby the load on the motor compressor unit is maintained within a predetermined maximum value.

2. In refrigerating apparatus, the combination of a plurality of evaporator elements, a motor compressor unit common to said evaporator elements for withdrawing vaporous refrigerant therefrom and for compressing the same, means for condensing the compressed refrigerant, means for supplying the condensed refrigerant to said evaporator elements, and means for restricting the total evaporation of liquid refrigerant in said evaporators in response to the suction pressure of said motor compressor unit, the suction pressure being maintained within a predetermined maximum limit in consequence of said restriction of the evaporation of refrigerant, whereby the load on the motor compressor unit is maintained within a predetermined maximum value.

3. In refrigerating apparatus, the combination of a plurality of evaporator elements, a motor-compressor unit for withdrawing vaporous refrigerant from said evaporator elements and compressing the same, a condenser for condensing the compressed refrigerant and providing a supply of liquid refrigerant for said evaporator elements, and means responsive to a predetermined maximum load condition of the motor-compressor unit for restricting the supply of liquid refrigerant to said evaporators.

4. In refrigerating apparatus, the combination of a plurality of evaporator elements, a motor-compressor unit for withdrawing vaporous refrigerant from said evaporator elements and compressing the same, a condenser for condensing said compressed refrigerant and providing a common supply of liquid refrigerant for said

evaporator elements, and means responsive to a load condition of said motor-compressor unit for controlling said common supply to prevent overloading of said motor-compressor unit.

5. In refrigerating apparatus, the combination of a plurality of evaporator elements, a motor-compressor unit for withdrawing vaporous refrigerant from said evaporator elements and compressing the same, a condenser for condensing said compressed refrigerant and providing a supply of liquid refrigerant for said evaporator elements, and means responsive to a load condition of said motor-compressor unit for shutting off supply of liquid refrigerant to one of said evaporator elements to prevent overloading of said motor-compressor unit.

6. In refrigerating apparatus, the combination of a plurality of evaporator elements, a motor-compressor unit for withdrawing vaporous refrigerant from said evaporator elements and compressing the same, a condenser for condensing said compressed refrigerant and providing a supply of liquid refrigerant for said evaporator elements, and means for shutting off supply of liquid refrigerant to a number of said evaporator elements successively in response to successive increases in load of said motor compressor unit.

7. In refrigerating apparatus, the combination of a plurality of evaporator elements, a common refrigerating unit for withdrawing vaporous refrigerant from said evaporator elements and for supplying liquid refrigerant thereto, and means responsive to the suction pressure of said refrigerating unit for controlling the supply of refrigerant to said evaporators in such manner as to limit the value of said suction pressure.

8. In refrigerating apparatus, the combination of a plurality of evaporator elements, a compressor connected to said evaporator elements, a condenser for condensing the compressed refrigerant, means for supplying condensed refrigerant to said evaporator elements, and means responsive to the suction pressure of said compressor for controlling the last-mentioned means to limit said suction pressure.

9. In refrigerating apparatus, the combination of a plurality of evaporator elements, a compressor for withdrawing vaporous refrigerant from said evaporator elements and compressing the same, a motor for driving said compressor, a condenser for condensing said compressed refrigerant and providing a common supply of liquid refrigerant for said evaporator elements, and means responsive to suction pressure of said compressor for controlling said common supply of liquid refrigerant during the operation of the compressor to prevent overloading of said motor.

10. In refrigerating apparatus, the combination of a plurality of evaporator elements, a compressor for withdrawing vaporous refrigerant from said evaporator elements and compressing the same, a condenser for condensing the compressed refrigerant and providing a supply of liquid refrigerant for said evaporator elements, and means responsive to the suction pressure of said compressor for incrementally controlling the supply of liquid refrigerant to the several evaporator elements to limit said suction pressure to a predetermined maximum value.

11. In refrigerating apparatus, the combination of a plurality of evaporator elements, a compressor for withdrawing vaporous refrigerant from said evaporator elements and compressing the same, a condenser for condensing said compressed refrigerant and providing a supply of liquid refrigerant for said evaporator elements, and means responsive to a high suction pressure of said compressor for shutting off the supply of liquid refrigerant to an evaporator element.

12. In refrigerating apparatus, the combination of a plurality of evaporator elements, a compressor for withdrawing vaporous refrigerant from said evaporator elements and compressing the same, a condenser for condensing said compressed refrigerant and providing a supply of liquid refrigerant for said evaporator elements, and means for shutting off the supply of liquid refrigerant to a number of said evaporator elements successively in response to successive increases in the suction pressure of said compressor.

13. In refrigerating apparatus, the combination of a plurality of evaporator elements, a common refrigerating unit for withdrawing vaporized refrigerant from said evaporator elements and for supplying liquid refrigerant thereto, and means for limiting the maximum value of the suction pressure of said refrigerating unit by controlling the supply of liquid refrigerant to said evaporators in response to said suction pressure.

14. The method of operating refrigerating apparatus including a plurality of evaporator elements and a common refrigerating unit for withdrawing vaporized refrigerant from said evaporator elements and for supplying liquid refrigerant thereto, which comprises reducing the supply of liquid refrigerant to the evaporator elements in response to increase in suction pressure of the refrigerating unit.

15. The method of operating refrigerating apparatus including a plurality of evaporator elements and a common refrigerating unit for withdrawing vaporized refrigerant from said evaporator elements and for supplying liquid refrigerant thereto, which comprises reducing the supply of liquid refrigerant to the evaporator elements in response to increase in load on the refrigerating unit.

16. The method of operating refrigerating apparatus including a plurality of evaporator elements and a common refrigerating unit for withdrawing vaporized refrigerant from said evaporator elements and for supplying liquid refrigerant thereto, which comprises shutting off the supply of liquid refrigerant to one evaporator element in response to increase in suction pressure of the refrigerating unit.

17. In refrigerating apparatus, the combination of a plurality of evaporator elements, a compressor connected to said evaporator elements, a condenser for condensing the compressed refrigerant, means for supplying the condensed refrigerant to the evaporator elements, and means for reducing the supply of condensed refrigerant to the evaporator elements in response to increase in suction pressure of the compressor.

18. In refrigerating apparatus, the combination of a plurality of evaporator elements, a compressor connected to said evaporator elements, a condenser for condensing the compressed refrigerant, means for supplying the condensed refrigerant to the evaporator elements, and means for reducing the supply of condensed refrigerant to the evaporator element in response to increase in load on the compressor.

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