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CONDENSING SYSTEM

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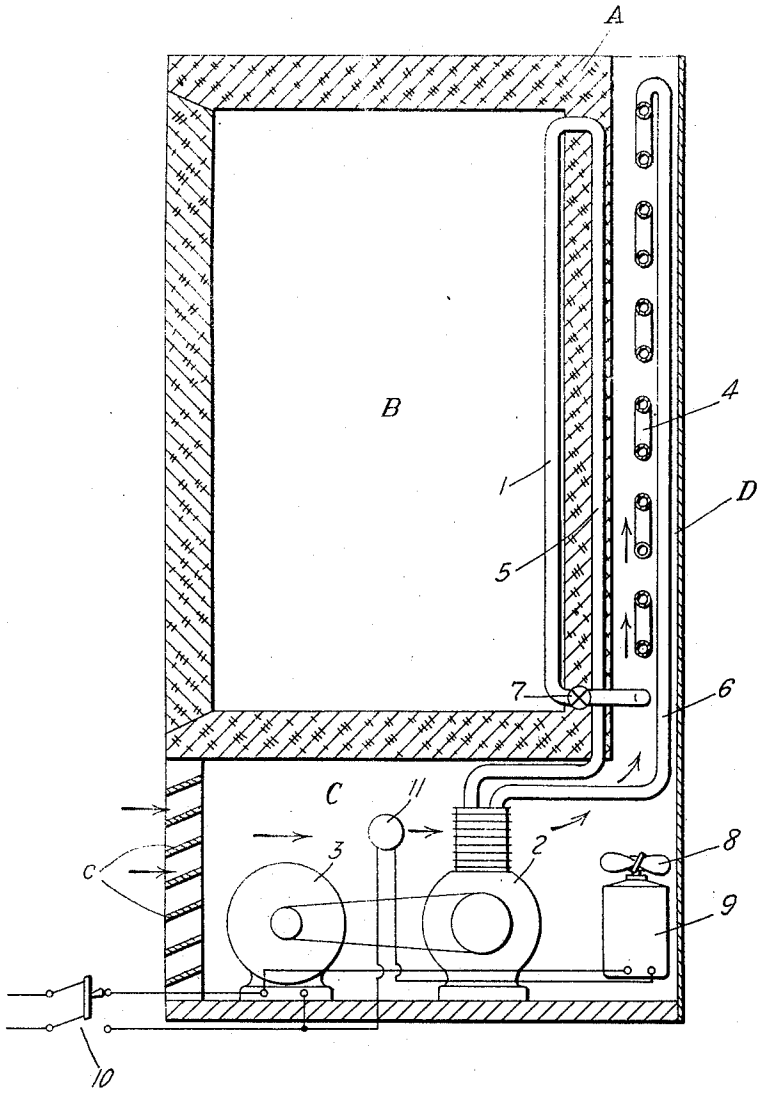

INVENTOR.
Ransom W. Davenport

BY

Ira L. Nickerson
ATTORNEY.

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RANSOM W. DAVENPORT, OF DETROIT, MICHIGAN, ASSIGNOR TO CHICAGO PNEUMATIC TOOL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY

CONDENSING SYSTEM

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The present invention relates to cooling processes and apparatus with particular reference to the ejection or removal of heat from condensing systems. It has special application to refrigerating processes and apparatus, particularly of the type intended for household use.

It is an old and well-known practice to cool condensers, compressors and the like by forcing a draft of air over them by a fan cooperating with the condenser. It is also well-known to arrange the members so that a natural draft is produced over them when heated. The natural draft method is economical and satisfactory in cool weather but is not well adapted to hot weather. The forced draft method is satisfactory in hot weather but wasteful in cool weather.

One object of the invention is to provide improved ways and means for cooling condensers and heat ejecting members. Another object is to effect economy in operation while securing increased efficiency. Other objects will be apparent from the detailed description which follows.

The invention consists broadly in providing means for forced cooling cooperating with the weather or the temperature of the surroundings rather than controlled directly by the refrigerating plant or the compressor. By preference a separate fan motor is provided for the forced draft cooling. Instead of operating the fan motor whenever the compressor operates, it is arranged to be operated only when and if the normally satisfactory natural draft is unable to produce proper results.

In order to illustrate the invention one concrete embodiment thereof is shown in the accompanying drawings, the single view of which is a vertical sectional view through a self contained refrigerating system of the household type.

In carrying out the principles of the invention the heat ejecting members of the refrigerating plant are arranged so that when heated a natural draft is caused to flow over them. To this end the illustrated embodiment shows a self-contained refrigerator comprising a cabinet A having a refrigerating chamber B, containing an evaporator 1 of any suitable or desired type, and an apparatus compartment C containing compressor 2 and an electric motor 3 for driving the compressor. By preference the apparatus compartment C is beneath chamber B and a flue D at one side of the cabinet, preferably the back, is provided for moving a draft of cooling air through compartment C, the air being admitted through suitable openings, such as provided by louvers *c*. To assist in producing an efficient natural draft the condenser 4 of the refrigerating system is by preference disposed in the flue D rather than in compartment C. In operation compressor 2 withdraws vapor from the top of evaporator 1 through a pipe 5 and discharges the same at higher temperature and pressure through a pipe 6 to the top of condenser 4 which may be in any suitable form such as a coil of pipe, the condensate being returned through a suitable expansion device 7 into evaporator 1 thereby forming a closed cycle system which may operate either on the conventional reversed Clausius-Rankine cycle or on the vapor-gas principle disclosed in my Patent No. 1,619,196.

The invention contemplates the use of suitable means for augmenting the draft passing over compressor 2 and condenser 4 when the temperature of the environing atmosphere is such that the natural draft arrangement does not permit the refrigerating system to operate at its proper efficiency. One arrangement is to provide a fan 8 driven by a motor 9. By preference this forced draft apparatus is disposed in compartment C so as to direct a blast of air up flue D and upon condenser 4. As indicated fan motor 9 is connected in parallel with compressor motor 3 and receives power from the same source under control of main switch 10. Fan motor 9, however, has separate control means responsive to the temperature of the environing atmosphere, such as a thermostat 11, of any suitable or desired type, connected with the circuit to motor 9. While thermostat 11 may be upon the exterior of the cabinet if desired, it is by preference disposed within compartment C and in the current of air induced by

the natural draft arrangement of the cabinet. Thermostat 11 may be adjusted to close the circuit to fan motor 9 at any predetermined temperature such as 90° F. With this adjustment the fan motor 9 will not operate while the room temperature is below 90°, all cooling then being effected by a natural draft. When the room becomes too warm to keep the draft temperature below 90° thermostat 11 will be actuated to bring fan motor 9 into operation to augment the draft through compartment C and up through flue D.

Thus a refrigerator in accordance with the present invention operates as a natural draft system while such a method is economical but automatically changes to a forced draft system when the former ceases to be economical. With this arrangement a self-contained refrigerator adapted normally for natural draft cooling need not be provided with a condenser of a size necessary to take care of the most extreme conditions such as a 100° room but may have a condenser of moderate size fully capable of meeting ordinary conditions, since the separate fan motor with its forced draft cooling is more than sufficient to take care of the most exacting and unusual conditions. Hence, the parts of the refrigerating system may be kept to very moderate sizes without impairment of efficiency and with decided economies in operation.

While the invention and the method of its operation have been herein disclosed in what is now considered to be a preferred form, it is to be understood that changes, modifications, and adaptations may be made in the details thereof without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim as my invention:

1. In a closed cycle refrigerating system of the evaporator-compressor-condenser type having a separate fan motor, the process of removing heat from the compressor and the condenser which comprises operating the fan motor to create a draft over the condenser and the compressor only when the temperature of the environing atmosphere is so high that the normal movement of air thereover is insufficient for economical operation of the system.

2. In a refrigerating system having heat ejecting members, means for causing a natural draft thereover, and means for augmenting said natural draft when the environing temperature is too high for efficient operation of the system.

3. In a refrigerating system having heat ejecting members, means for causing a natural draft thereover, and means responsive to temperature changes in the environing atmosphere for augmenting said natural draft.

4. In a refrigerating system having heat ejecting members, means for causing a natural draft thereover, and means controlled by the temperature of the environing atmosphere for directing a forced draft upon at least one of said members.

5. In a refrigerating system having heat ejecting members, means for causing a natural draft thereover, means for directing a forced draft upon at least one of said members, and thermally actuated means for controlling said forced draft means.

6. In a closed cycle system of the evaporator-compressor-condenser type, means for producing a natural draft over said compressor and said condenser to remove heat therefrom, and means controlled by the temperature of said natural draft for augmenting the latter.

7. In a closed cycle system of the evaporator-compressor-condenser type, means for producing a natural draft over said compressor and said condenser to remove heat therefrom, means for augmenting said natural draft, and a thermostat arranged automatically to control said augmenting means.

8. A self contained refrigerator comprising a cabinet having a refrigerating chamber and an apparatus compartment, means including a flue for inducing a natural draft of air through said compartment for cooling purposes, and automatically controlled means for augmenting the draft therethrough.

9. A self contained refrigerator comprising a cabinet having a refrigerating chamber and an apparatus compartment, means including a flue for inducing a natural draft of air through said compartment for cooling purposes, and automatically controlled means in said compartment for augmenting the draft therethrough.

10. A self contained refrigerator of the evaporator-compressor-condenser type comprising a cabinet having a refrigerating chamber containing the evaporator and a compartment adjacent said chamber for the remaining apparatus, means including a flue for inducing a natural draft through said compartment for cooling the compressor and the condenser, a fan for augmenting the draft through said compartment, and means for controlling the operation of the fan in response to variations in the temperature of said draft.

11. A self contained refrigerator of the closed cycle type comprising a cabinet having a refrigerating chamber and an apparatus compartment, means including a flue for inducing a natural draft through said compartment, an evaporator in said chamber, a compressor and a motor for driving the latter in said compartment, a condenser disposed in said flue, and means for producing a forced draft through said compartment to augment said natural draft when the latter is insufficient for cooling said condenser and said compressor.

12. A self contained refrigerator of the

closed cycle type comprising a cabinet having a refrigerating chamber and an apparatus compartment, means including a flue for inducing a natural draft through said compartment, an evaporator in said chamber, a compressor and a motor for driving the latter in said compartment, a condenser disposed in said flue, and forced draft means for augmenting said natural draft comprising a fan, a motor therefor, and means operating in response to changes in the environing atmosphere for controlling said fan motor.

13. A self contained refrigerator of the closed cycle type comprising a cabinet having a refrigerating chamber and an apparatus compartment, means including a flue for inducing a natural draft through said compartment, an evaporator in said chamber, a compressor and a motor for driving the latter in said compartment, a condenser disposed in said flue, and means for directing a forced draft over said condenser comprising a fan and a motor therefor in said compartment, and means responsive to the temperature of air entering said compartment for controlling the operation of said fan motor.

14. A self contained refrigerator of the closed cycle type comprising a cabinet having a refrigerating chamber and an apparatus compartment, means including a flue for inducing a natural draft through said compartment, an evaporator in said chamber, a compressor and a motor for driving the latter in said compartment, a condenser disposed in said flue, a fan and a motor therefor in said compartment for directing a blast of air up said flue, and a thermostat for controlling said fan motor.

15. A self contained refrigerator of the closed cycle type comprising a cabinet having a refrigerating chamber and an apparatus compartment, means including a flue for inducing a natural draft through said compartment, an evaporator in said chamber, a compressor and a motor for driving the latter in said compartment, a condenser disposed in said flue, and forced draft means in said compartment comprising a fan and a motor for operating the latter, said fan motor being in parallel with said compressor motor, and a thermostat in said compartment in series with said fan motor for controlling the operation of the latter in response to the temperature of the air entering said compartment.

Signed by me at Detroit, in the county of Wayne and State of Michigan this third day of January, 1928.

RANSOM W. DAVENPORT.