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AIR COOLED REFRIGERATOR

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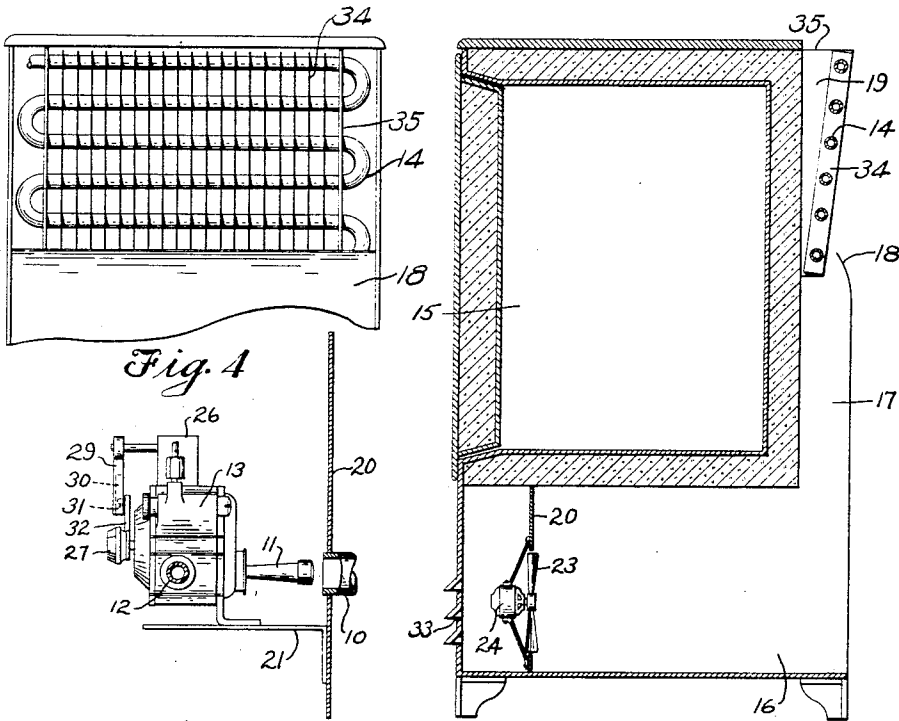
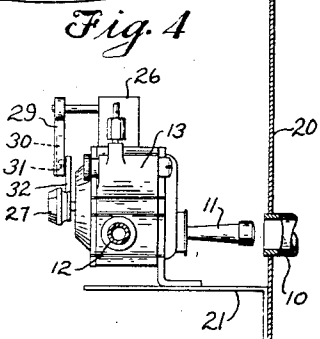
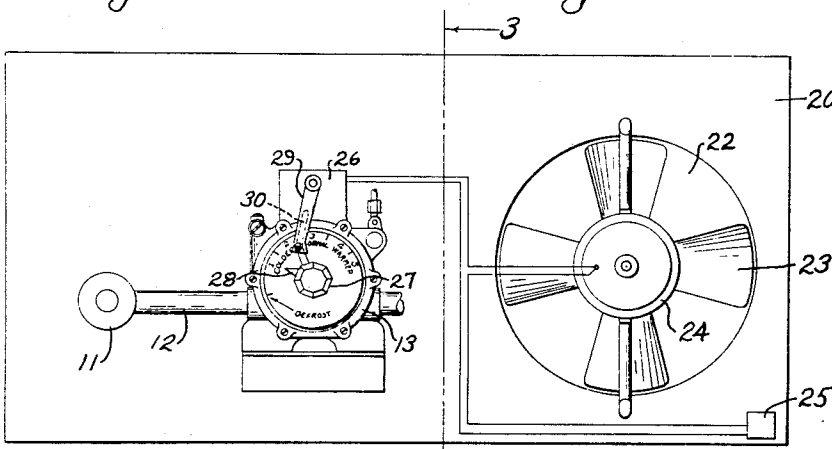


Fig. 2

Fig. 1

Fig. 4

Fig. 3

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## UNITED STATES PATENT OFFICE

2,040,174

## AIR-COOLED REFRIGERATOR

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12 Claims. (Cl. 62—5)

This invention relates to refrigeration and more particularly to cooling heat emitting portions of refrigeration apparatus such as a condenser.

It is an object of this invention to better utilize natural draft for cooling with air the condenser of a refrigeration apparatus.

It is a further object of the invention to so arrange a refrigerator cabinet and the condenser of a refrigeration apparatus that both natural and forced draft cooling may be utilized yet obtain maximum flow of air for natural cooling.

Further, in accordance with this invention, a forced draft of air for cooling the condenser of a refrigeration apparatus is controlled responsive to the temperature control setting of the apparatus.

Other objects and advantages will be apparent from the following description taken in connection with the accompanying drawing, in which,

Fig. 1 shows schematically, in vertical section, a refrigerator cabinet with the condenser of a refrigeration unit and a fan for flowing cooling air over the condenser;

Fig. 2 shows in front elevation the fan illustrated in Fig. 1 and control therefor in conjunction with the temperature control for an absorption type refrigeration apparatus;

Fig. 3 is a section taken on line 3—3 in Fig. 2; and

Fig. 4 is a rear view of the condenser shown in Fig. 1.

Although in nowise limited thereto, this invention is well adapted for air cooling refrigeration apparatus of the absorption type. Such apparatus is well known in the art and forms no part of this invention. Briefly, however, refrigerant vapor is expelled from solution by heat in a generator and passes into a condenser where it is cooled and liquefied. The liquid refrigerant is vaporized in an evaporator, the vapor being reabsorbed by weak solution from the generator from which it was expelled. Such a system is greatly simplified by providing an absorber and circulating an inert gas between the evaporator and absorber whereby the pressure in the system is equalized, as well known in the art, allowing the use of simple means for circulating absorption solution between the absorber and generator. The generator may be heated by a gas burner and temperature control obtained by a thermostatically operated valve in the burner supply line.

In Figs. 2 and 3 are shown an end of a generator heating flue 10 and a gas burner 11 having a supply line 12 in which there is an adjustable thermostatic valve 13 of a type well known in

the art. Other parts of the apparatus, except the condenser 14 shown in Fig. 1, are omitted in order to clarify the drawing illustrating the present invention.

Referring to Fig. 1, there is shown a refrigerator cabinet comprising a heat insulated storage compartment 15 and a lower apparatus chamber 16 from the rear of which there extends upwardly behind the storage compartment a passage 17 formed by a rear wall which terminates with an inward flare 18 below the top of the refrigerator.

The refrigeration apparatus unit is arranged and mounted in the cabinet so that the condenser 14 is located in the rear and near the top of the cabinet directly above the upper end of passage 17 and inclined upwardly away from the cabinet forming therewith a flue space 19. As shown in Figs. 1 and 4, the condenser 14 comprises a reversely looped tube between plates 35 and provided with transverse heat radiating fins 34. The plates 35 close the ends of the flue space 19 between the condenser and the adjacent exterior wall portion of chamber 15. Preferably, the lower end of the condenser structure is positioned close to the wall to completely close the bottom of the flue space against flow of air. If the condenser is spaced further from the wall, means should be provided to block off the lower end of the flue space, which means may conveniently be another element of the refrigeration unit. It will be apparent that in an arrangement as just described all the air entering the flue space 19 must pass over the condenser tube or fins. The action of a flue depends upon an unbalanced pressure due to the lower specific weight of a heated column of air with respect to an equivalent column of atmospheric air, as well known. Therefore, the more air in the flue which is heated by the condenser, the greater will be the pressure difference and consequent flow of air through the condenser. In other words, leakage of unheated air into the flue dampens the draft through the condenser. It will be further appreciated that, in the condenser arrangement herein disclosed, the condenser is exposed directly to the atmosphere rather than to flow of air through a restricted passage.

A burner mounting plate 20 secured on the lower end of the apparatus unit extends across the front of the apparatus chamber 16 when the unit is mounted in position. One end of the generator heating flue 10 extends through the mounting plate 20 and the burner and thermostat assembly is adjustably mounted on plate 20 as by a bracket 21 so that the burner 11 may be cor-

rectly located with respect to the flue 10. Suitably mounted in an opening 22 in the plate 20 is a fan 23 operated by an electric motor 24. Suitable electrical connection for the fan motor is provided by a terminal block 25 and operation of the motor is controlled by a switch 26 which is preferably of the well known snap action type mounted adjacent or directly on the casing of the thermostatic valve 13, as best illustrated in Fig. 2.

Setting of the thermostatic valve 13 is obtained by turning a knob 27 provided with a pointer 28 which cooperates with a suitable scale on the valve casing. The operating lever 29 of the fan control switch 26 is provided with slot 30 and extends toward the temperature setting knob 27 so as to be engaged by a pin 31 on an arm 32 of the knob 27 during a portion of the movement to and away from its low temperature setting. Thus, referring to Figs. 2 and 3, when the knob 27 is turned toward the setting indicated by the character 1 on the scale, the switch lever 29 is engaged and moved to close the switch 26, putting the fan into operation. When the knob 27 is turned in the opposite direction over the scale, the switch lever 29 is moved to its normal "off" position to open the switch 26 and shut down the fan.

Except when the thermostat is set for low temperature or fast freezing operation, the fan 23 is not in operation and the condenser 14 is cooled by a natural draft of air passing over the finned tubes of the condenser into the flue space 19. However, when the thermostat is set for low temperature operation, the fan is started as previously described and air, drawn through louvers 33 and opening 22 in the plate 20, is blown through the apparatus compartment 16 and upwardly through passage 17 from which it is directed over the condenser 14 by the inward flare 18 of the rear wall.

It will be obvious to those skilled in the art that various other changes may be made in the construction and arrangement without departing from the spirit of the invention and therefore the invention is not limited to what is shown in the drawing and described in the specification but only as indicated in the following claims.

I claim:

1. In a refrigerator having a condenser adapted to be cooled by air, a control device for refrigeration apparatus, means for adjusting said device, a fan for blowing air over said condenser, and means for controlling said fan and operated directly by said adjusting means.

2. In a refrigerator having a condenser adapted to be cooled by air, a temperature control device for refrigeration apparatus, adjusting means for said device, an electric motor driven fan for blowing air over said condenser, and a switch for controlling said fan and directly operated by said adjusting means.

3. In a refrigerator including a thermal insulated compartment and a lower apparatus compartment having a passage extending upwardly therefrom outside said insulated compartment, a condenser adapted to be cooled by air located in spaced relation with an exterior wall portion of said insulated compartment above the upper end of said passage, means enclosing the space between said condenser and wall portion to form a flue, and a fan for blowing air upwardly through said passage over said condenser.

4. In a refrigerator, a cabinet having a thermal

insulated compartment and a lower apparatus compartment, a condenser adapted for cooling by air located outside said cabinet for cooling by ambient air, a fan in said apparatus compartment, and means for directing flow of air from said fan over said condenser to augment natural flow of air thereover, said means terminating at the lower part of said condenser.

5. Refrigeration apparatus including a condenser adapted to be cooled by air, an automatic device for regulating operation of said refrigeration apparatus, a fan constructed and arranged to blow air over said condenser, means for controlling operation of said fan, and means for adjusting said automatic device and operatively associated with said fan control means in a manner to cause operation of said fan control means only at a predetermined setting of said adjusting means.

6. In a refrigerator, absorption refrigeration apparatus including a generator, a heater for said generator, and a condenser adapted to be cooled by air, an automatic device for regulating said heater responsive to refrigeration temperature and having a manually operable adjustment, an electric motor driven fan as an auxiliary means for blowing air over said condenser to augment natural air cooling of the condenser, and a switch for controlling operation of said fan, said switch and said manual adjustment being operatively associated in such a manner that said switch is operated only upon movement of said adjustment to a predetermined setting.

7. In a refrigerator, absorption type refrigeration apparatus including a condenser disposed in a substantially upright plane and having heat transfer surfaces substantially perpendicular to said plane, means completely bounding, except at the top, a flue space of which one side is formed by said condenser, whereby all air entering said flue space must pass in thermal exchange relation with said condenser, and a fan for augmenting natural flow of air over said condenser.

8. In a refrigerator, absorption type refrigeration apparatus including a condenser disposed in a substantially upright plane and constructed and arranged for cooling by flow of air in contact therewith and substantially perpendicular to said plane, means completely bounding except at the top, a flue space of which a portion is bounded by said condenser, a fan, and means for directing flow of air from said fan to said condenser in a manner to augment natural flow of air over said condenser.

9. In a refrigerator, a cabinet having an apparatus compartment open to atmosphere at the top and one side of the cabinet, absorption type refrigeration apparatus including a condenser disposed in a substantially upright plane in said compartment adjacent said open side and constructed and arranged for cooling by flow of air in contact therewith and substantially perpendicular to said plane, means completely bounding, except at the top, a flue space of which a portion toward said open side of the cabinet is bounded by said condenser, a fan in said apparatus compartment, and means for directing flow of air from said fan to said condenser in such a manner as to augment natural flow of air in contact with said condenser.

10. In a refrigerator, a cabinet having a thermal insulated storage compartment, a condenser comprising a reversely looped tube provided with transverse heat radiating fins and arranged in spaced relation with an exterior wall of said cabi-

net, means enclosing the space between said condenser and wall to form a flue into which air may flow only through the condenser, an apparatus compartment in said cabinet below said storage compartment having an air outlet, means forming  
5 a passage extending from said apparatus compartment and terminating with an opening adjacent said condenser, and a fan in said apparatus compartment for blowing air through said passage  
10 toward said condenser.

11. In a refrigerator, a cabinet having a thermal insulated storage compartment, a condenser comprising a reversely looped tube provided with transverse heat radiating fins and arranged in  
15 spaced relation with an exterior wall at the rear of said cabinet, means enclosing the space between said condenser and wall to form a flue into which air may flow only through the condenser, an apparatus compartment in said cabinet below

said storage compartment having an air inlet, means forming a passage extending from said apparatus compartment and terminating with an opening adjacent said condenser, a fan in said apparatus compartment for blowing air through  
5 said passage toward said condenser, an electric motor for driving said fan, a temperature control device for refrigeration apparatus, adjustment means for said control device, and a switch for  
10 controlling said fan motor operatively associated with said adjustment means.

12. In a refrigerator, a condenser adapted to be cooled by air, a flue for inducing flow of air over said condenser, a temperature control device  
15 for refrigeration apparatus having adjustment means, a fan for blowing air over said condenser, and means for controlling said fan and operated directly by said adjustment means.

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