Dec. 9, 1941. N. J. SMITH 2,265,497

REFRIGERATING APPARATUS

Original Filed March 29, 1935 3 Sheets-Sheet 1

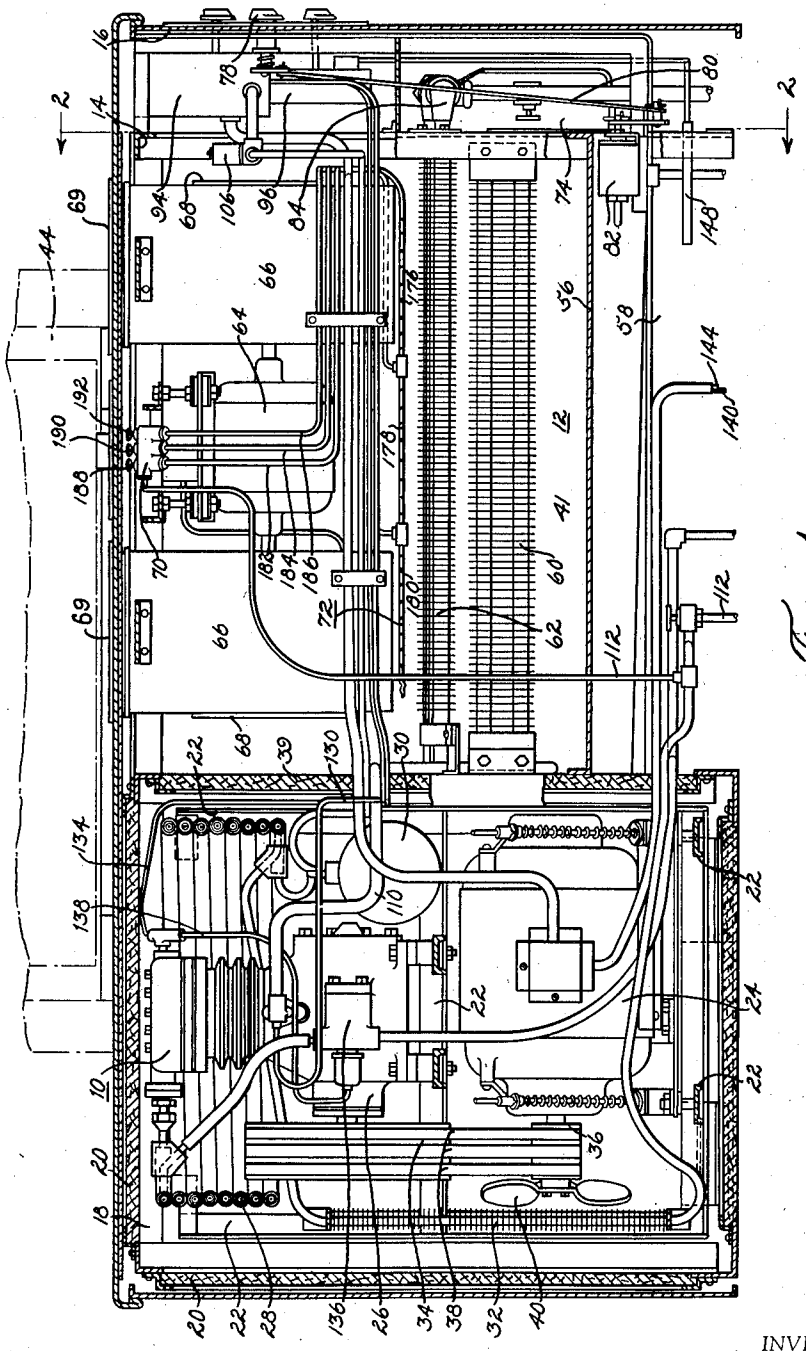

Fig. 1

INVENTOR.
Nelson J. Smith.
BY Spencer, Hardman & Fisher

Dec. 9, 1941. N. J. SMITH 2,265,497

REFRIGERATING APPARATUS

Original Filed March 29, 1935 3 Sheets-Sheet 2

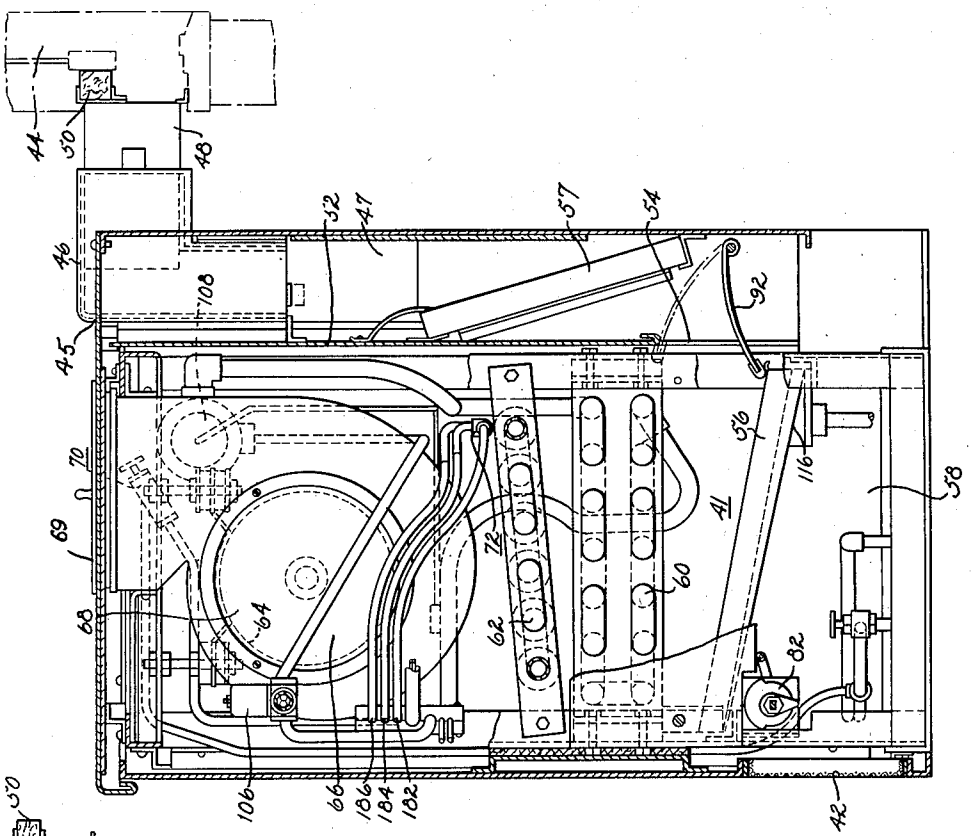

Fig. 2

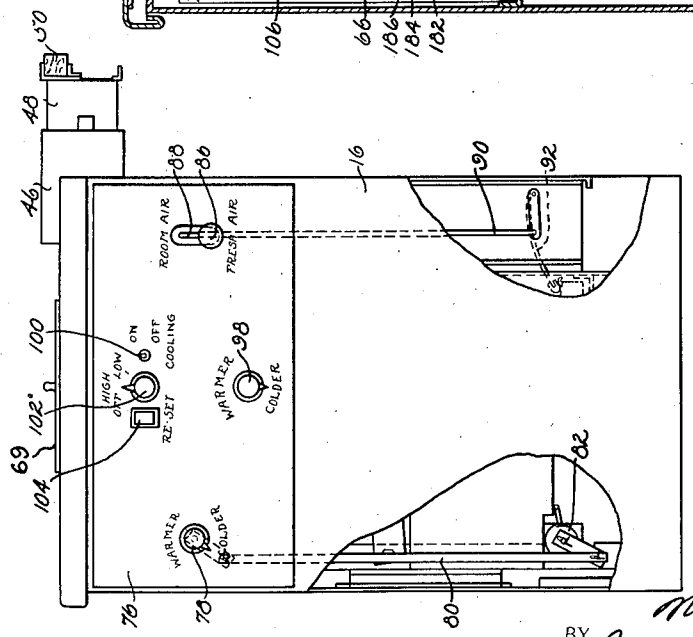

Fig. 3

INVENTOR.
Nelson J. Smith.
BY Spencer, Hardman & Fehr.

Dec. 9, 1941. N. J. SMITH 2,265,497

REFRIGERATING APPARATUS

Original Filed March 29, 1935 3 Sheets-Sheet 3

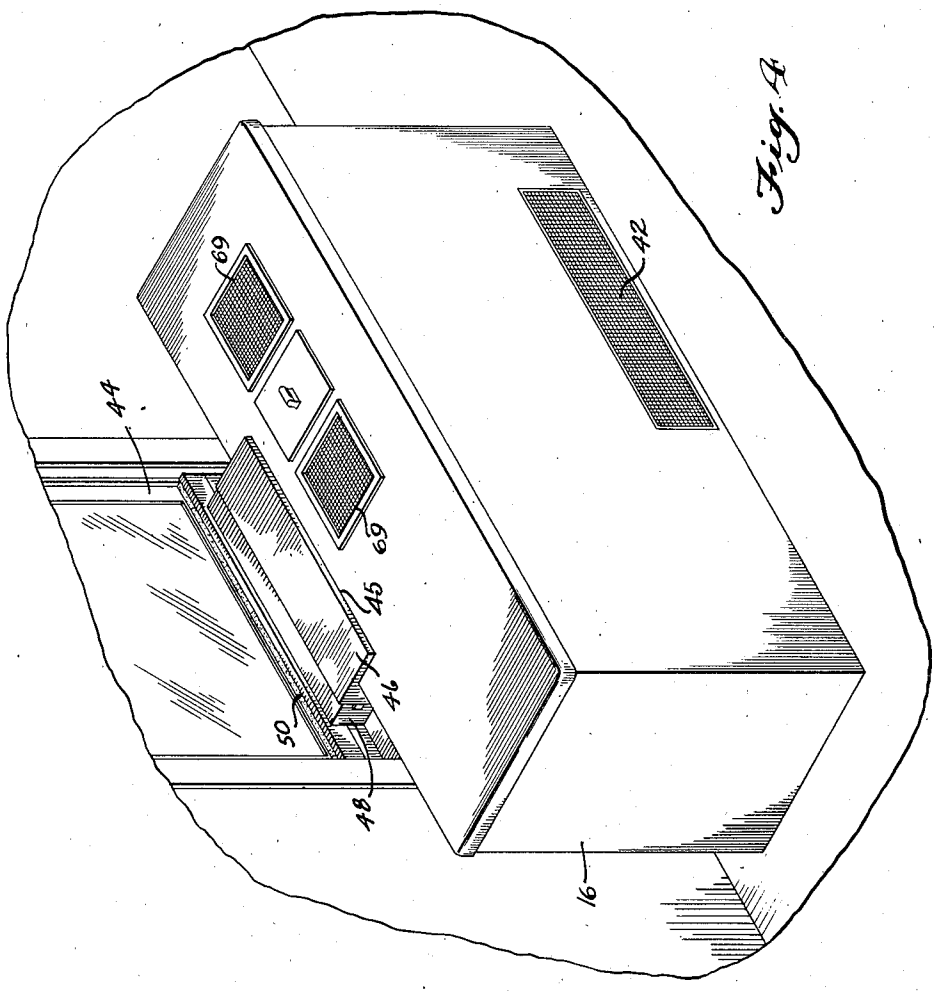

Fig. 4

INVENTOR.
Nelson J. Smith

BY Spencer, Hardman & Fehr
ATTORNEYS.

Patented Dec. 9, 1941

2,265,497

UNITED STATES PATENT OFFICE

2,265,497

REFRIGERATING APPARATUS

Nelson J. Smith, Dayton, Ohio, assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

Original application March 29, 1935, Serial No. 13,710. Divided and this application August 29, 1938, Serial No. 227,348

3 Claims. (Cl. 98—94)

This invention relates to refrigerating apparatus and more particularly to a refrigerating apparatus adapted to provide conditioned air within an enclosure.

This application is a division of my copending application Serial No. 13,710 filed March 29, 1935, now Patent No. 2,151,995.

It is an object of this invention to provide a unitary structure which may be located within a space to be air conditioned and which will perform the functions of cooling, dehumidifying, cleaning and circulating the air within the enclosure in warm weather and will perform the functions of heating, humidifying, cleaning and circulating air within an enclosure in cold weather, and in addition will provide for the introduction of selectively variable amounts of fresh air to the enclosure in either warm or cold weather.

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

In the drawings:

Fig. 1 is a vertical cross section of a refrigerating apparatus embodying the present invention;

Fig. 2 is a cross section on line 2—2 of Fig. 1;

Fig. 3 is an end view of the device illustrated in Fig. 1, a portion of the apparatus being broken away; and

Fig. 4 is an isometric view showing the exterior of the cabinet shown in Figs. 1, 2 and 3.

The device illustrated in Figs. 1 to 3 comprises generally a rectangular casing enclosing a refrigerant liquefying unit generally designated as 10, and an air treating unit generally designated as 12. Both units are mounted upon a generally rectangular frame 14 within a casing 16. The unit is adapted to be supported upon the floor of an enclosure to be air conditioned and adjacent one of the side walls thereof, preferably near a window.

The refrigerant liquefying unit 10 is enclosed within an insulated chamber 18 having insulating walls 20 surrounding the same to prevent the conduction of both heat and noise from the compartment 18 to the enclosure to be air conditioned. The refrigerant liquefying unit is mounted upon a frame 22 supported upon the main frame 14 and includes a motor 24, a compressor 26, a condenser 28, receiver 30 and a heat exchanger 32 for cooling the compartment 18. The compressor 26 is driven by the motor 24 through pulleys 34 and 36 and belts 38. A fan 40 located on the motor shaft circulates the air within the compartment 18 over the heat exchange device 32.

The air treating unit 12 comprises a duct 41 for air to be treated formed by the walls of the casing 16, the wall 52 (see Fig. 2) and the common wall 39 between the units 10 and 12. The air treating duct 41 has two inlets, one of which is formed by the grille 42 for the ingress of recirculated air from the enclosure to be air conditioned and the other of which is situated at the window 44. A sheet metal elbow 46 is arranged to pass through an opening 45 in the top of the casing 16 at the rear thereof and may be vertically adjusted to correspond to the height of the sill of the window 44. The rearwardly facing opening of the elbow 46 carries an adjustable sleeve 48 which is movable toward and away from the rear face of the unit so that it may be brought in contact with the window 44. A pad 50 of felt is secured to the sleeve 48 to insure air tight contact between the sleeve 48 and the sash of the window 44. The downwardly facing opening of the elbow 46 communicates with a duct 47 formed between the rear wall of the casing 16 and an intermediate sheet metal wall 52 which terminates in an opening 54 leading into the air treating duct 41. A replaceable filter screen 57 of any suitable construction is positioned diagonally in the duct 47 between the sleeve 46 and the opening 54. A drip pan 56 is positioned in the casing to form the bottom of the duct 41 and the top of the duct 58 which extends from the grille 42 to the opening 54 leading into the duct 41.

Positioned in the duct 41 near the bottom thereof is a refrigerant evaporator 60 of any suitable construction which is maintained at a low temperature by the refrigerant liquefying unit 10. Above the evaporator 60, there is positioned a heating coil 62 which is adapted to be connected with the heating system of the building within which the air conditioning unit is placed. Near the top of the duct 41 there is mounted an air circulating unit comprising a motor 64 which drives a pair of blowers 66 at either end thereof having their inlets 68 opening into the duct 41 and their outlets discharging through openings 69 provided in the top wall of the casing 16. A humidifying device is also provided in the duct 41 comprising a control manifold 70 which is connected to a water distributing head 72 which overlies the heating coil 62.

As explained hereinabove, the elbow 46 constitutes one portion of the outside air intake duct system, and as shown in Figs. 1, 2, 3 and 5 of the drawings the upper surface of elbow 46 is a flat surface which is arranged in a plane substantially parallel to the top wall of the cabinet.

At the right hand end of the device as viewed in Fig. 1, a chamber 74 is provided within which are located the control devices for the air conditioning unit. The end wall of the casing 16

is provided with a control panel 76 (see Fig. 3) having located thereon all of the handles by which the various control devices are actuated. Thus, the knob 78 is connected by means of a lever and link connection 80 to the temperature responsive element 82 positioned within the duct 58 which controls the admission of heating fluid to the coil 62 through the valve 84. The knob 86 which is reciprocable in a slot 88 controls through the medium of a link 90 a damper 92 which is adapted to swing in the opening 54. The electrical controls for the apparatus are mounted within the casings 94 and 96 and are controlled through the medium of knobs 98, 100, 102 and 104 in a manner later to be described.

For a more complete description of the air conditioning apparatus and the controls therefor, reference is hereby made to my Patent No. 2,151,995, of which this is a division.

In operation of the unit as a whole under summer weather conditions, the compressor 26 is driven by the motor 24 to withdraw gaseous refrigerant from the evaporator 60 and to deliver compressed refrigerant to the condenser 28 where it is liquefied by the cooling water supplied through the conduit 112 and subsequently collected in the receiver 30. Whenever the solenoid valve 106 is open, liquid refrigerant is delivered to the expansion valve 108 where it is expanded into the evaporator 60 to reduce the temperature thereof in a well known manner. The fan 40 circulates the air within the compartment 18 over the heat exchanger 32 to withdraw the heat of the motor and the heat of the compressor from the air in the compartment 18. The blowers 66 cause the withdrawal of air into the ducts 47 and 58 through the opening 54 and through the duct 41 where the air is cooled by the evaporator 60 or heated by the heating coil 62 depending upon which one of them is in operation and delivers the treated air through the outlets in the top of the casing 16.

During winter operation, humidification of the air being conditioned is desirable and is provided by means of the water distributing head 72. The head 72 is divided into three sections 176, 178 and 180, each of which is out of communication with the other except through the manifold 70. Separate conduits 182, 184 and 186 lead from the manifold 70 to the separate portions of the head 72. Individual valves 188, 190 and 192 control the admission of water from the conduit 112 to the conduits 182, 184 and 186 respectively. Thus, if a small amount of humidification is desired, only one of the valves in the manifold will be opened, thus delivering water to only one-third of the distributing head 72. The humidifying water is, therefore, distributed over only a small portion of the heating coil 62 and the amount of moisture added to the air passing to the conduit 41 is limited. If more humidification is desired, two or three of the valves in the manifold 70 may be opened, thus increasing the area on the coil 62 over which humidifying water is distributed. It will be understood that very little control over the rate of humidification may be obtained by varying the amount of opening of any one of the valves in the manifold 70. This is due to the fact that substantially the smallest practical opening of any one of the valves admits enough water to the distributing head 72 to completely cover or wet the surface of the coil 62 immediately below that portion of the head 72 to which water is delivered. Any greater opening of the valve will merely increase the amount of water which flows over that portion of the heater coil 62 without increasing the amount of wetted surface thereof. Inasmuch as the rate of humidification is dependent upon the amount of wetted surface, it will be seen that the provision of separately controllable distributors for different portions of the surface of the coil 62 provides a reliable means for varying the rate of humidification of the air passing over the coil 62. The drip pan 56 collects the surplus water delivered from the distributing head 72 and delivers it to the drain during winter operation, while during summer operation, the cooling coil 60 collects water of condensation from the air being cooled thereby which is also collected in the drip pan 56 and delivered to the drain.

While the form of embodiment of the present 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. In combination with an air conditioning cabinet having a plurality of side walls and a top wall, means for introducing air into said cabinet comprising a vertically adjustable elbow member having a vertical portion projecting through the top of said cabinet within the confines of said walls and having a horizontal portion extending rearwardly from said cabinet, said horizontal portion having a substantially flat upper surface arranged substantially parallel to the upper surface of said top wall, means for cooling at least a portion of the air circulated through said cabinet, said last named means comprising an evaporator, and means for supplying refrigerant to said evaporator.

2. In combination with an air conditioning cabinet having a plurality of side walls and a top wall, means for introducing air into said cabinet comprising a vertically adjustable elbow member having a vertical portion projecting through the top of said cabinet within the confines of said walls and having a horizontal portion extending rearwardly from said cabinet, said horizontal portion having a substantially flat upper surface arranged substantially parallel to the upper surface of said top wall.

3. In combination with an air conditioning cabinet having a plurality of side walls and a top wall, means for introducing air into said cabinet comprising a vertically adjustable elbow member having a vertical portion projecting through the top of said cabinet within the confines of said walls and having a horizontal portion extending rearwardly from said cabinet, said horizontal portion comprising telescopically engaging portions, said horizontal portion having a substantially flat upper surface arranged substantially parallel to the upper surface of said top wall, means for cooling at least a portion of the air circulated through said cabinet, said last named means comprising an evaporator, and means for supplying refrigerant to said evaporator.

NELSON J. SMITH.