July 22, 1941. P. MANISCALCO 2,250,386

COMBINATION REFRIGERATOR AND AIR CONDITIONER

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Fig. 1

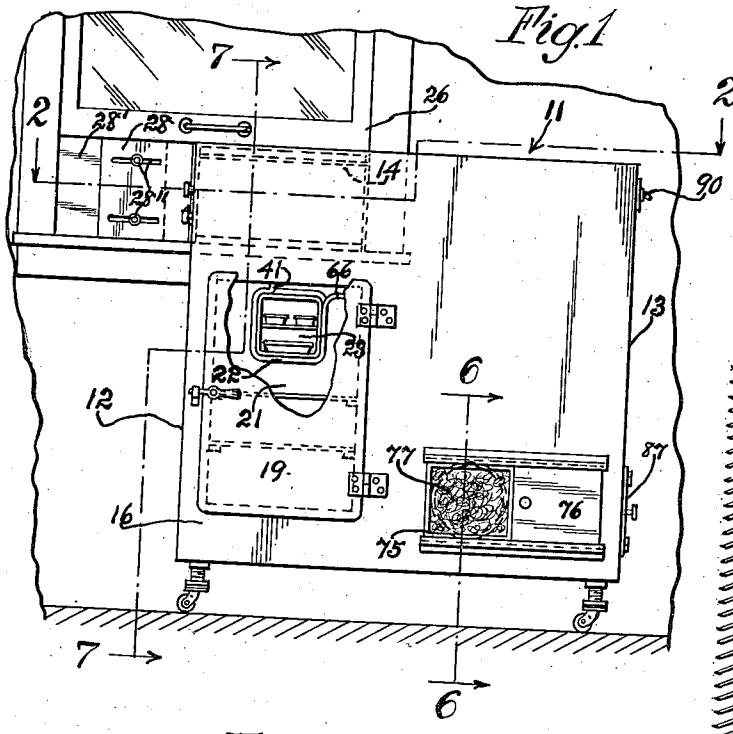


Fig. 3

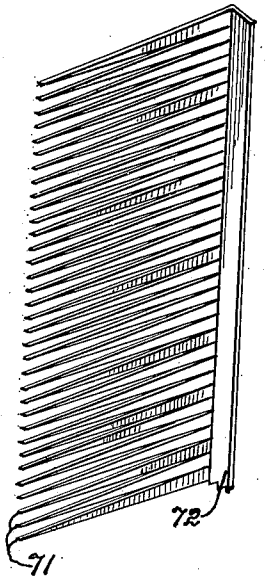
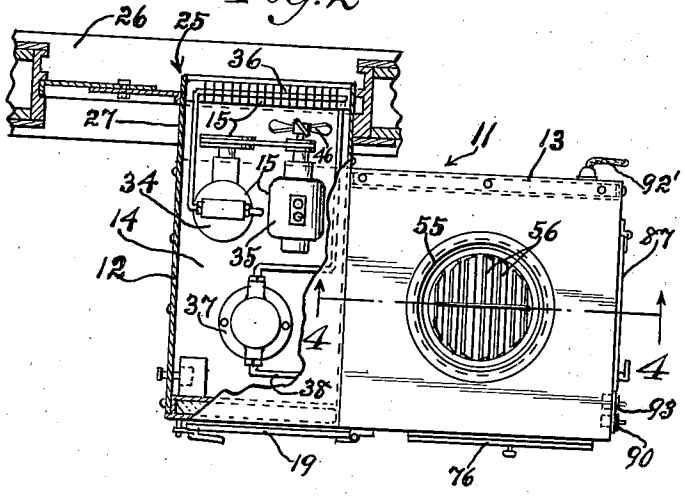


Fig. 2



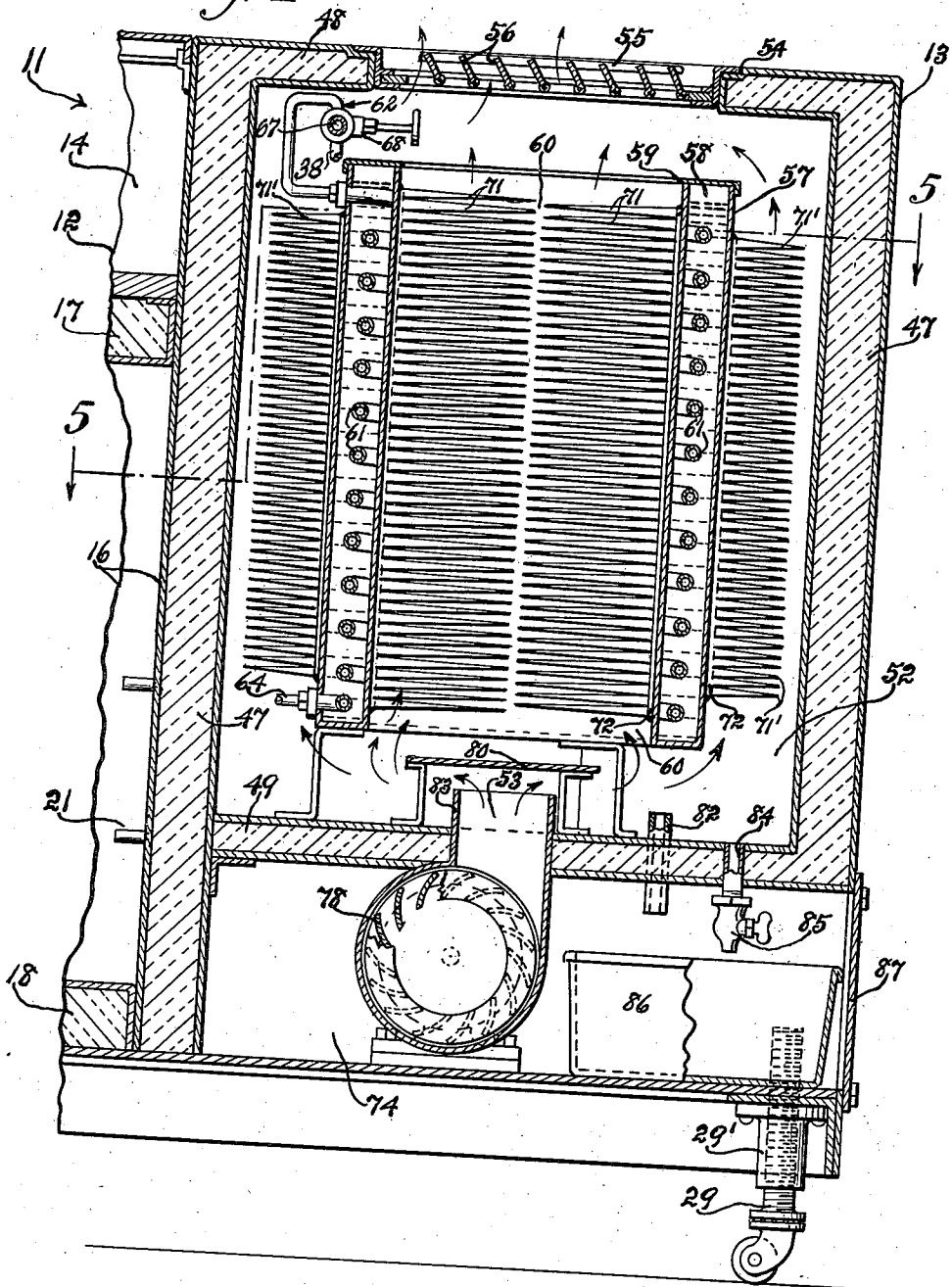
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COMBINATION REFRIGERATOR AND AIR CONDITIONER

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Fig. 4



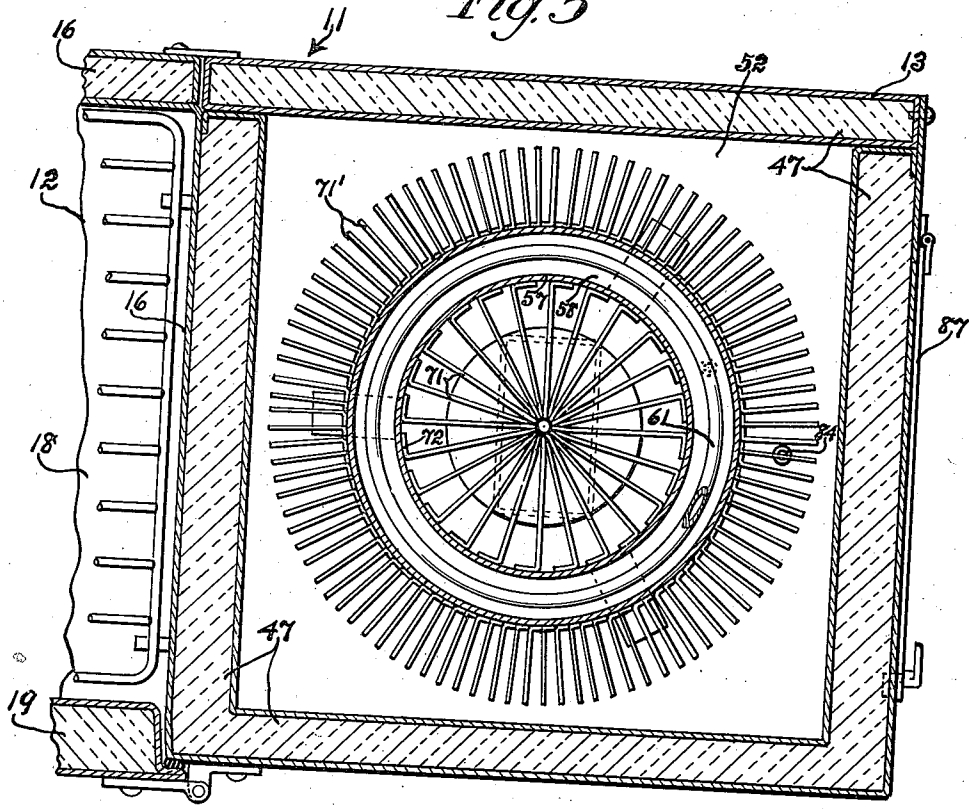
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COMBINATION REFRIGERATOR AND AIR CONDITIONER

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Fig. 5



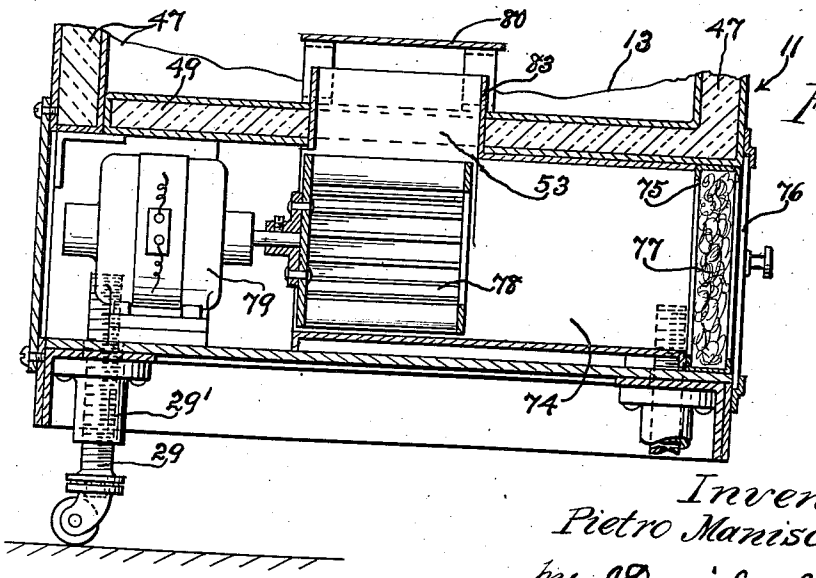


Fig. 6

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Fig. 7

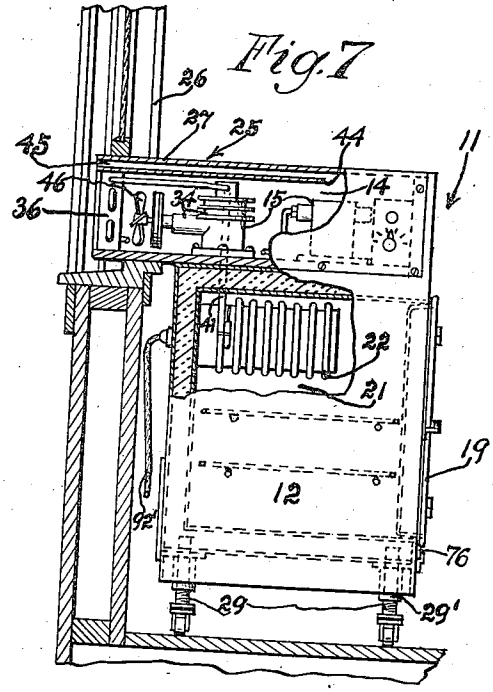


Fig. 8

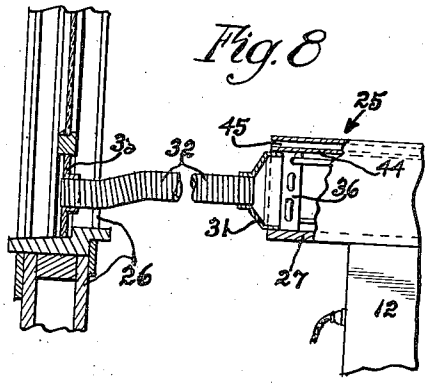


Fig. 10

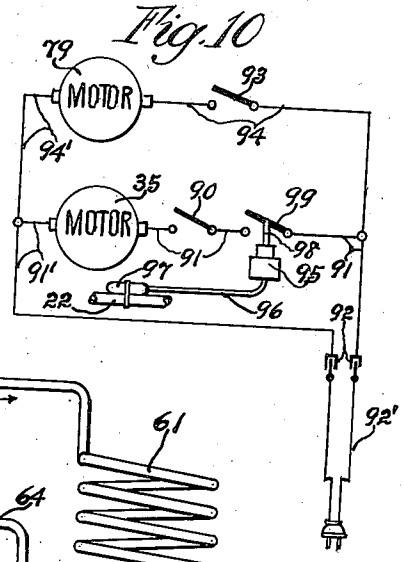
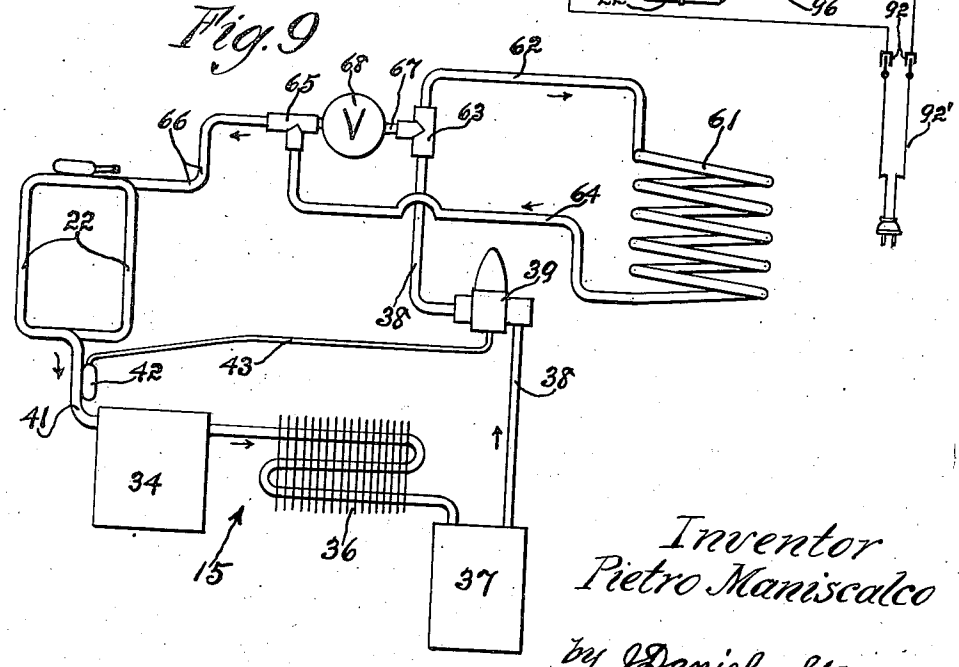


Fig. 9



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UNITED STATES PATENT OFFICE

2,250,386

COMBINATION REFRIGERATOR AND AIR CONDITIONER

Pietro Maniscalco, Chicago, Ill.

Application November 1, 1940, Serial No. 363,889

12 Claims. (Cl. 62—140)

This invention relates to improvements in a combination refrigerator and air conditioner.

One of the essential objects of this invention is to provide a combination device of this type which is particularly adapted for use in the home, and also for the office and the like, and comprises a domestic type of refrigerator having an air conditioner combined therewith which can be operated selectively in conjunction with the refrigerator and can also be retained idle while the refrigerator is in use; and wherein the conditioner can be utilized furthermore for hydrating and cooling the air, or for either alone.

Another object of this invention is to equip the air conditioning means of this device with an improved air cooling mechanism which is arranged to provide an excess of stored cooling medium, thereby adapting the conditioner to be especially valuable during the warmer periods of the day.

A further object of this invention is to provide the air conditioner with improved air cooling means, which preferably includes a liquid container with elements projecting therefrom, for more evenly and efficiently distributing the cooling effect into the air which is flowing thru the conditioner.

Another object of this invention is to provide such a combination device which comprises improved mechanism for carrying the heat generated by the compressor-condenser unit away from the room.

These and various other objects and advantages are attained with this invention, as will become apparent from the following description, taken in connection with the accompanying drawings wherein the invention is disclosed in its preferred form, it being apparent that various other arrangements and forms of construction may be adopted in carrying out the objects and purposes of this invention.

In the drawings:

Fig. 1 is a front elevational view illustrating this invention mounted in position adjacent a window, parts being broken away.

Fig. 2 is a part plan and part sectional view thereof, taken on line 2—2 of Fig. 1.

Fig. 3 is a perspective view of part of a cooling prong unit.

Fig. 4 is an enlarged vertical sectional view, taken on line 4—4 of Fig. 2, disclosing the air cooling and humidifying mechanism.

Fig. 5 is a horizontal sectional view, taken on line 5—5 of Fig. 4.

Fig. 6 is an enlarged detail sectional view, taken on line 6—6 of Fig. 1.

Fig. 7 is a part side elevation and part vertical sectional view, taken on line 7—7 of Fig. 1.

Fig. 8 is a detail view, partly in section, illustrating auxiliary means for exhausting the heat generated by the compressor-condenser unit, used where the device is stationed away from the window.

Fig. 9 is a diagrammatic view illustrating a suitable operating unit, in connection with the cooling means in the refrigerator and in the air conditioner of this invention.

Fig. 10 is a diagrammatic view illustrating suitable electric means including the motors and switch-equipped conductors, adapted for use with this invention.

The drawings illustrate this invention in its preferred form of construction, being substantially in the form and type of a domestic refrigerator, especially adapted for use in the home, and also in the office and the club and the like. It comprises a cabinet 11 which contains a refrigerating part or refrigerator 12 and an air conditioning part or conditioner 13; and preferably also includes the machinery chamber 14, which contains the compressor-condenser means or operating unit 15 therein, and is preferably placed at the upper part of the cabinet, above the refrigerator 12, as indicated in the drawings.

The cabinet 11 contains insulated walls, and the refrigerating part 12 therein comprises the upstanding walls 16 with the top wall 17 and the bottom 18, and the door 19 hinged thereon, all provided with insulating material; thereby providing the storage compartment 21 for food, etc., which is equipped with suitable coils 22 forming a cooling unit containing a freezing chamber 23 therein, in the usual manner.

Heat exhausting means 25 is herein provided on the machinery chamber 14, for carrying away therefrom the heat which is generated by the operating unit 15 and discharging the same out of a window 26 adjacent which the device is placed. Said means 25 preferably includes an extension or casing portion 27 projecting from chamber 14 and being adapted to have its outlet end placed in the partly opened window 26; and it also includes a shield 28 which is positioned at its side in the window, having an extendible portion 28' thereon which is adjustable by manipulating means 28'', thus adapting this means 25 for mounting in windows of different widths.

The cabinet is furthermore provided with adjustable supporting means to adjust the height thereof; as for example, adjustable legs which include each a pair of adjustably connected parts 29 and 29', so that the elevation of the heat exhaust means 25 may be readily adjusted to fit the height of the window sill to which it is connected.

Auxiliary heat exhaust means is preferably also provided with this invention, to be utilized when this device is placed at some distance from a window; and this auxiliary means comprises a hood or funnel member 31 which is readily attachable to the outlet end of said portion 27, and a flexible conduit 32 extends from said hood and has at its outer end a shield 33 which is an extendible shield similar to said shield 28, adapted to fit in the window in place of said casing portion 27 and shield 28.

The operating unit or compressor-condenser means 15 in chamber 14 may be of a standard type; and it is shown herein as comprising a compressor 34, a main driving motor 35, a condenser 36, a tank 37, and the usual refrigerant conducting conduits connecting the same, which herein include a feed conduit 38 extending from the tank 37 and equipped with an expansion valve 39, and also a return conduit 41 connecting the refrigerator coils 22 with the compressor 34 for returning the refrigerant to the latter. Said expansion valve 39 has a power tube or bulb 42 connected thereto by a pipe 43 and mounted on the return conduit 41, as indicated in Fig. 9 of the drawings.

It should be noted that the machinery chamber 14 as well as the heat exhaust portion 27 thereon are equipped with a partition wall 44 near the top, thereby providing an air intake channel 45 therebetween for conducting fresh cool air from outside the window 26 to the inner part of said chamber 14. A fan 46 is positioned in the outer part of said portion 27, being connected to and driven by the motor 35, for moving the heated air generated by the operating unit 15 out of the chamber 14, thru the adjacent window 26 and out of the room, thus effectively expelling said heat away from the conditioned air in the room.

The air conditioning part or conditioner 13 comprises upstanding walls 47, one of which is common with the wall 16 of the refrigerator and forms a partition wall between said refrigerator and the conditioner, said wall having a top wall 48 and bottom 49, and a hinged door 50 thereon, all being provided with insulating material, and together provide an air conditioning chamber 52 therebetween. This chamber has an air inlet 53 in the bottom 49 and an air outlet 54 in the top wall 48, while an air deflector 55 is mounted in said outlet to be removable and adjustable therein, adapted to be readily turned and positioned therein with its vanes 56 suitably tilted, so as to deflect the conditioned air in the particular direction and suitably deflected as may be desired.

The air cooling or chilling means provided herein comprises a hollow-walled tubular member or jacket 57 which includes chamber means 58 within said walls. Said jacket is mounted in conditioner chamber 52, being spaced from the walls thereof and from the air inlet and outlet thereon; and in this form illustrated it is substantially annular or cylindrical, and the chamber means 58 is likewise annular and closed at the bottom, having a removable cover 59 airtight thereon. Said chamber 58 is thus adapted to contain a suitable liquid which does not readily congeal, such as a salt brine, or Prestone, or some similar antifreeze solution; and an air channel 60 is hereby provided centrally thru the jacket.

A refrigerating unit or chilling unit 61 is mounted in thermal relation with said jacket, to cool the liquid contained therein, and in this form illustrated the unit 61 comprises a coil unit which is mounted between the double walls of the jacket, being immersed in the liquid in chamber 58; and this unit is operatively connected with the feed conduit 38.

As indicated in Fig. 9, the unit 61 has one end connected thru a conduit 62 and a connecting member 63 with the feed conduit 38 and the expansion valve 39 therein, to be fed the cold refrigerant thereby; and this unit has its other end connected thru a conduit 64 and a connecting member 65 with the conduit 66, which conducts the refrigerant to the unit 22 in the refrigerator 12. A conduit 67 connects said members 63 and 65 and has a control valve or shut-off valve 68 interposed therein; thereby providing operative connections between the two coils 22 and 61 and thereof with the operating unit 15.

When it is desired to operate both coil units 22 and 61 together, the control valve 68 is closed, whereupon the refrigerant will flow under normal conditions from tank 37 thru conduit 38 and expansion valve 39, thru member 63, conduit 62, unit 61, conduit 64, member 65, conduit 66, and thru unit 22 and back thru return conduit 41 to the compressor, and thru condenser 36 and back to tank 37. When it is desired to operate the refrigerator unit 22 alone, the control valve 68 is opened, whereupon the refrigerant will flow from the tank 37 thru conduit 38 and its valve 39 into the connecting member 63, and then, in view of the elevation of conduit part 62, which extends to the conditioner unit 61, as shown in Fig. 9, the refrigerant will follow the path of least resistance and flow from member 63 thru conduit 67 and the open valve 68 therein, and thru conduit 66 and unit 22 and return conduit 41 back into the operating unit 15.

With this construction the expanded refrigerant in circulating thru the conditioner coils 61 thus cools the liquid in jacket chamber 58 to an extremely chilling degree, and thereby provides an excess of cooling medium which forms a holdover of cooling effect, so that this conditioning device is furthermore particularly serviceable during the warmer periods of the day and place where the device is in use, and it remains effective even after the operating unit 15 is at rest.

Improved air cooling means is furthermore provided with this invention for more uniformly and efficiently distributing the cooling effect from the conditioner unit 61 and chilled liquid in jacket 57, and this means preferably comprises a considerable number of slender pointed elements or prongs 71 projecting from the jacket; and in the form illustrated herein these include prongs 71 projecting from the inner wall of the jacket well into the channel 60, and also prongs 71' projecting from the outer wall of the jacket towards the walls 47 of the conditioner. These prongs can be provided economically by arranging them to extend integral from a backing strip 72 as a unit of prongs, as indicated in Fig. 3, so that a pair of units can be cut at once from a sheet of metal without producing waste; and many such units of prongs are then secured by their strips 72 onto the jacket walls.

An air intake chamber 74 is provided in the cabinet, below the conditioner chamber 52, and it

has an air inlet port 75 with a door 76 thereon which is slidable for adjusting the size of the open port, suitable filtering means 77 being preferably placed in said port for cleaning the incoming air. A fan 78 and a driving motor 79 therefor are mounted in said chamber 74, to force the air thru inlet 53 into chamber 52; and a deflector 80 is mounted between said inlet and the jacket, so that part of the air is caused to flow along the outer side of the jacket and over the prongs 71' thereon, and part will flow thru the channel 60 and over the prongs 71 which protrude into the same, as indicated by the arrows in Fig. 4 of the drawings.

This device is furthermore constructed and equipped to contain water for humidifying the air when it is too dry, and for this purpose an overflow pipe 82 projects up above the bottom 49 of the conditioner, and the air inlet means 53 also has a mouth portion 83 projecting above said bottom 49, so that a certain quantity of water can be placed and retained in the lower part of the air conditioning chamber 52. A drain pipe 84 with a valve 85 therein is also provided in said bottom 49; and a suitable pan 86 can be placed in chamber 74, beneath pipes 82 and 84, for draining purposes; while a door 87 in one side of chamber 74 provides access to said pan 86 and valve 85 therein.

Control means is provided herein to enable operation of the two motors 35 and 79 together, when it is desired to utilize the air conditioner and the refrigerator together; and whereby either motor can be operated alone while the other is retained idle. For this purpose, as indicated in Fig. 10, the main motor 35 of the operating unit 15 has a control switch 90 interposed in one of its conductor wires 91 and 91' which are connected electrically with a current inlet socket 92 on the cabinet, adapted for connection with a suitable supply conductor 92'. Similarly the motor 79 of fan 78 has a control switch 93 interposed in its conductor wires 94 and 94' which are connected with said wires 91 and 91'.

A thermostat 95 is preferably also provided which has a tube 96 extending therefrom to a thermal element or bulb 97 connected with one of the cooling units, being shown herein as mounted on the unit 22 in the refrigerator; while a stem 98 of the thermostat actuates a switch 99 which is interposed in the wire 91, so as to break the circuit thru motor 35 whenever the temperature of the coils 22 and 61 has descended below the desired degree.

With this improved device, by manipulating switches 90 and 93, the motor 79 with its fan 78 can be operated along with the main motor 35, while the control valve 68 is closed, thereby utilizing the air conditioner and the refrigerator together; and likewise, the motor 79 may be held idle while operating the motor 35 alone, while the control valve 68 is open, so as to operate the refrigerator but leave the air conditioner idle. Furthermore, if the refrigerator is not required, but the air is dry, then water can be placed in the lower part of chamber 52, and the fan 78 with its motor 79 operated, while the main motor 35 is retained idle, thereby utilizing the conditioner part for moistening and circulating the air, without the use of the refrigerator. This provides a highly useful combination device of this type.

I claim:

1. In a device of the class described including a cabinet provided with an operating unit, an air conditioner comprising an insulated chamber in said cabinet provided with air inlet and outlet means, a hollow-walled jacket mounted in said chamber spaced from the chamber walls and from said inlet means and providing an annular liquid chamber between its walls, a chilling unit in thermal relation with said jacket to chill the liquid therein and being operable by said operating unit, air deflecting means between said inlet and outlet means, and means to force air along the deflecting means and the outward side and thru the inner channel of the jacket, whereby the chilled liquid creates a surplus cooling medium available for the warmer periods of the day.

2. In a domestic type of refrigerator including a cabinet having a storage compartment with cooling means therein and having an operating unit to actuate said cooling means, an air conditioner comprising an insulated chamber in said cabinet provided with air inlet and outlet means therein, a doubled-walled jacket in said chamber providing a liquid containing space within its walls and providing an air channel centrally therethrough, refrigerant conducting means associated with said jacket to chill the liquid therein and being operable by said operating unit, means to force the air thru said channel and conditioner, and means operable for operating the refrigerator cooling means either alone or in conjunction with said chilling means in the conditioner.

3. In a domestic type of refrigerator including a cabinet having a storage compartment with cooling means therein and having an operating unit to actuate said cooling means, an air conditioner comprising an insulated chamber in said cabinet provided with air inlet and outlet means, a hollow-walled jacket in the chamber providing an annular liquid container therein and an air channel centrally therethru, a chilling unit immersed in the liquid in said jacket and operable by said operating unit, means for forcing air thru the central channel and along the outward side of the jacket, and control means operable for operating said refrigerator cooling means either alone or in conjunction with said chilling means in the conditioner.

4. In a domestic type of refrigerator including a cabinet having an insulated storage compartment with cooling means therein and having a machinery compartment with heat exhaust means thereon and with an operating unit therein for actuating said cooling means, an air conditioner comprising an insulated chamber in said cabinet provided with air inlet and outlet means, a hollow-walled jacket in said chamber adapted to contain liquid therein and providing an air channel centrally therethru, a chilling unit mounted in thermal relation with the jacket and being operable by said operating unit and connected with said cooling means, means for forcing the air and directing it along the outer side of the jacket and thru the channel centrally thereof, and control means in the connection between said cooling means and said chilling unit and being operable for operating said cooling means alone or in conjunction with said chilling unit.

5. The subject matter set forth in claim 4, wherein the cabinet is provided with adjustable supporting means for adjusting the elevation of the cabinet, and the heat exhaust means is located in the cabinet so that the outlet of the

exhaust means can be positioned in the window to be suited for windows at various heights.

6. In a device of the class described including a cabinet, an insulated chamber in said cabinet provided with air inlet and air outlet means, a hollow-walled annular jacket adapted to contain liquid therein, being spaced from the chamber walls and providing an air channel centrally therethru and an air passage between the jacket and the chamber walls, chilling coils immersed in the liquid in the jacket, an operating unit for operating said chilling coils, means for forcing the air thru the inlet means and deflecting means for directing said air through said air passage along the outside of the jacket and thru said channel in the jacket, and means in the chamber arranged to either retain water in the chamber for humidifying the air or else to draw it from the chamber.

7. The subject matter set forth in claim 6, wherein the liquid retaining means includes valve controlled means on the chamber for draining the water therefrom.

8. In a domestic type of refrigerator including a cabinet having an insulated storage compartment with cooling means therein and having a machinery compartment with heat exhaust means thereon and with an operating unit therein for actuating said cooling means, an air conditioner comprising an insulated chamber in said cabinet provided with air inlet and air outlet means, a hollow-walled jacket in said chamber providing an annular liquid container therein and an air channel centrally therethru, a chilling unit mounted in the liquid in the jacket and being operable by said operating unit, means for forcing the air and directing it along the outer side of the jacket and thru the channel centrally thereof, means on the lower part of the chamber adapting it to contain water for humidifying the circulating air, and control means operable for operating said cooling means alone or in conjunction with said chilling unit.

9. The subject matter set forth in claim 8, wherein the cabinet is provided with adjustable supporting means for adjusting the elevation thereof, and the heat exhaust means is located on the cabinet so that the outlet of the exhaust means can be positioned in the window to be suited for windows at various heights.

10. The subject matter set forth in claim 8, wherein many long sharp prongs are provided on the jacket walls, to project outwardly therefrom into said chamber and also inwardly into said air channel.

11. In a domestic type of refrigerator including a cabinet having a storage compartment with cooling means therein and provided with an operating unit, an air conditioner comprising an insulated chamber in said cabinet provided with air inlet and outlet means, a hollow-walled jacket between the inlet and outlet means in the chamber providing an annular liquid chamber within its walls and also an air channel centrally of the jacket and an air passage between the jacket and the insulated chamber walls, a chilling unit mounted in said liquid chamber to cool the liquid therein and being operable by said operating unit, slender prongs projecting from the inner wall of said jacket and extending substantially to the axial center of said air channel, and means for forcing the air thru the jacket and conditioner and over the surface of said prongs to enhance the cooling effect on said air thereby.

12. A combination air conditioner and refrigerator comprising a cabinet containing a storage chamber with a cooling unit therein, a refrigerating unit in the cabinet to operate the cooling unit, an air channel extending thru the cabinet and including air inlet means and outlet means thereon, annular liquid containing means interposed in said channel, adapted to have the air pass therethru, a freezing unit associated with said containing means and operable by said refrigerating unit to freeze liquid in said containing means and thereby cool the air flowing thru the conditioner, control means for rendering said liquid freezing unit either active or idle while said cooling unit is in operation, whereby the frozen liquid creates a surplus cooling medium adapted to be utilized at certain periods in conditioning the air.

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