VENTILATING SYSTEM FOR REFRIGERATOR MECHANISMS

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Application April 8, 1948, Serial No. 19,668

10 Claims. (Cl. 63—117.4)

The present invention relates to a new and improved combination of means which together form a ventilating system for the refrigerator mechanism housing compartment of a modern refrigerator, such ventilating means being more specifically adapted to refrigerators of the individual unitary type for home use.

It is the present day practice with substantially all refrigerators to dispose the operating mechanism including the main units such as the motor, condenser, compressor, reservoir, etc., in a lower or bottom compartment of the refrigerator with only suitable pipelines leading to the upper portion of the box and to the evaporator in the cooling compartment of the conventional form of refrigerator for conventional operation. Since circulation of air is necessary for the usual operation of the motor-compressor units and the condenser, most of the modern refrigerators merely take in air from about the base of the refrigerator which supports the operating mechanisms and obviously most of this air travels into this portion of the box or refrigerator from openings located adjacent the floor. This air is circulated through and out of the lower compartment of the box by the fan or impeller which is connected with the motor and drives this air through the condenser and out through an opening in the back of the box. In addition, most of the refrigerators are provided with an upwardly extending false back which opens near the upper end of the back of the box, and the function of this false back is to discharge air which circulates through the mechanism compartment and out of the opening in the back of the box in a general vertical direction into the room in which the refrigerator is located.

This system has a number of disadvantages. One such disadvantage is that all of the intake air is drawn directly from about the area surrounding the base or the bottom of the refrigerator adjacent to the floor supporting the same, which obviously causes the intake air to pick up dust, dirt, and lint, together with other airborne materials which are all drawn into the bottom compartment of the refrigerator and directed with the air to pass over as well as through the various operating mechanisms located in this lower compartment of the refrigerator. A considerable amount of this airborne dirt and other materials are deposited upon the mechanism and the oily parts thereof, but a greater portion of this airborne material is forced into the condenser and therethrough by means of the circulating fan which forces the air through the condenser and upwardly through the false back so that this air together with the dirt therein is discharged directly into the room adjacent the wall against which the refrigerator is located.

A further disadvantage of this type of mechanism and the general arrangement thereof for the purpose of circulating the air in the manner pointed out above is the fact that when the various operating mechanisms are shut off under the automatic controls of the box, there is considerable latent heat retained by all of these mechanisms in this portion of the box and more particularly by the compressor which is hot from operation, the motor which also is hot, and a certain amount is retained by the condenser as well as by all of the surrounding connected parts including the base and other units located within this compartment of the refrigerator box. Such latent heat is therefore retained within this compartment causing a heating of the bottom of the cooling compartment of the box, therefore directly tending to reduce the efficiency of the refrigerator, increasing the cost of operation thereof as well as the cost of maintenance by reason of the fact that the operating mechanism of the refrigerator is in motion for a considerably longer space of time than is actually necessary. If the same has stopped running, the efficiency and operation of a comparable refrigerator would be greatly enhanced.

It is one of the main objects of the present invention to provide an efficient and positively operating ventilating system for the circulation and dissipation of air from within the compartment for the operating mechanisms of a refrigerator to thus overcome the aforementioned disadvantages, and which system will increase the efficiency of the box as well as the practical operation thereof on a reduced cost basis both as to cooling operation and as to maintenance of the refrigerator.

It is a further object of the present invention to provide a ventilating system for the compartment of the refrigerator mechanisms which completely confines and directs air through said compartment and which operates both as a self acting ventilating system, and also as a forced air system through the action of the fan or impeller of the refrigerating mechanism that induces air circulation during the period of operation of the mechanism.

Another object of the present ventilating system includes an installation of a permanent na-
ture which can be supplied in new homes under construction, and which also may be readily installed in old homes to introduce such a system. The means used can be a standardized construction capable of supplying a wall fixture for use with the refrigerator, and whereby the latter by means of its self-contained air flow system may be connected to such wall systems to entirely eliminate free circulation of air from about the base of the box or from the floor of the room supporting the refrigerator, and to further eliminate entirely any discharge of airborne dirt and other materials directly into the room in which such refrigerator is located. Such room is usually the kitchen where cleanliness should be paramount.

Another advantage of the present system and the complete installation thereof is that no change is necessary in the location of the refrigeration mechanisms in the lower portion of the box. It is contemplated that the ventilating system of the present invention may be applied with substantially no change to the entire mechanism set-up. About the only requirement is that the compartment housing the refrigerating mechanisms should be sealed to confine the circulation of the air to such compartment and to the proposed ventilating system which operates to produce its own path of circulation of air through such compartment from and to a wall adapter for a duct against which the box is set or placed for permanent location in the manner which shall hereinafter be described.

All other features and advantages relating to the air circulation cooling of the refrigerating mechanisms comprising the motor, compressor, condenser and other analogous cooperative units carried in the lower portion of the modern refrigerator shall hereinafter appear in the following detailed description having reference to the accompanying drawings which illustrate a preferred construction of the system comprising the subject matter of the present invention.

In the drawings:

Fig. 1 is a diagrammatic side elevational view of a modern refrigerator as placed adjacent the wall of a house and as such box would normally be located for operation and use, certain portions of the box being broken away in section with the adjacent fragmentary portions of the house wall also shown in section to better illustrate the details of construction of the complete ventilating system for the refrigerator as contemplated by the present invention;

Fig. 2 is a rear elevational view of the refrigerator illustrated in Fig. 1 also having a portion thereof broken away and in section to show certain other details of construction of the ventilating system;

Fig. 3 is a vertical cross-sectional view taken substantially along the plane of the line 3—3 in Fig. 2 showing the cooperating connecting members of the box and the wall which together form the separable members which comprise an integral portion of the two coating air conflicting parts of the ventilating system; and

Fig. 4 is a front elevational view of the wall adapter and the wall duct as the same would appear by itself and free from any adjacent wall portions with which this unit connects.

This ventilating system comprises two main parts, one part being the portion of the system which is associated with the refrigerator for unitary and complete assembly therewith, so as to be an integral part of the box, and the second part of the system which may comprise a standard installation can be readily built into the wall of a house and provided with a suitable wall adapter prelocated with respect to the place designated for the refrigerator and also prelocated at a certain fixed distance from the floor for direct cooperation with the first part of the system described as forming a unitary portion of the box.

Referring now to Figs. 1 and 2 the refrigerator 5 presents a conventional type of box having a lower compartment 6 for housing the various units that are normally employed for operating the cooling system of the box for refrigerating purposes. Compartment 6 is defined by top and bottom walls 7 and 8, side walls 9 and 10 and a back wall 11, the forward portion of this wall confined compartment 6 being open for the reception of a closure member in the form of a door 12 having one or more suitable clamping units 13 to tighten the door and to seal the opening of the compartment. The door 12 is preferably provided with a gasket 14 to further insure this particular sealing function. Obviously, the door 12 is also adapted for ready removal whenever necessary for servicing or checking the operating system, and to provide for removable wall 8 of the compartment is further provided with aprons 15 and 16 at the sides of the refrigerator and with a connecting apron 17 at the front thereof, which aprons together function as means for supporting the entire box as is readily seen by reference to Figs. 1 and 2.

The refrigeration mechanisms comprise such conventional units diagrammatically illustrated as the motor 18 which drives a pulley and belt mechanism 19 that connects with the conventional compressor 20, the motor 18 also supporting a suitable fan or impeller 21 upon its drive shaft, which fan directs air into and through the condenser 22 to cool the refrigerant flowing therethrough during the usual cycle of operation of the refrigerator. As a rule, the refrigerant reservoir is also carried in this portion of the refrigerator and all of the elements mentioned including the motor 18, compressor 20 and the condenser 22, are mounted upon an integral base 23 that is spring supported upon the bottom wall 8 of the box illustrated in Fig. 1.

The rear of the box is provided with a false back 24 defining the boundaries of an enclosure divided into an air inlet section 25 and an air outlet section 26 as determined by the division wall 27 best illustrated in Fig. 3. A suitable opening 28 substantially the size of the condenser 22 is provided in the rear wall 11 of the compartment 6 and leads into the bottom of the outlet or discharge section 36 of the false back 24. A further suitable opening 29 (Fig. 2) is also formed in the rear wall 11 of the compartment 6 and this opening communicates between the inlet section 25 of the false back 24 and a duct 30 which is located to generally follow the end wall 10 of the compartment 6. Duct 30 is provided with a lateral opening 31 as seen in Fig. 1 which opens into the sealed compartment 8 at the lower portion of the box and in a corner remote with respect to the discharge opening 28 previously described.

Both the inlet and discharge sections 25 and 36 are connected in back 24 by a circular stub duct 32 best illustrated in Fig. 3. This stub duct 32 comprises an outer cylindrical wall 33 terminating in a closed end 34 which abuts the rear portion of the box, and the circular wall 33 fits snugly through an opening 35 suit-
ably prelocated in the false back 24, and the stub duct 32 is soldered or otherwise connected as at 36 to the edge of the opening 35 of the false back 24.

The stub duct 32 is further provided with a horizontal division wall 51 and with two peripheral openings 38 and 39 which communicate directly with the inlet and discharge sections 25 and 26 of false back 24 and to each side of the division wall 31. Thus, as best seen in Fig. 2, the lower semi-circular duct area 40 of the stub duct 32 communicates with the false back 24 through the inlet section of such false back and is connected through the opening 29 to the lateral forward portion of the compartment 5 of the box by means of the opening 31 of the duct 30. The upper semi-circular duct portion 41 communicates through the opening 39 with the discharge section 26 of the false back 24 and is also connected through the opening 28 in the rear wall 11 of the compartment 6 for receiving the discharge air directed out of the sealed compartment 6.

The aforesaid described part of the ventilating system comprises the portion of such duct leading to the opening 46 previously described. A suitable rubber gasket 54 best illustrated in Figs. 3 and 4 nests within the opening or interior of the annular ring 52 and seats against the portions of the duct 42 which surround the semi-circular openings 49 and 50 within the area of the annular ring 52. The facing of the rubber gasket 54 is made with a flange 55 that seats against the surface of the rear wall 56, and the annular opening 57 of the rubber gasket 54 is converted conversingly inwardly to receive the outer end of the stub duct 32 against shoulder 58 of the gasket 54 disposed in coplanar relationship with respect to the outer surface of the part 61 to be described.

The part of the rubber gasket 54 which lies adjacent the wall of the duct is also provided with two semi-circular openings 59 and 60 which are located and arranged to coincide with the openings 49 and 50 of the duct 42. Openings 59 and 60, by reason of their spaced relation about a common axis, are located to either side of a transverse rubber strip 61 which is diametrically formed and horizontally located as best shown in Figs. 3 and 4.

It is readily seen that the rubber gasket 54 which is held in place by the annular ring 52 and is connected with the duct 42 provides a fixed cooperative means forming a wall adapter which is a component part of the ventilating system for the refrigerator when the refrigerator 5 is located in cooperative alignment and positioned next adjacent thereto. The corresponding coacting elements of the ventilating system connected with the refrigerator permit ready operative connection of the openings of the system as described by merely moving the refrigerator in correct alignment with respect to the wall adapter and by then pushing the refrigerator toward the wall and into the position illustrated in Fig. 1. The parts of the system are thereby intimately joined to form a simple functioning and efficient apparatus that provides adequate and confined ventilation of the refrigerator operating mechanism compartment disposed in the lower end of the refrigerator. When the refrigerator 5 is moved into position against the wall, the stub duct 32 occupies the position illustrated in Fig. 3 with the annular outward edge 62 of the duct 32 seated tightly against the shoulder 59 of the rubber gasket 54 and with the transverse division wall 37 of the duct 32 seated against the diametrical strip 61 of the gasket 54 thus joining the upper and lower halves 41 and 46 of the stub duct 32 with the appropriately located and aligned openings 49 and 50 of the gasket 54 and duct 42 in the manner best illustrated in the drawings. In this manner the duct 32 of the false back 24, and the gasketed annular ring 52 of the duct 42 provide separable means operatively joining the two parts of the system to function in the capacity for which they were designed.

During the functional operation of the units of the refrigerating mechanism including the motor 10, compressor 20 and the like the air passes through the bottom end 43 of the duct 42 which then passes into the lower half 40 of the stub duct 32 through the aligned openings 50 and 60 of the duct 42 and gasket 54, and such air then passes through the opening 35 in duct 22 and on into the inlet portion 23 of the false back 24, then through the opening 29 and into the duct 30 to be discharged into the lower
sealed compartment 6 through the opening 31 in duct 30.

This intaken air stream is then forced by the fan or impeller 21 through the condenser 22 and into the discharge section 25 of the false back 24 from which the same discharges through the opening 39 of duct 32 and then into the upper half 41 of such stub duct, the air then passing therethrough from the aligned openings 39 and 49 into the upper section of the duct 42 to be discharged from the opening 45 during this cycle of operation of the entire system. In this manner the invention contemplates an entirely enclosed system adapted for ventilating a sealed compartment within the refrigerator and for cooling the operating mechanisms housed within such compartment. In this manner none of the air from the surrounding area of the refrigerator is drawn into such compartment housing the mechanisms, nor is any of the air that is expelled from this compartment discharged directly into the room or into any space surrounding the refrigerator per se.

Whenever the mechanisms in the lower compartment 5 of the refrigerator are shut off by the automatic controlling instruments of the standard refrigerator, the heated air and heat retained by the aggregate mechanisms will then naturally rise and flow out of the uppermost 52 of compartment 5 and such air will pass upwardly through section 52 of the false back 24 into the upper section 41 of the stub duct 32 and from there such hot air will pass upwardly and out of the duct 42 whereby hot air will efficiently and quickly rise out of compartment 5 underneath the refrigerator proper and cool air will be drawn into the lower end 43 of the duct and into the compartment 6 to accelerate this cooling action of the mechanisms in the lower portion of the refrigerator box at such times when the mechanisms of the compartment 5 have just shut off or are idle.

In this manner the mechanisms of the refrigerator, both when in operation or out of operation, will be adequately and quickly cooled, dissipating heat without objectionable transmission to the box itself and thereby providing a better and more efficiently running refrigerator having all of the advantages herebefore pointed out in the objects and in the foregoing description of the operating means of this invention. The system also introduces a safety factor by establishing means for diverting harmful gases from a refrigerator in the event that a leak or break occurs in the refrigerant system of the box.

Other modifications and changes are contemplated in the present design and construction of the ventilating system of this invention, and the disclosure and description both relate to means only suggested by way of example. All modifications and changes contemplated shall however be governed by the breadth and scope of the language of the appended claims directed to the salient features of this invention.

What I claim is:

1. A wall connection for joining the inlet and outlet conduits of a sealed compartment housing the refrigerator operating mechanisms, with a wall duct having air intake and air discharge portions, comprising an annular ring secured to the wall duct, a divider in said duct positioned diametrically with respect to said ring, said duct having openings therein disposed in alignment with said wall duct openings, said inlet and outlet conduits of said sealed compartment terminating in a divided stub duct having coplanar terminal edges adapted for abutting engagement with said gasket and arranged for dual sealing of intake and discharge portions of said wall duct through the two openings in said duct to either side of the divider in said duct.

2. A ventilating system for drawing off heated air from adjacent the cooling chamber of a refrigerator comprising a refrigerator compartment, operatively connected mechanisms mounted within said compartment for running the refrigerator, said mechanisms including a condenser cooling fan, a unitary housing forming a double air enclosure connected with said compartment having corresponding openings therein disposed in alignment with said wall duct openings, said inlet and outlet conduits of said sealed compartment terminating in a divided stub duct having coplanar terminal edges adapted for abutting engagement with said gasket and arranged for dual sealing of intake and discharge portions of said wall duct through the two openings in said duct to either side of the divider in said duct.

3. In a refrigerator, a sealed compartment adjacent the cooling chamber thereof, operative mechanisms mounted within said compartment for running said refrigerator, and air confining means connected in sealed relation with said sealed compartment comprising a divided stub duct having a double air enclosure connected with said compartment having corresponding openings therein disposed in alignment with said wall duct openings, and an air duct having at least one end open to receive cooled air and another end open at a location remote from the cooling chamber of the refrigerator and above the sealed compartment thereof, said air duct having a fitting to connect with said conduit means including a separate pair of openings to allow heated air to pass out of one section of said sealed compartment and into said duct and to permit cool air to enter the other section of said compartment from said duct.

4. In a refrigerator, a sealed compartment, operative mechanisms including a cooling fan disposed within said compartment to run the refrigerator, air confining means connected with said compartment having one portion thereof opening behind the fan and another portion thereof open in front of the fan, air conduit means connected with the respective portions of said air confining means, and an air duct having one open end disposed for the reception of cold air and the other end thereof to expel warm air, said duct including a fitting for connection with said conduit means, said fitting having one passageway to connect the cool air end of said duct with the portion of the air confining means opening behind the fan, and said fitting having another passageway to connect the warm air end of said duct with the portion of the air confining means with its opening disposed in front of the fan.

5. A ventilating system for a refrigerator to draw cool air through the operating mechanisms thereof comprising a closed compartment to house said mechanisms, a false back on said refrigerating having dual air passageways therein in com-
munication with oppositely disposed portions of said compartment respectively, a divided duct connected with each air passageway of said back, and a vent stack having one end positioned to receive cool air and its other end to discharge said air, said vent stack being divided and hav-

ing a dual opening fitting for communication with said divided duct, and said fitting being adapted for operative connection with said divided duct to provide cool air passage from said stack to said compartment and warm air passage from said compartment into said stack.

6. In combination with a refrigerator having a compartment to house mechanisms to operate the refrigerator, a wall duct having one end adapted for cool air intake and another end for warm air outlet, an enclosure wall of said re-

frigerator having a pair of chambers with open-

ings disposed in spaced relation in said refrigera-
tor compartment, said wall duct having a dividing wall therein to segregate the cool air portion of said duct from the warm air portion thereof, and a separable coupling to provide one air passageway between said cool air portion of said wall duct and one of the chambers of said enclosure wall, and to provide another air passageway be-
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7. In combination with a refrigerator having a compartment to house mechanisms to operate the refrigerator, a wall duct having one end adapted for cool air intake and another end for warm air outlet, an enclosure wall of said re-

frigerator having a pair of chambers with open-

ings disposed in spaced relation in said refrigera-
tor compartment, said wall duct having a dividing wall therein to segregate the cool air portion of said duct from the warm air portion thereof, and a separable coupling to provide one air passageway between said cool air portion of said wall duct and one of the chambers of said enclosure wall, and to provide another air passageway be-
tween the other of the chambers of said enclosure wall and the warm air portion of said wall duct and one of the chambers of said enclosure wall, and to provide another air passageway be-

8. In combination with a refrigerator, a sealed compartment to confine the operating mecha-

nisms of the refrigerator therein, a false back on said refrigerator comprising an air conducting means having an air inlet section connected with one portion of said sealed compartment and having an air outlet section connected with another portion of said sealed compartment, a divided wall duct disposed adjacent said refrigerator and having air intake and air discharge sections with open ends disposed in remote positions with re-

9. In combination with a refrigerator, a sealed compartment, refrigerating operating mechanisms including a motor driven fan housed within said compartment, a false back on said refrigerator comprising an air conducting means having an air inlet section connected with said compartment in a position removed from the location of said fan, and having an air discharge section connected with said compartment in a position to receive the air stream discharged by said fan, a divided wall duct disposed adjacent said refrigerator and having air intake and air discharge sections with open ends disposed in remote positions with re-

10. A ventilating system for drawing off heated air from adjacent the cooling chamber of a re-

frigerator, comprising a refrigerator compart-

ment having mechanisms mounted therein for running the refrigerator, an air confining cover connected with said compartment in the form of a divided housing having communication at spaced points with said compartment and terminating with adjacent inlet and outlet openings disposed at a predetermined location with re-

spect to said refrigerator, and an independent air vent duct arranged for connection with said re-

frigerator and having at least one opening therein disposed in a location remote from said refriger-

ator and above the compartment thereof and hav-

ing at least one other opening therein for con-

nection with said refrigerator compartment, and a separable conduit to join said one other open-

ing of said air vent duct with at least one opening of said divided housing to provide com-

munication between said refrigerator compart-

ment and said air vent duct.

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