

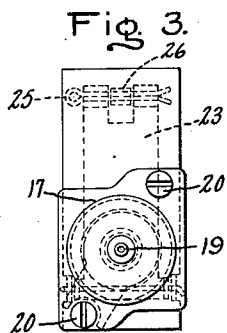
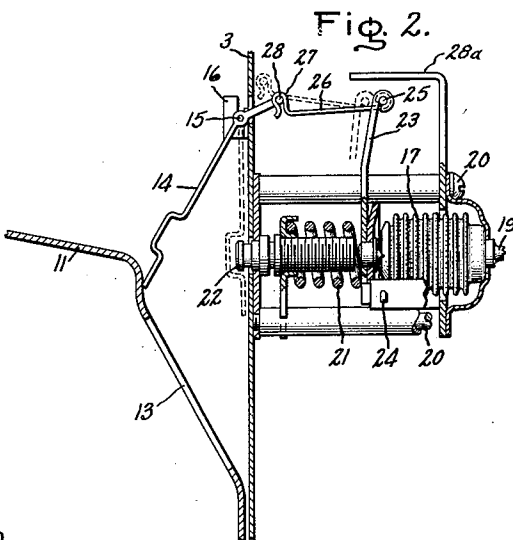
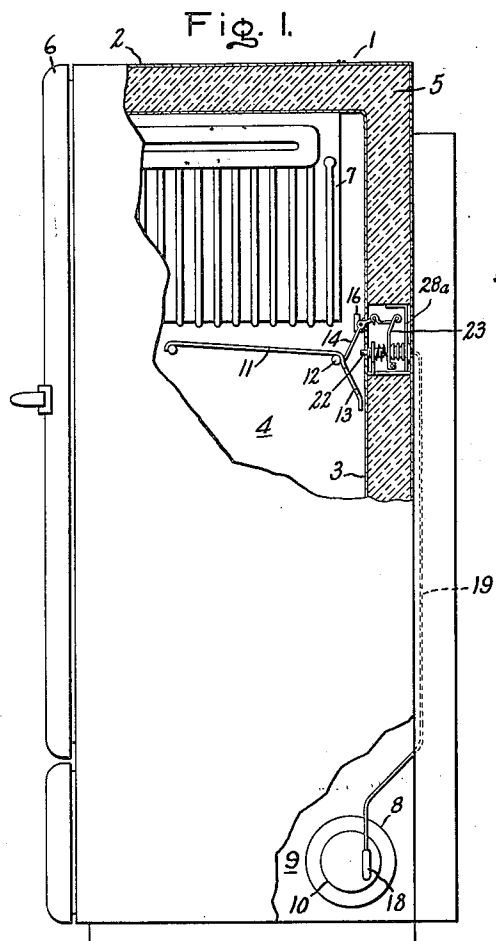
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REFRIGERATOR AIR CIRCULATION CONTROL

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REFRIGERATOR AIR CIRCULATION
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6 Claims. (Cl. 62—3)

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My invention relates to refrigerators and more particularly to arrangements for controlling air circulation within the refrigerator cabinets.

It is an object of my invention to provide an improved arrangement for controlling air circulation within a refrigerator cabinet.

It is a further object of my invention to provide an improved arrangement for controlling air circulation in a refrigerator cabinet to compensate for variations in ambient temperature and in load on the refrigerator.

Further objects and advantages of my invention will become apparent as the following description proceeds, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In carrying out the objects of my invention, a damper is provided for controlling the circulation of air through a passage within the food storage compartment of the refrigerator cabinet. The position of this damper is controlled in response to the temperature of the refrigerating unit, and more specifically the temperature of the case of the motor-compressor assembly, so that the circulation of air is increased as a temperature of the case increases and vice versa.

For a better understanding of my invention, reference may be had to the accompanying drawing in which Fig. 1 is a side elevation view, partly broken away, of the refrigerator cabinet incorporating an embodiment of my invention; Fig. 2 is an enlarged side elevation view of a portion of Fig. 1; and Fig. 3 is an end view of the apparatus shown in Fig. 2.

Referring now to the drawing, there is shown a refrigerator cabinet 1 which includes an outer wall 2 and a spaced inner wall or liner 3 which defines a food storage compartment 4. The space between the inner and outer walls is filled with a suitable heat-insulating material 5. The access opening of the storage compartment 4 is closed by a hinged door 6.

A cooling unit or evaporator 7 is disposed in the upper portion of the compartment 4 for cooling this compartment. Refrigerant is supplied to the evaporator 7 from a refrigerating unit 8 disposed in a machinery compartment 9 at the bottom of the refrigerator. The refrigerating unit 8 is of the conventional type well known in the art which includes a motor-compressor assembly (not shown) disposed within a hermetically-sealed case 10.

The compartment 4 is refrigerated by air which moves by natural circulation over the evapo-

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rator 7 downwardly to the bottom of the compartment 4 and then, as the air becomes warmed, upwardly to the evaporator 7. A path for circulation of air within the food storage compartment is defined by a baffle 11. This baffle 11 is positioned beneath the evaporator 7 and supported on a plurality of supports 12 mounted on the liner 3. As illustrated, the baffle 11 extends substantially to the rear wall of the liner 3, an opening 13 being provided in the rear portion of the baffle 11 defining a passage for circulation of air therethrough. Thus air circulating within the compartment 4 passes rearwardly between the evaporator 7 and the baffle 11 and then downwardly through the opening 13. Alternatively, of course, the baffle 11 could be terminated at the opening 13 so that the rear end of the baffle is itself spaced from the rear wall of the liner 3 to define an air-circulating passage.

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The refrigeration requirements for maintaining the compartment 4 at a proper temperature may vary dependent upon a number of factors. For example, these requirements increase as the ambient temperature increases and to maintain a proper operating temperature in the compartment 4 under the condition of increased ambient temperature, it is desirable to increase the rate of air circulation over the evaporator 7 and through the compartment 4. Also the refrigeration requirements increase substantially with increased load, for example, that attributable to an increased number of openings of the door 6. By my arrangement air circulation in the compartment 4 is varied to compensate for these variations in ambient temperature and in increased load. As the ambient temperature increases or as an increased load is placed on the refrigerator, for example by increased door openings, these increases are reflected in an increase in the operating temperature of the refrigerating unit and, more specifically, in the temperature of the case 10 which surrounds and hermetically seals the motor-compressor assembly. To effect the aforementioned compensation, a damper 14 is provided in the food storage compartment, and this damper is controlled automatically in response to the temperature of the refrigerating unit 8.

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The damper 14 is arranged for controlling flow of air through the aforementioned passage so as to regulate this flow of air in accordance with the temperature of the refrigerating unit 8 or, more specifically, with the temperature of the case 10 of this refrigerating unit. The

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damper 14 is pivoted at 15 on a bracket 16 which is mounted on the liner 3. The damper is moved by a closed control system which includes a bellows 17, a temperature-responsive bulb or feeler 18 and a connecting tube 19. This closed control system is charged with a volatile fluid. The temperature-responsive bulb or feeler 18 is mounted on the case 10 of the refrigerating unit in direct heat exchange relationship therewith. The bellows 17 is positioned within a recess in the insulation between the spaced inner and outer walls of the refrigerator, being supported by studs 20 or other suitable supporting elements. The expansion of the bellows is opposed by a coil spring 21. The compression of the spring 21 may be adjusted by a screw 22 accessible from the compartment 4 for properly calibrating the apparatus. The bellows 17 and the spring 21 bear against an arm or member 23 which is pivoted at 24. The free end of the arm 23 is connected by a pin 25 to a link 26. The other end of the link 26 is formed in a hook as indicated at 27 to engage a pin 28 on the damper 14. An L-shaped bracket 28a is provided to support the heat-insulating material 5 to space it from the above-described mechanism.

As the bellows 17 expands the arm 23 is moved by the bellows toward the dotted line position indicated in Fig. 2, swinging the damper 14 in a counterclockwise direction about its pivot 15 to increase the circulation of air through the opening 13. As the bellows contracts the spring 21 moves the arm 23 back toward its solid line position, thereby swinging the damper 14 in a clockwise direction toward its solid line position, as illustrated in Fig. 2.

Under varying conditions of ambient temperature and under varying loads, the temperature of the refrigerating unit and, more specifically, the temperature of the case 10 thereof, varies over a substantial range, and this wide range of the controlling function makes it possible to operate the damper without sensitive and expensive apparatus. Moreover, this wide swing in the controlling function makes a large quantity of energy available for actuating the damper. Finally, the utilization of the case temperature as a controlling function enables the control to compensate not only for ambient temperature changes but also for other variations such as changes in door opening load which increase the load on the refrigerator and on the refrigerating unit.

The operation of the apparatus is as follows. Under conditions of low ambient temperature and relatively small load on the refrigerator, the temperature of the case 10 will be at a low point in its range and the resultant contraction of the bellows 17 may position the damper 14 substantially in engagement with the baffle 11, as illustrated by the solid lines in Fig. 2, thereby substantially blocking the circulation of air within the compartment 4. As the ambient temperature increases or as the load on the refrigerator increases, for example by an increased number of door openings, the temperature of the case 10 rises, causing an expansion of the bellows 17. The linkage 23, 26 is thereby moved toward the dotted line position shown in Fig. 2, swinging the damper in a counterclockwise direction toward the dotted line position and affording an increasing amount of air circulation through the opening 13. This increased circulation of air over the cooling unit 7 and

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through the compartment 4 provides more effective cooling of the compartment 4 and enables the maintenance of a substantially constant temperature therein despite the aforementioned variation in the ambient temperature or in the load. The opposite shifting of the controlling apparatus occurs upon decrease in ambient temperature or decrease in load resulting in a decrease in the case temperature. This opposite movement results in a reduction in the amount of air circulating over the cooling unit and through the compartment 4, minimizing the danger of freezing fresh food stored within a compartment 4.

While I have shown and described a specific embodiment of my invention, I do not desire my invention to be limited to the particular construction shown and described and I intend, by the appended claims, to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A refrigerator including a refrigerating unit, a food storage compartment and a cooling unit for said compartment, means within said compartment defining a passage for air circulating over said cooling unit and through said compartment, means for controlling flow of air through said passage, and means responsive to the temperature of said refrigerating unit for controlling the position of said air controlling means.

2. A refrigerator including a refrigerating unit, a food storage compartment and a cooling unit for said compartment, means within said compartment defining a passage for air circulating over said cooling unit and through said compartment, a damper for controlling flow of air through said passage, and means responsive to the temperature of said refrigerating unit for controlling the position of said damper.

3. A refrigerator including a refrigerating unit, a food storage compartment and a cooling unit for said compartment, said refrigerating unit including a motor-compressor assembly positioned within a hermetically-sealed case, means within said compartment defining a passage for air circulating over said cooling unit and through said compartment, a damper for controlling flow of air through said passage, and means responsive to the temperature of said case for controlling the position of said damper.

4. A refrigerator including a refrigerating unit, a liner defining a food storage compartment and a cooling unit for said compartment, a baffle within said food storage compartment below said cooling unit and spaced from a wall of said liner to provide a passage for air circulating over said cooling unit and through said compartment, a damper positioned adjacent said wall of said liner for controlling flow of air through said passage, and means responsive to the temperature of said refrigerating unit for controlling the position of said damper.

5. A refrigerator including a refrigerating unit, a liner defining a food storage compartment and a cooling unit for said compartment, a baffle within said food storage compartment below said cooling unit, said baffle having an opening therein for air circulating over said cooling unit and through said compartment, a damper for controlling flow of air through said opening, and means responsive to the temperature of said refrigerating unit for controlling the position of said damper.

6. A refrigerator including a refrigerating unit,

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a food storage compartment and a cooling unit for said compartment, said refrigerating unit comprising a motor-compressor assembly disposed within a hermetically-sealed case, means within said compartment defining a passage for air circulating over said cooling unit and through said compartment, a damper for controlling flow of air through said passage, a bellows for positioning said damper, a spring opposing said bellows, and a closed control system including said bellows and a temperature-responsive feeler connected thereto, said system having a volatile fluid therein, said feeler being mounted on said case in heat exchange relationship therewith whereby increase in temperature of said case causes expansion of said bellows to move said damper for increasing air circulation through said passage.

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