May 31, 1966 J. X. MATYSKELLA 3,253,422

ARRANGEMENT OF CONTROL MEANS IN REFRIGERATOR APPARATUS

Filed April 13, 1964 2 Sheets-Sheet 1

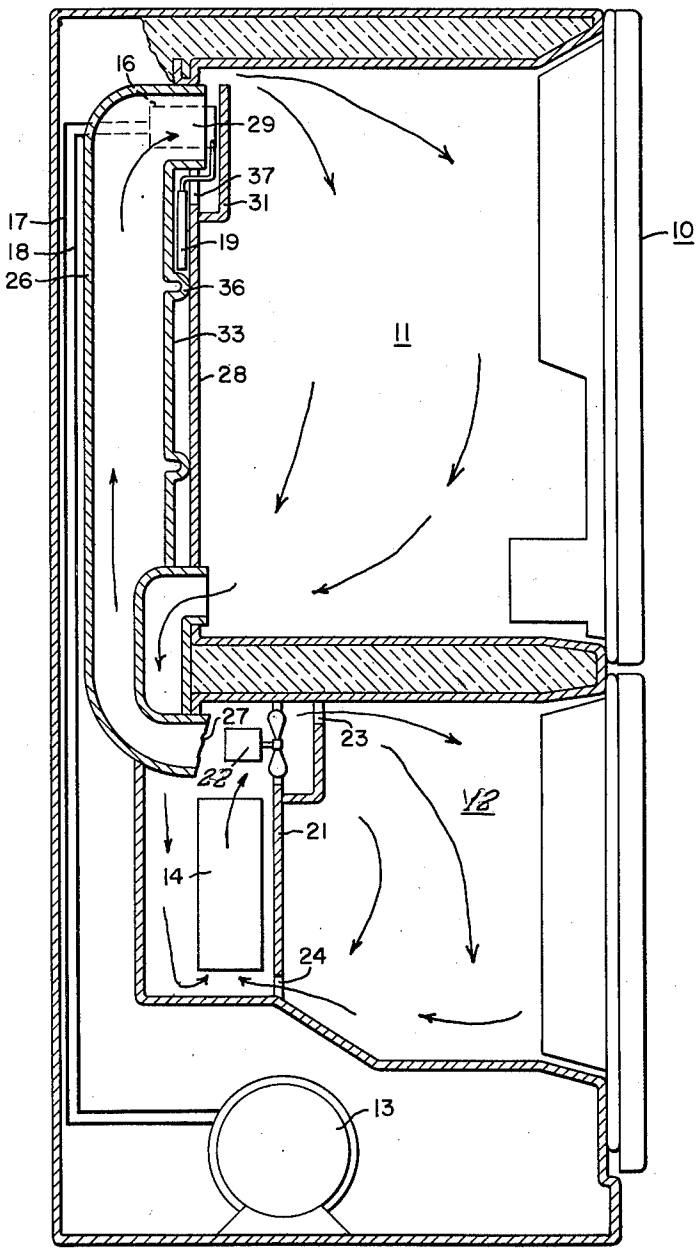


Fig. 1.

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ARRANGEMENT OF CONTROL MEANS IN REFRIGERATOR APPARATUS

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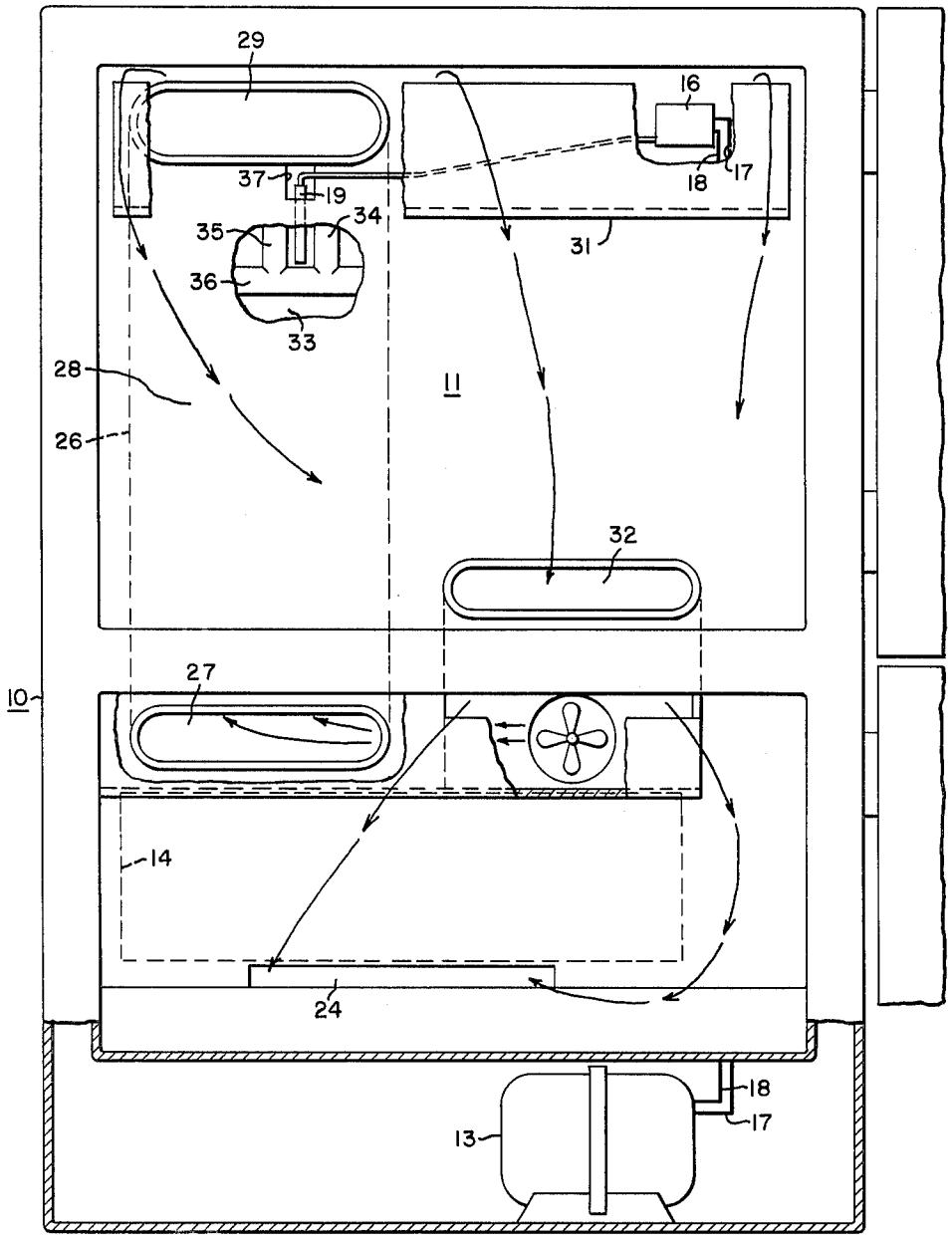


Fig. 2.

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ARRANGEMENT OF CONTROL MEANS IN REFRIGERATOR APPARATUS

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This invention relates to refrigerator apparatus and more particularly to an arrangement of the control elements in such apparatus.

In a domestic type refrigerator, the refrigeration system is generally controlled by a temperature sensing element located at a critical position within a compartment in which the temperature is to be maintained. However, a problem often exists in providing a location for the sensing element wherein the element is effective to react to the temperature of the compartment, yet is unaffected by various air currents flowing into the compartment.

It has been found, for instance, that location of the control element in the food compartment of a domestic refrigerator results in the objectionable warming of the control element when the food compartment door is opened. In such an arrangement, opening the food compartment door in a 90° ambient warms the control bulb to a temperature sufficient to attempt compressor starting in approximately one minute. This resulting attempt to start the compressor before the system has equalized, causes nuisance trips of the overload protector until the compressor has the ability to start.

It is therefore an object of the present invention to provide refrigerator apparatus having a temperature sensing means located such that warm air flow entering the food compartment is ineffective to initiate operation of the refrigeration system.

Another object of the invention is to provide refrigerator apparatus wherein the temperature sensing means is substantially shielded from warm air flow entering the food compartment when the food compartment door is in the opened position.

These and other objects are effected by the invention as will be apparent from the following description taken in connection with the accompanying drawings, forming a part of this application, in which:

FIGURE 1 is an elevational view partly in section, showing a refrigerator cabinet having the invention employed therein; and

FIGURE 2 is a front elevational view of the cabinet of FIG. 1, having portions of the structure broken away for clarity, showing further details of the invention.

Although the principles of the invention are broadly applicable to refrigerator apparatus, the invention has been herein illustrated as employed in a refrigerator-freezer combination, and will be so described.

Referring to the drawings, there is shown a refrigerator-freezer cabinet **10** having an above freezing compartment **11** for the storage of fresh foods, and a below freezing compartment **12** for storage of frozen food.

The cabinet **10** has a refrigerating system of the compressor-condenser-evaporator type which includes a refrigerant compressor **13**, and an evaporator **14** disposed at the rear of the freezer compartment **12**. Initiation and termination of the operation of compressor **13** is controlled by a control means in the form of a bellows type control element **16** connected to the compressor **13** by lines **17** and **18**. The control element **16** is operatively connected to a fluid containing bulb **19** which senses the temperature impinging on the bulb surface. A change in the temperature of the control bulb surface causes change in fluid pressure in the bulb, which actuates the bellows in the control element **16** to make or break contact in the electrical circuit of the compressor **13**.

The refrigeration system and related controls thus far enumerated are well known in the art, and therefore have been explained only in sufficient detail as they are pertinent to the present invention.

In the refrigerator construction shown, a single evaporator **14** is employed to cool both the below freezing compartment **12** and the above freezing compartment **11** by means of air passages and duct structure disposed in the cabinet **10**. As will be observed in the drawings, air is drawn upwardly through the evaporator **14**, and is blown against a baffle structure **21** by a blower **22**. A portion of the air flows through an opening **23** in the baffle structure **21**, into the freezer compartment **12**, and returns through an opening **24** in the lower portion of the baffle structure.

The remaining portion of the air blown against the baffle **21** enters a duct structure **26** through a slotted opening **27** and travels upwardly through the duct which is disposed adjacent the rear wall **28** of the compartment **11**. At the upper end of the duct structure **26** the air is exhausted through an opening **29**, and impinges on the diffuser plate **31** which functions to distribute the air throughout the compartment **11**.

Air flow from the compartment **11** passes through an opening **32** at the bottom of the compartment, and is directed through a secondary duct structure to the evaporator **14** for recirculation.

In the system disclosed, to insure the maintenance of proper temperatures in the fresh food compartment **11** and freezer compartment **12**, the control element **16** and associated control bulb **19** are calibrated to respond to the temperature of the fresh food compartment for controlling the refrigeration system. With the system so arranged, it becomes necessary to place the control bulb **19** at some point in the compartment **11** at which an increase in temperature of the compartment will so affect the bulb as to initiate operation of the refrigeration system, and a decrease in temperature in the compartment will cause the control bulb to terminate operation of the system.

In employing the present invention, the duct structure **26** has a front wall **33** disposed in spaced relation to the compartment wall **28**. A pair of vertical webs **34** and **35** and a horizontal web **36** are provided on the wall **33** in contact with the compartment wall **28**. In addition to providing spacer members to maintain the relationship between the wall **28** and the duct structure **26**, the webs **34**, **35** and **36** define an enclosure adjacent the opening **29** of the duct structure. A small opening **37** is provided in the compartment rear wall **28** adjacent the opening **29** to provide access to the enclosure formed by the webs.

With the control element **16** supported adjacent the diffuser plate **31**, the control bulb **19** is dropped through the opening **37** where it is supported in the enclosure.

In operation, during the ON cycle the cold air enters the compartment **11** through the openings **29** and impinges on the control bulb **19**, thereby cooling the bulb as the compartment is cooled. With the refrigeration system shut down, should the door be opened in a 90° ambient or other unusually warm condition, the warm air entering the compartment does not affect the control bulb **19** which is substantially shielded by the rear wall **28**. During normal warm-up of the compartment **11**, however, the characteristic of the duct **26** and wall **28** to warm slowly provides a sufficient period of time for the pressure of the refrigeration system to equalize before the control attempts to start the compressor motor.

It should therefore be obvious that the provision of an enclosure in the compartment **11** to shield the control bulb **19** serves to provide a thermal lag for the control bulb, which prevents nuisance trips of the overload protection for the compressor **13**.

While the invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof.

What is claimed is:

1. Refrigerator apparatus comprising:
an outer cabinet including outer cabinet walls;
an above-freezing storage cabinet defined by liner walls spaced inwardly from said outer cabinet walls;
a refrigeration system including a refrigerant evaporator;
an air-flow system including an air-duct having an inlet receiving air cooled by said evaporator and extending between one of said liner walls and the facing outer cabinet wall, said duct having an outlet in communication with said storage compartment;
a controller for said refrigeration system; and
temperature sensing means connected to said controller, said temperature sensing means including a part thereof located between said duct and said liner wall facing said duct so that said part reflects the temperature of said duct.

2. Refrigerator apparatus according to claim **1** wherein:
said air duct includes means on its wall facing said liner wall defining an open-ended enclosure with said liner wall to receive said part of said temperature sensing means therewithin.

3. Refrigerator apparatus according to claim **1** including:
wall means defining a partly-open chamber with said liner wall through which said outlet communicates with said storage compartment, said temperature sensing means being confined in said partly-open chamber in shielded relation to said storage compartment.

4. Refrigerator apparatus comprising:
a cabinet having wall structure defining a food storage compartment having a front opening,
a door for closing said compartment front opening,
a refrigeration system disposed in said cabinet and including
a heat exchanger located exterior of said compartment,
structure defining duct means having an outlet opening into said compartment for directing flow of cooled air from said heat exchanger to said compartment,
temperature sensing means disposed adjacent one of said compartment walls,
control means operatively connected with said sensing means for initiating and terminating operation of said refrigerating system in response to said temperature sensing means, and
wall means including a portion of said one compartment wall and a portion of said duct structure defining an enclosure for receiving said sensing means therein,

said temperature sensing means disposed within said enclosure so that said sensing means reflects the temperature of said duct and is shielded from warm air flow entering said compartment through said opening with said compartment door in the open position.

5. Refrigerator apparatus comprising;
a cabinet having wall structure defining a food storage compartment having a front opening,
a door for closing said compartment front opening
a refrigeration system disposed in said cabinet and including
a heat exchanger located exterior of said compartment
structure defining an air duct having an outlet opening in one of said compartment walls for directing flow of cooled air from said heat exchanger to said compartment,
a temperature sensing element disposed adjacent said opening in said one wall,
control means operatively connected with said sensing element for causing operation of said refrigeration system in response to said temperature sensing element, and
wall means including a portion of said one compartment wall and a portion of said duct structure defining an enclosure for receiving said sensing element therein,
said temperature sensing means being disposed within said enclosure in part at least to reflect the temperature of said duct and be substantially shielded from warm air flow entering said compartment through said opening with said floor in the open position.

6. Refrigerator apparatus comprising;
a cabinet having wall structure defining an above freezing compartment having a front opening,
a door for closing said front opening,
a refrigerating system disposed in said cabinet and including
a heat exchanger located exterior of said compartment,
one of said compartment walls having an opening provided therein,
structure defining an air duct disposed in spaced relation to the outer surface of said one wall and communicating between said opening and said heat exchanger for directing flow of air to said compartment,
a blower disposed in said cabinet for causing air flow through said duct,
a temperature sensing element disposed with a part thereof adjacent said opening and in said space between said one wall and said duct structure so that said part reflects the temperature of said duct, and
control means operatively connected with said sensing element for causing operation of said refrigeration system in response to said temperature sensing element.

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MEYER PERLIN, *Primary Examiner.*