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TEMPERATURE AND HUMIDITY CONTROLLED REFRIGERATING APPARATUS

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5 Claims. (Cl. 62—114)

1. This invention relates to refrigerating apparatus. More particularly the invention deals with means for controlling humidity and circulation of air through apparatus of this type and kind in maintaining a desired atmosphere within the refrigerating apparatus for any purpose, and particularly in the processing of chocolate candies.

The novel features of the invention will be best understood from the following description when taken together with the accompanying drawing, in which certain embodiments of the invention are disclosed, and in which the separate parts are designated by suitable reference characters in each of the views, and in which:

Fig. 1 is a perspective view diagrammatically illustrating a refrigerating apparatus showing part of the apparatus in open position; and

Fig. 2 is a section on the line 2—2 of Fig. 1 on an enlarged scale diagrammatically showing the general arrangement of the mechanism of the refrigerator.

In illustrating one adaptation and use of my invention, I have shown in the accompanying drawing the box, casing, or cabinet 10 of a refrigerator. The cabinet 10 is of double walled construction throughout, in other words, comprises inner and outer sheets 11 and 12 between which is a body of insulation 13, as will clearly appear from the sectional illustration of Fig. 2.

Considering Fig. 1, it will appear that the front wall has a large door opening 14 adapted to be closed by a double walled door 15 which constitutes part of a truck or tray carrying member 16 which may also be termed a supplemental cabinet. The member 16 is mounted on castors or rollers 17 to facilitate free movement over a floor or other supporting surface which is indicated at 18. The cabinet 10 is so mounted in connection with the surface 18 as to dispose the upper surface 19 of the bottom wall of the cabinet in alignment with the surface 18, as will clearly appear from a consideration of Figs. 1 and 2 of the drawing. It will thus be apparent that the member 16 may be moved into and out of the refrigerator cabinet without distortion to the member 16, thus maintaining a plurality of candy supporting trays 20 in horizontal position at all times in the member 16.

The trays 20 are supported on cleats 21 and 22 arranged upon the inner surface of the cover 15 and the inner surface of the inner wall 23 of the member 16. The member 16 is open at both sides so that the trays 20 are free to slide onto the cleats 21 and 22 from either side of the member. It will thus be apparent that by bringing the member 17 into position at a loading station, these trays may be slid into the member from one side while the other trays are discharged from the opposite side. The trays 20 may, in some uses, simply be shelves upon which articles can be supported.

Within the cabinet are upper and lower supplemental top wall portions 24 and 25, these portions dividing the upper closed end 26 of the cabinet into two transverse chambers 27 and 28 in communication with opposite sides of the cabinet, as seen at 29 and 30. The wall 29 forms the top of the refrigerating chamber 31 of the cabinet into which the member 16 is free to pass through the opening 14. The chamber 31 is also defined by supplemental side walls 32 and 33 which form vertical circulating passages 34 and 35 at opposite sides of the cabinet and in alignment with the passages 29 and 30 respectively.

The walls 32 and 33 are both provided with vertically spaced longitudinal circulating passages 36 and 37. Pivoted to the wall 33 adjacent each of the passages 37 are adjustable vanes 38 adapted to control the circulating passages 37 and regulating the flow of air from the passage 35 into the chamber 31. Other vanes 38a are adjustably pivoted to the wall 32 adjacent the passages 36 and further control circulation through the chamber 31 and out through the passages 35 and 34.

Supported in the chamber 28 between the walls 24 and 25 is an electric motor 39 actuating a fan or blower 40 which is exposed at one side of refrigerating coils 41. At the other side of these coils, and preferably in spaced relation thereto is supported an open work-heating unit 42 through which air blown around the coils 41 is adapted to pass into the passages 30 and 35 or either of them. Supported in the chamber 28 adjacent the passages 30 and 35 is a damper or butterfly control 43 pivotedly supported, as seen at 44, and manually or otherwise operated or adjusted to control the size of the discharges from the chamber 28 into the passages 30 and 35 in controlling the circulation of air through the apparatus and particularly in regulating the temperature of this air. The damper or butterfly 43 is of sufficient size to completely shut off either of the passages 30 and 35, and may be adjusted to relatively increase or decrease the size of these passages at least where they communicate with the chamber 28, it being understood in this connection that the passage 35 is a long passage extending the full height of that part of the cabinet occupied by the chamber 31.
Extending from the refrigerating coils 41 is a condensate line 45 which extends out through the refrigerating coils 46. Air passed through the walls of the cabinet 35 and communications 47 and 48, the communication 47 leading to a thermostat bulb 49, whereas the communication 48 extends to a humistat device 50, both of the latter controls being located in the upper portion of the chamber 34. These communications extend in and out into engagement with the automatic controls on the damper or butterfly 43, as well as any other part of the refrigerating apparatus as a whole in controlling the operation of the apparatus. At the same time, they will also be in operative connection with the refrigerating unit as in other refrigerating apparatus and may also be employed to control operation of the electric heater 44.

In the processing of candy, and particularly chocolate candy, it has been difficult to control the setting or hardening of chocolate by reason of the difficulty in controlling not only the question of temperature of a cooling unit but also the humidity of the atmosphere exposed to the candy. From experience it has been found that best results are accomplished by maintaining the chocolate at a substantially fixed temperature and in a relatively dry atmosphere throughout the setting period in order to produce the most desirable results in the resulting candy. That is to say, an even hardening or setting of the chocolate throughout the thickness of the chocolate and to obviate what might be regarded as case or surface hardening, usually experienced in excessive chilling or too quick setting of the chocolate. Furthermore, an apparatus of the kind under consideration may be so regulated and controlled that the temperature to which the candy is subjected during the setting or hardening process can be varied during the processing of a single batch of candy or from time to time in treatment of different batches of candy having different consistencies or properties. Considerable difficulties have also been experienced in using refrigeration apparatus of the conventional construction from the standpoint of time factor involved in placing a series of trays in the refrigerator and the loss of temperature by virtue of this delay in first removing the processed trays and in the insertion of new trays of candy for further processing.

With my present construction, a number of the tray units or members 16 can be employed in conjunction with each cabinet, and assemblages of these units can be made so that in the removal of one processed unit from the cabinet, another assembled unit may be immediately inserted into the cabinet, thus maintaining high efficiency in the operation of the cabinet and minimizing on the losses in the operation of the refrigerating apparatus. Suitable means may be provided for sealing the door 15 of the unit on the outer surface of the cabinet, but as such devices form no specific part of my present invention, they are not shown. In fact, the entire illustration is in the accompanying drawing, diagrammatic, as I am not concerned with the specific structural details of the several parts of the apparatus, but more in general arrangement, which is clearly illustrated.

By providing the independent adjustable vanes 36-36a, circulation of heated air from the passage 35 into the chamber 31 may be regulated so as to provide a good distribution of the air through the entire height of the unit. This air will pass through the passages 37, across the trays supported in the member 16, then out through the passages 34 and then into the chamber 31. It is then recirculated by the fan or blower 30 through the coils 41 and heater 42. The damper or butterfly 43 controls the volume of air circulated into the passage 38. The balance of this air extends through the damper or butterfly 43 and then back into the chamber 31 through the passage 39 and becomes a recirculated current of air which will maintain high efficiency in operation of the apparatus. In other words, assuming the damper or butterfly 43 is manually or automatically set at a position similar to that shown in Fig. 2 where a comparatively small discharge is provided at 51 into the passage 38 and a large discharge 52 is provided into the recirculating chamber 27.

It will then be apparent that the apparatus is calling for a minimum amount of heated air to be circulated through the chamber 31 for proper functioning of the apparatus. In this way, and from time to time, the heating unit as at 42 may actually be cut off. On the other hand, when a large volume of heated air is required for supply to the chamber 31, the damper or butterfly 43 may be entirely dispensed with or rendered inoperative or an auxiliary or booster cooling unit employed. In still other instances, the principle of forced air circulation through a refrigerating apparatus or cooling unit of any type or kind may be employed. As may be apparent from this kind, and particularly refrigerator boxes or cabinets, circulation is dependent entirely upon normal circulation of hot and cold air. Providing the forced draft circulation according to the principles illustrated in Fig. 1, and in distributing this circulation throughout the entire area of the refrigerating chamber or compartment of the apparatus will produce a more highly efficient unit and will also provide throughout the chamber 31 a more even distribution of temperature for the processing or preservation of products located in different parts of the chamber of the apparatus. It will also be understood that where independent or variable temperatures are required in different parts of a storage chamber, these may be further controlled by the adjustable vanes 36-36a to intensify or diminish the temperature of the forced circulated air through the storage chamber. One of the other distinctive features of my invention resides in the mounting of a refrigerating apparatus in connection with a floor or roof, or a somewhat diagonal in such manner as to enable the truck or carrier member to maintain a non-tiled horizontal position at all times. This is particularly desirable when distortion of trays or the products supported on the trays would be detrimental in the processing stage, particularly before setting and hardening in the refrigerating apparatus.

Having fully described my invention, what I
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5 claim as new and desire to secure by Letters Patent is:

1. A refrigerating apparatus of the class described comprising an insulated walled cabinet, said cabinet having a large refrigerating chamber therein defined by top and side walls spaced from the cabinet walls and forming in conjunction therewith communicating circulating passages at the top and sides of the cabinet, means comprising vertically spaced and horizontally aligned passages in opposed side walls of said cabinet placing the side wall passages in communication with said chamber at vertically spaced intervals, means providing forced circulation of air from the upper passage downwardly through one of the side passages across said chamber and upwardly through the other side passage in the operation of the apparatus, adjustable means controlling the intake of air into the chamber through the vertically spaced passages at the intake side of the cabinet, other means controlling the volume of air introduced into the first named intake side passage, and last named means also controlling recirculation of air through said top circulating passage.

2. A refrigerating apparatus of the class described comprising an insulated walled cabinet, said cabinet having a large refrigerating chamber therein defined by top and side walls spaced from the cabinet walls and forming in conjunction therewith communicating circulating passages at the top and sides of the cabinet, means comprising vertically spaced and horizontally aligned passages in opposed side walls of said cabinet placing the side wall passages in communication with said chamber at vertically spaced intervals, means providing forced circulation of air from the upper passage downwardly through one of the side passages across said chamber and upwardly through the other side passage in the operation of the apparatus, adjustable means controlling the intake of air into the chamber through the vertically spaced passages at the intake side of the cabinet, other means controlling the volume of air introduced into the first named intake side passage, and last named means also controlling recirculation of air through said top circulating passage, hot and cold temperature control means arranged in the top passage and through which a forced circulated air is adapted to pass, and a thermostat control in said chamber.

3. A refrigerating apparatus of the class described comprising an insulated walled cabinet, said cabinet having a large refrigerating chamber therein defined by top and side walls spaced from the cabinet walls and forming in conjunction therewith communicating circulating passages at the top and sides of the cabinet, means comprising vertically spaced and horizontally aligned passages in opposed side walls of said cabinet placing the side wall passages in communication with said chamber at vertically spaced intervals, means providing forced circulation of air from the upper passage downwardly through one of the side passages across said chamber and upwardly through the other side passage in the operation of the apparatus, adjustable means controlling the intake of air into the chamber through the vertically spaced passages at the intake side of the cabinet, other means controlling the volume of air introduced into the first named intake side passage, and last named means also controlling recirculation of air through said top circulating passage, hot and cold temperature control means arranged in the top passage and through which a forced circulated air is adapted to pass, and a humidostat control in said chamber.

4. A refrigerating apparatus of the class described comprising an insulated walled cabinet, said cabinet having a large refrigerating chamber therein defined by top and side walls spaced from the cabinet walls and forming in conjunction therewith communicating circulating passages at the top and sides of the cabinet, means comprising vertically spaced and horizontally aligned passages in opposed side walls of said cabinet placing the side wall passages in communication with said chamber at vertically spaced intervals, means providing forced circulation of air from the upper passage downwardly through one of the side passages across said chamber and upwardly through the other side passage in the operation of the apparatus, adjustable means controlling the intake of air into the chamber through the vertically spaced passages at the intake side of the cabinet, other means controlling the volume of air introduced into the first named intake side passage, and last named means also controlling recirculation of air through said top circulating passage, hot and cold temperature control means arranged in the top passage and through which a forced circulated air is adapted to pass, and a thermostat control in said chamber.
the chamber through the vertically spaced passages at the intake side of the cabinet, other means controlling the volume of air introduced into the first named intake side passage, said last named means also controlling recirculation of air through said top circulating passage, heat and cold temperature control means arranged in the top passage and through which a forced circulated air is adapted to pass, the front of the cabinet having a large opening extending into the chamber of the cabinet, and a portable carrier including a door closure movable through said opening into the chamber of the cabinet.

7. A refrigerating apparatus of the class described comprising an insulated walled cabinet, said cabinet having a large refrigerating chamber therein defined by top and side walls spaced from the cabinet walls and forming in conjunction therewith intercommunicating circulating passages at the top and sides of the cabinet, means comprising vertically spaced and horizontally aligned passages in opposition side walls of said chamber placing the side wall passages in communication with said chamber at vertically spaced intervals, means providing forced circulation of air from the upper passage downwardly through one of the side passages across said chamber and upwardly through the other side passage in the operation of the apparatus, adjustable means controlling the intake of air into the chamber through the vertically spaced passages at the intake side of the cabinet, other means controlling the volume of air introduced into the first named intake side passage, said last named means also controlling recirculation of air through said top circulating passage, a temperature control unit arranged in the top passage and through which a forced circulated air is adapted to pass, the front of the cabinet having a large opening extending into the chamber of the cabinet, a portable carrier including a door closure movable through said opening into the chamber of the cabinet, said carrier comprising a frame open at opposite sides, and means spaced vertically in the frame for detachably mounting a plurality of article supporting trays therein.

8. A refrigerating apparatus of the class described comprising an insulated refrigerator cabinet having a large refrigerating chamber therein, one wall of the cabinet having a door opening providing access to said chamber, the bottom wall of said chamber and door opening being flush with a surface upon which the cabinet is arranged, a wheeled carrier movable over said surface for free movement into and out of the chamber of said cabinet through said door spacing, said wheeled carrier including a door forming a closure for the opening of said cabinet, the wheels of said carrier being all arranged inwardly of said door, said carrier being open at opposite sides, and vertically spaced means in the carrier for supporting a plurality of trays therein.

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