

Dec. 8, 1942.

C. M. HOLMEN

2,304,094

REFRIGERATION APPARATUS

Filed Nov. 30, 1938

2 Sheets-Sheet 1

Fig. 1

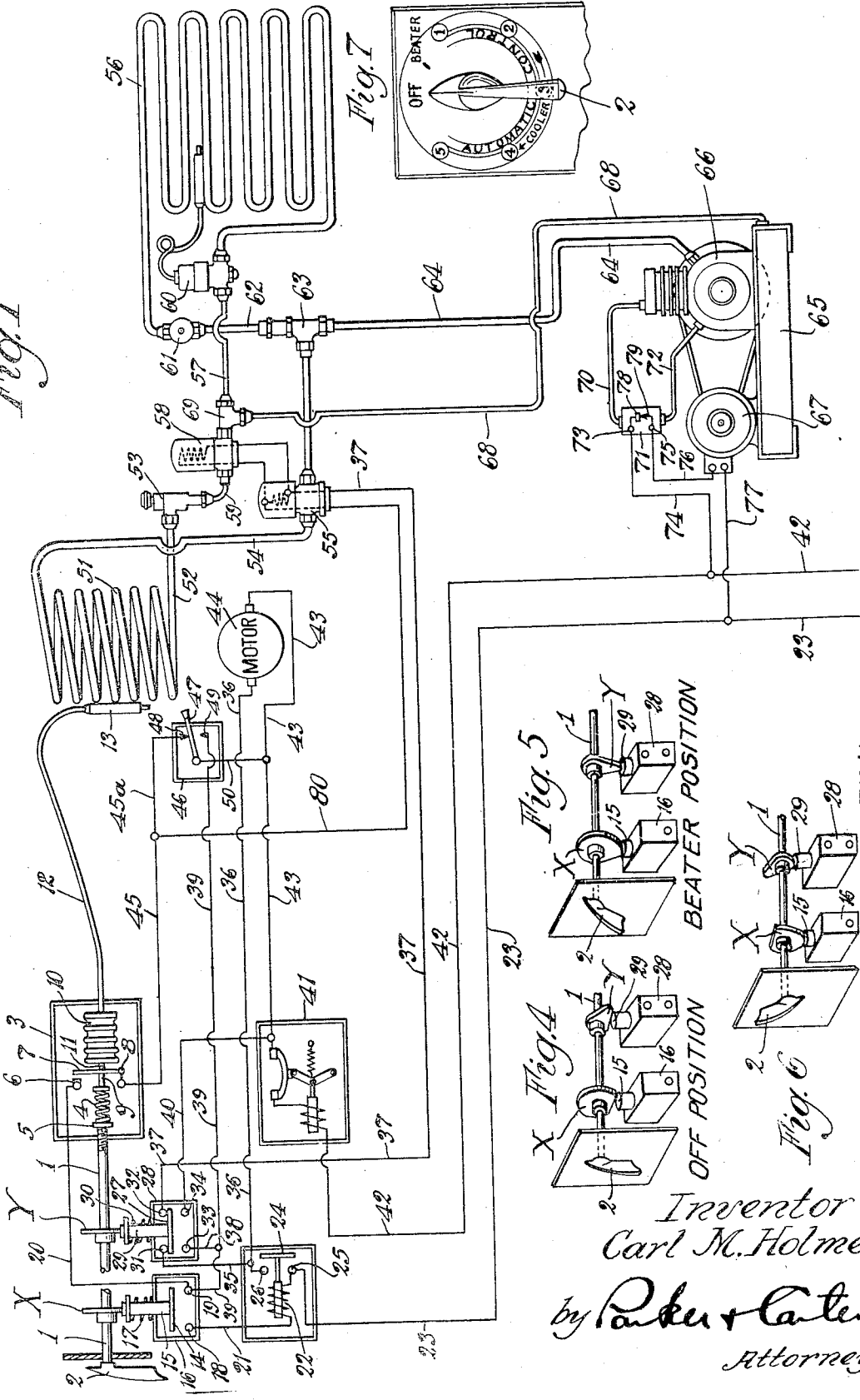


Fig. 7

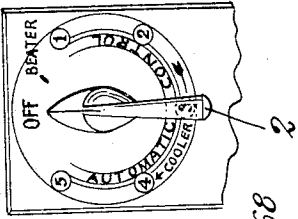


Fig. 5

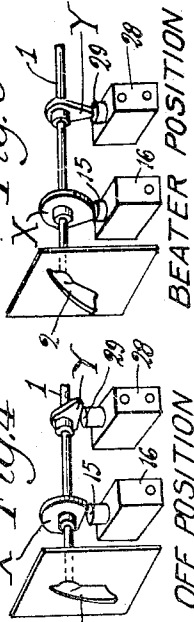


Fig. 4

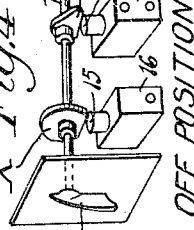
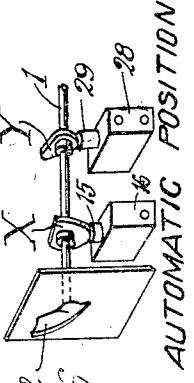


Fig. 6



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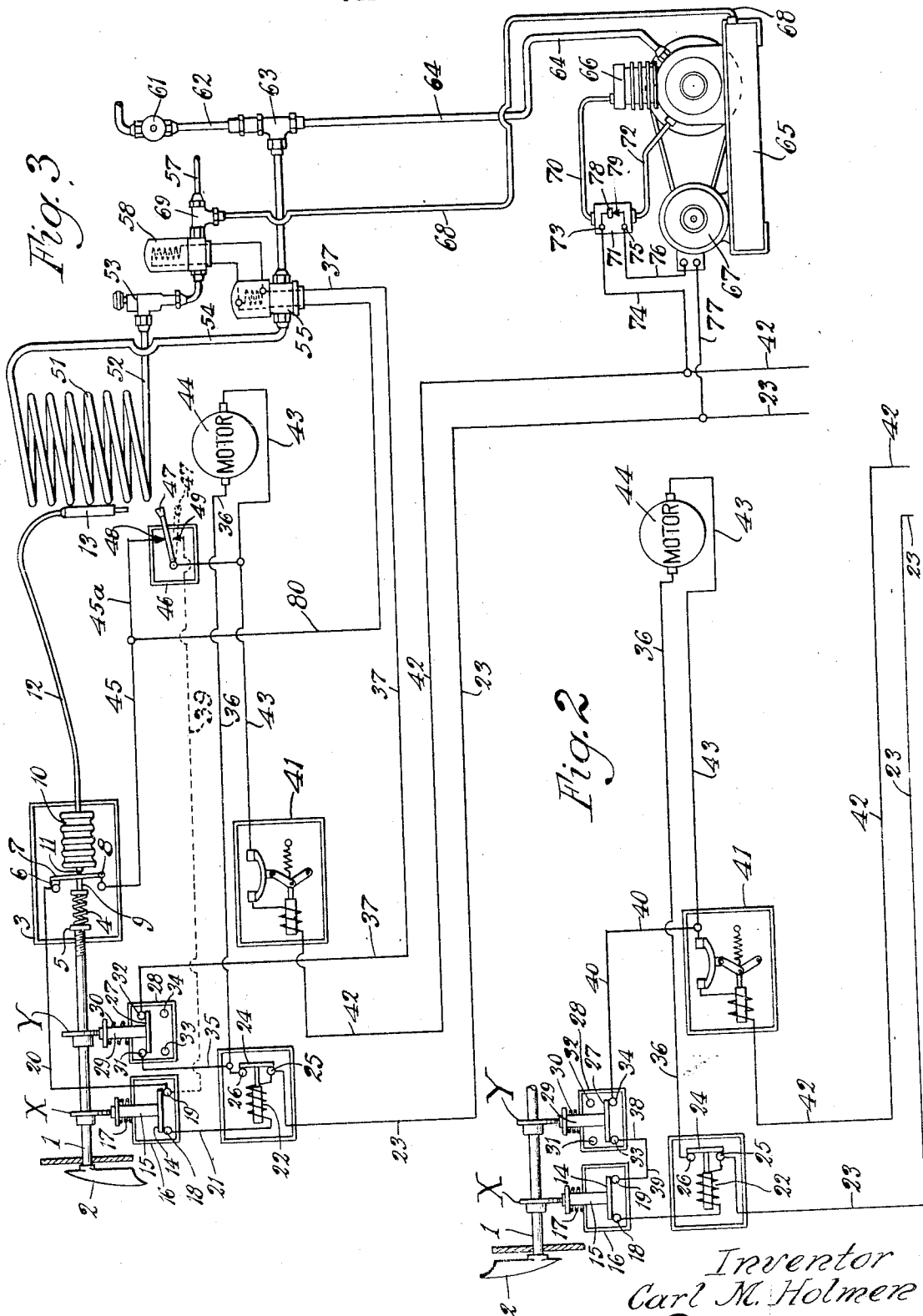
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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REFRIGERATION APPARATUS

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Application November 30, 1938, Serial No. 243,075

18 Claims. (Cl. 62—114)

This invention relates to a freezer and an electric circuit therefor. It has for one object to provide in connection with such a circuit a unitary manual control combining in a single switch all of the necessary controls for the control and variation of the temperature of the contents of the freezer, and for the control of the operation of the beater. Another object of the invention is to provide in connection with such a control an automatic control associated with the discharge gate from the freezer, so arranged that movement of the freezer gate automatically controls the operation of the beater when necessary. Another object is to provide in connection with such a circuit automatic means in the circuit itself effective to prevent damage to the parts of the total assembly.

Other objects will appear from time to time throughout the specification and the claims.

The invention is illustrated more or less diagrammatically in the accompanying drawings, wherein:

Figure 1 is a schematic diagram of the total circuit and the parts of the total assembly;

Figure 2 is a schematic diagram illustrating the switch and the circuit parts changed from the position shown in Figure 1;

Figure 3 is a schematic diagram of the total assembly with a still further change of switch and circuit arrangement;

Figures 4, 5 and 6 are diagrammatic views illustrating the cam mechanism in the off position, the beater position and the automatic position, respectively;

Figure 7 is an elevation of the switch handle and dial.

Like parts are designated by like characters throughout the specification and the drawings.

The invention is applied to an ice cream or drink freezer in which means are provided for controlling the freezer and its contents, and in which beater means are provided for agitating the contents. As far as possible the showing is diagrammatic since the details of the particular physical embodiments of the freezer and associated parts form no essential part of the invention, which is directed to the electric circuit and the controlling and adjusting means therefor. So far as possible the showing of the freezer parts has been avoided and only so much of the mechanism has been shown as is necessary to an understanding of its operation.

The reference character 1 designates a control shaft or rod having a suitable handle or lever 2 and carrying fixed upon it at suitable points

cams x and y . At its inner end the shaft 1 is connected to a thermostatic temperature switch so that movement of the shaft can be used to adjust the switch and to adjust the temperature at which it operates.

The temperature switch assembly may be enclosed in a housing 3 and, as illustrated, the switch includes a switch resisting spring 4 adjustably positioned upon the shaft 1 by a nut 5. At its opposite end the switch resisting spring 4 carries a switch contact or pointer 9 arranged to contact the switch lever 7 pivoted as at 8. An electrical terminal 6 is adapted to be contacted by the switch 7. The pointer 9 is an extended member attached to and moving with the spring 4. It might be integral with that spring. The spring tends normally to hold the switch lever open but can yield to permit it to close. Positioned also within the housing 3 is an enclosure member 10, which may, as in the present case, take the form of a bellows or "Sylphon." At one end the member 10 carries a projection or pointer 11 and at its other end it is connected to a tube 12, which is connected to a thermo tube or thermostat bulb 13. This latter may be positioned any place desired but ordinarily is positioned so as to be affected by the temperature of the freezer. The bulb 13, tube 12, and bellows or Sylphon 10 are filled with a fluid that expands when the temperature of the bulb increases. It will thus be seen that a predetermined increase in the temperature in the freezer or freezer coil 51 will cause the bellows 10 to expand toward the left in Fig. 3 and force the switch arm 7 into engagement with the contact 6. Associated with the cam x is the cam action switch 14, which is carried by a member 15 within a housing 16. A spring 17 normally holds the switch open, as shown in Figure 1, but may yield to permit closing of the switch by the cam action to the position shown in Figure 3. Positioned to be contacted by the switch member 14 are two contact points 18 and 19. To the point 19 is connected a wire 20, which is also connected to the point 6 of the temperature control switch 3. To the point 18 is connected a wire 21, which leads to a relay 22. From the relay leads a wire 23, which is connected to a source of electric current. Associated with the relay 22 are the switch armature 24, and two contact points 25 and 26.

A second cam action switch is associated with the cam y . Structurally it is generally the same as the first cam action switch, comprising a switch member 27, a housing 28, a shaft 29 and a spring 30. It has two pairs of contact points;

31, 32; 33 and 34. From the contact point 31, a wire 35 leads to the wire 36; and to the contact point 32, a wire 37 is connected. From the contact point 33, a wire 38 leads to the wire 39, which is secured to the contact point 19 of the first cam action switch. A wire 40 is secured to the contact point 34.

The wire 40 is secured to an overload release, switch breaker, or protection device 41. From this the wire 42 leads to a suitable source of electrical current. A second wire 43 leads from the overload release or protection device and to a motor 44, which is arranged to drive a beater, not shown, in the freezer. The wire 36 is connected to the opposite pole of the motor 44.

A wire 45 is connected to the switch lever 7 of the temperature control switch 3 and leads to a draw off gate switch assembly, which includes a housing 46, a lever 47 and contact points 48 and 49. The lever 47 is operated by the gate and hence, for the purpose of this disclosure, the member 47 may be considered the gate. This gate is closed when in the position shown in full lines in Fig. 3 and open when in the position shown in dotted lines in Fig. 3. The wire 39, connected to the first cam action switch, is secured to the point 49. A wire 50 is connected to the base of the lever 47 and to the wire 43.

One suitable form of cooling system comprises a freezer coil 51, which is situated preferably about a container within which the material to be frozen can be held. The coil may have insulation and a surrounding jacket. The coil is connected at its lower end by the portion 52 with an expansion valve 53 and a solenoid controlled valve 58 is interposed in the conduit 59 between the expansion valve 53 and the refrigerant supply line or pipe 68 from the condenser 65. The valve 58 controls the passage of the refrigerant to the coil 51. The solenoid for operating the valve 58 is energized by an electric circuit opened and closed automatically, as will presently appear. At its opposite end it is connected by the portion 54 with a solenoid suction valve 55, which will be described in more detail below. A hardening expansion coil 56 is provided in the system. At one end it is connected by means of a pipe 57 to a solenoid valve 58, which is joined by a connection 59 to the expansion valve 53. At its opposite end the coil 56 is connected to a service shut-off valve 61, which may be manually operated. From the valve 61, a pipe 62 connects with a check valve 63 from which a pipe 64 runs to a condenser unit 65. The details of this unit need not be fully described. They comprise in the main base, a compressor 66 and a motor 67 secured thereto. The pipe 64 is connected to the compressor 66. A pipe 68 leads from the T 69, to which the solenoid valve 58 and the pipe 57 are secured, and at its opposite end is secured to the compressor. From the compressor, a pipe 70 leads to a high-low pressure control 71. From this control a pipe 72 also leads to the compressor.

The high-low pressure control comprises a base as shown, a connection point 73, from which a wire 74 leads to the wire 42, and a connection point 75, from which a wire 76 leads to one pole of the motor 67. Also a wire 77 leads from the opposite pole of the motor 67 to the wire or conduit 23. A switch point 78 and a switch lever 79 are connected, respectively, too the connection points 73 and 75.

In Figures 4, 5 and 6 the cam mechanism for operating the switches is illustrated in perspective.

As shown, the cam x is substantially circular in shape with a partially flattened portion, while the cam y is provided with an extended cam nose. Figure 4 illustrates the off position which corresponds to the diagram of Figure 1. Figure 5 illustrates the position for beater operation, which is that illustrated in Figure 2; and Figure 6 illustrates the position for automatic operation, which is also illustrated in Figure 3.

As shown in Figure 7, the handle 2 is in the off position. The other positions are indicated adjacent the operating handle 2 so that it can be readily moved to the necessary positions for complete off as shown; or when moved clockwise the point is brought to the beater position, at which the beater is turned on. When the handle is moved clockwise beyond the beater position to positions 1, 2, 3, 4 or 5, the operation is automatic and the degree of cold which will be attained by the automatic operation is determined by the position and the amount of clockwise movement. As the handle 2 is rotated in the clockwise direction, the rod 1 is rotated and thus adjusts the temperature for which the switch mechanism contained in the housing 3 is set, and it is thus adjustable to be set to operate at a higher or lower temperature as desired. The operation is automatic within this range and the temperature is set as indicated.

Although I have shown an operative form of my device, it will be understood that many changes in the form, shape and arrangement of parts might be made without departing from the spirit of my invention, and I wish that my showing be taken as in a sense diagrammatic.

The use and operation of the invention are as follows:

The system illustrated herewith is arranged to operate a freezer which may be used to make ice cream or similar products, or may merely be arranged to cool a variety of beverages or foods. The system provides means for automatically operating the entire assembly so that cooling, beating and the like are carried out automatically and are automatically stopped when the desired predetermined condition has been attained. The system also provides means for manual control of the operation of the various parts; and in addition to that, it provides for automatic operation of the beater in response to movement of the discharge gate. As shown in Figure 1, the system is complete but the handle 2 has been set in the off position so that none of the mechanism is operating. While certain parts of the mechanism are illustrated, the showing is intended to be diagrammatic and only so much of the mechanical assembly is illustrated as is required to understand the device. The compressor and motor for driving it, as well as the cooling coils, are illustrated, therefore, only diagrammatically, and the invention is not limited to the particular forms or associations shown. The thermostats which are associated with the coils might be in almost any other desired location. The beater motor 44, which is shown below the coil 51, is shown without a beater to simplify the drawings. The coil 51 is intended to be positioned adjacent the freezer receptacle and some form of a beater is positioned in the receptacle, and this beater is driven from the motor 44. In general, almost any freezer construction might be used and almost any beater and means of driving it might be used. Hence a detailed showing of these parts is omitted in the belief that the

invention can be understood fully without them and in order to simplify the showing.

I have shown in Figure 2 only that part of the electrical circuit which will be energized by the setting of the handle 2 and cams *x* and *y*, shown in Figure 2; that is, the position of "beater only," in which the motor 44 is energized so as to actuate the beater. The device is thus not operating automatically or under automatic control without setting of the parts shown in Figure 2. It is operating under manual control, the beaters have been positively turned on and will continue to beat until positively turned off. This position is used in washing the container and may be used in "over-run" when the food is being cooled or frozen. No refrigerant is being circulated with the parts shown in the position of Figure 2.

With the handle and cams in the position shown in Figure 3, the system is set for automatic operation. The beater circuit is controlled by the mechanism within the housing 3, which operates in response to temperature variations effective upon the thermostat 13. Thus the beater is turned off and on automatically in response to temperature variations, and is always in operation when refrigeration is called for in response to the operation of thermostat 13. The thermostat bulb 13, which is shown diagrammatically as positioned along side the coil 51, in practice would probably not be positioned just there. It will ordinarily be positioned somewhere in the freezer assembly so that it responds to the actual temperature of the contents of the freezer. Also as shown in Figure 3, the solenoid valves 55 and 58 are energized and allow the refrigerant to pass. The compressor 66 is operating, having been started in response to the movement of the low pressure control 18, 19. It is to be understood that the coil 56, shown in detail in Figure 1, is also included in the assembly of Figure 3.

The circuits will now be traced for the position of the handle 2 as shown in Fig. 3. When the handle 2 is moved to the full line position in Fig. 3, the switch 14 is closed and this sets the device so that it will operate automatically, either when the gate or lever 47 is moved to the dotted line position shown in Fig. 3 or when the switch 7 is moved into engagement with contacts 6, as shown in full lines in Fig. 3.

Assuming first that the switch at 7 is open, if the gate or lever 47 be opened—that is, if the lever 47 be moved to the dotted line position shown in Fig. 3—the current will enter through the lead 23, pass through the solenoid 22, the switch 14, the conductor 39, contact 49, lever 47, and conductors 50 and 43, back to the main lead 42 and to the source of supply. This circuit will energize the solenoid 22, which in turn will close the switch 24 and then the current from 23 will divide at 25 and a portion will flow as traced above and the remainder will flow across the switch 24 to the motor lead 36 through the motor 44 and back through the lead 43 to return lead 42, thus operating the motor 44 which operates the beaters.

Suppose, however, that the gate or switch 47 is in the full line position shown in Fig. 3—that is, the gate is closed. Now if the switch 7 be closed by the "Sylphon" or bellows 10, due to an increase of heat in the chamber containing the freezer coil 51, the circuit through the stirrer motor will also be automatically closed. The circuit may be traced as follows:

Starting with the lead 23, the current now

passes through the winding 22, conductor 21, switch 14, conductor 20, switch 7, conductor 45, switch 48, conductors 50, 43, to lead 42, and back to the source. Energizing the solenoid 22 closes the switch 24, and a portion of the current from 23 passes through switch 24 to the motor lead 36, then through motor 44, motor lead 43, back to lead 42, and to the source.

When the switch 7 is closed while the gate 47 remains closed, as shown in Fig. 3, a circuit will be also simultaneously closed through the electrically operated valves 55 and 58. The circuit operates these valves in parallel and may be traced as follows:

The current from 23, Fig. 3, flows through winding 22, conductor 21, switch 14, conductor 20, switch 7, conductors 45 and 80 to valves 55 and 58, back through conductor 37, switch 27, conductors 35 and 36, motor 44, conductor 43, and back to the lead 42.

When the handle 2 is turned to the position shown in Figs. 2 and 5, the circuit will be closed through both switches 14 and 27 and through the beater motor 44 and the motor will run continuously. In this position of the handle 2 the current entering the lead 23, Fig. 2, passes through the solenoid 22, as before, then through the two switches 14 and 27, through the circuit breaker 41 to the lead 42, and back to the electric source. The solenoid 22, becoming energized, closes the switch 24, and a portion of the current from 23 will pass through the switch 24 and conductor 36 to the beater motor 44, back through conductor 43, circuit breaker 41, and finally through lead 42 to the source. The operation of the switches 7 and 47 will not affect these circuits nor the operation of the beater motor 44.

When the handle 2 is turned to the off position, as shown in Figs. 1 and 4, the circuit through the solenoid 22 is opened at 14, and hence the opening of the gate or switch 47 or the closing of the switch 7 will not close the circuit through the stirrer motor 44.

It is an important feature of the invention that two solenoid valves—55 and 58—are provided to control the flow of refrigerant to and from the coil 51. In the past where only a single solenoid valve, such as the valve 58, has been used, when the condenser is stopped there is a brief lag in the operation of the controls, and this has frequently proven sufficient to permit the withdrawal of a substantial portion of the refrigerant from the coil 51. Because of this sudden and large withdrawal, there is a further temperature drop in the coil 51 which may result in flexing the beater or in other damage. By the provision of the two solenoid valves which operate simultaneously this is avoided; and when the controls operate to stop the compressor, both valves operate instantly and prevent any withdrawal of refrigerant from the coil 51, and hence prevent any temperature drop in that coil or in the zone affected by the coil after stoppage of the compressor. With the parts set as shown in Figure 3, the condensing-unit electric circuit operates independently of the freezer circuit.

While three separate settings of the controls and three circuit conditions are illustrated in Figures 1, 2 and 3, still other conditions are possible. The draw-off gate, which controls the draw-off opening from the freezer, is moved or opened when material is to be discharged from the freezer. The switch lever 47 is controlled by this movement. When the draw-off gate is opened, it moves the switch directly or through

some intermediate mechanism so that the switch is moved to complete the beater circuit when the draw-off gate is opened, and the switch is moved to break the beater circuit when the draw-off gate is closed. This is desirable because under ordinary conditions the contents of the freezer cannot be discharged except when the beater is in operation; but frequently it is not desirable to have the beater operate—hence, as soon as the gate is closed, the beater should stop. If the beater is in operation in response to the heater position of the cams x and y , as shown in Fig. 5, then movement of the draw-off gate and the switch controlled by it does not affect the beater operation which continues irrespective of the switch 47. On the other hand, when the handle 2 is in automatic position as shown in Figs. 3 and 6, the beater will operate when the shut-off gate is opened; that is, when the lever 47 is moved to dotted line position as shown in Fig. 3. The beater will also operate when the switch 7 is closed, as pointed out above. As shown in full lines in Figures 1 and 3, the switch 47 is in the position which it occupies when draw-off gate is closed. As shown in dotted lines, the switch 47 is in the position which it assumes when the draw-off gate is open and the wire 39 is indicated in dotted lines. If the gate were moved from the closed to the open position, the switch lever 47 would be moved from the full line position of Figure 3 to the dotted line position and the wire 39 would be energized as a part of the circuit to cause the beater to start. It is to be noticed that in this dotted line position, whether the draw-off gate is opened or not, the remainder of the circuit is automatically controlled and, hence, where the draw-off gate is opened frequently and might otherwise permit the contents of the freezer to become too warm, the automatic control is still effective and still responsive to the temperature variations of the contents of the freezer and the cooling system will be automatically controlled no matter how many times the draw-off gate is opened.

There are other possible variations in the position of the controls which would alter the electric circuit where the handle 1 has been moved to bring the controls to the automatic position; but where the system is down to operating temperature and the cooling mechanism is not operating, having been shut off by the automatic temperature control, the draw-off gate being opened, the switch controlled by the draw-off gate will be moved to complete and energize the circuit for the beater driving means so that the beater will continue to operate while the gate is open; and this may occur while the control is on the automatic position but is actually not operating to carry out automatic control of temperature.

In general, the operation of the system and the controls illustrated herewith have many advantages. Heretofore freezers have been provided with manual control means so that the refrigeration is circulated and the beater operates until they are manually turned off. A careless operator can allow the product to become too cold and it becomes too viscous for beater movement so that damage occurs. At the least, this requires something to be done to the electric circuit, but it frequently results in damage to the mechanism. But in the present invention, no matter what the temperature may finally become, the beater circuit is controlled in response to the temperature and the beater motor will be shut off when the

temperature within the freezer reaches a predetermined safe limit for which the thermostatic switch which controls the beater motor has been set.

The present invention embodies in one main switch assembly operated by one control handle means for controlling the circuit automatically so that the ice cream or other product is cooled to any desired minimum temperature at which the beater motor can rotate the beater, and on reaching that predetermined temperature, the control automatically cuts off the beater motor; and after this has been done, by movement of the switch within the automatic range the temperature of the contents of the freezer may be raised or lowered, and into this automatic mechanism the above described control of the beater in response to the movement of the draw-off gate has been incorporated. And in view of this, the apparatus may be set to operate automatically to give the desired consistency to the product in the freezer. The beater stops when this is attained and the operator does not thereafter touch the control; and when the product is to be withdrawn from the freezer, he merely opens the gate which actuates the beater during the period that the gate is open; and thus the automatic control is effective both in preparing the product and in maintaining it at the desired temperature and consistency after preparation.

Another feature of the invention is that the compressor of the cooling system is controlled entirely by the low pressure control 78, 79 and is not electrically connected with the switch mechanism.

In the position of Figure 2 the opening and closing of the draw-off gate is immaterial because the beaters are already in operation due to the positive setting of the control handle at the "beaters only" position.

In Figure 3, as above noted, the apparatus is set for automatic operation and when the product reaches a predetermined temperature for which the temperature control switch within the housing 3 has been set the compressor will shut down due to the action of the low pressure control 78, 79. After this has happened, the temperature of the product can be further changed by the operator moving the control handle 2 further in a clockwise position, as shown in Figure 7. The total possible temperature range may vary considerably, depending upon the capacity of the cooling system and other factors. The invention is not limited to any particular possible temperature range.

Another feature of the electric circuit illustrated is that the arrangement of the switch mechanism shown permits changing from the off position to the beater position without opening the solenoid circuit which controls the refrigerant. In previous systems when the switch was moved from the off to the beater position, the solenoid valve had been opened sufficiently to start the compressor if only for a very short time and this had the disadvantage of increasing current consumption without serving any useful purpose. This disadvantage is avoided by the present arrangement.

A simple example of one operating cycle is as follows:

The mixture is poured into the machine with the switch in the off position. When the operator has determined what temperature he needs for the type of mixture he is using, he sets the switch to one of the numbered automatic posi-

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tions; for example, position 4. When the product reaches the temperature corresponding to this setting, the cooling mechanism will be shut off and the temperature will not fall below that predetermined and will be maintained at that temperature. After the desired temperature has been attained, the operator may move the handle to the "beaters only" position where it is maintained until the desired "over-run" in the product has been secured. After this, he turns the control handle back to the number 4 position so that the completed product will be automatically maintained at the desired temperature. He may now upon the completion of his product desire to withdraw some; and if this occurs, the beater will be started automatically. If the temperature of the freezer contents has risen, meanwhile the compressor will start in order to provide some of the refrigeration which may have been lost during the beating operation or during the rest period. It is to be understood that whatever the position of the control handle 2, when the gate is opened the beaters automatically operate to assist in the discharge of the material from the freezer. Should the temperature during the drawing-off operation reach the minimum for which the switch is set, the refrigeration will be turned off at that time but the beaters will continue in operation until the gate is closed.

The temperature control switch contained within the housing 3 may be of the well-known type including a Sylphon bellows which is actuated by a temperature-control bulb; in this case, the member 13. By these means the switch is operated to open and close the circuit. The switch is operated by the cams x and y that may be of the well-known plunger type and they, of course, are operated manually.

The rotation of the shaft 1 moves not merely the cams X and Y but, also, adjusts the spring 4 so as to adjust the point at which the expansion and contraction of the Sylphon 10 is effective. Thus, for one spring tension of the spring 4 the movement of the Sylphon might be resisted with one force, and for a different spring tension the movement would be resisted with a different force. The shaft 1 can be rotated in either direction by the handle 2 and this rotation adjusts the spring either to increase or to decrease its compression and, thus, to vary the compression on the Sylphon 10 and consequently to vary the "cut-in" and "cut-out" of the whole switch assembly within the housing 3.

The Sylphon 10 is operated through the capillary tube 12 by means of the bulb 13 which is positioned to respond to the temperature of the coil 51 around the freezing cylinder. Consequently, a setting of the spring 4 determines the resistance to the movement of the Sylphon bellows 10.

The shaft 1 also controls and moves the cams X and Y adjacent the switch assemblies 16 and 28, respectively, and without relation to the refrigeration. Thus, adjustment of the parts shown can either control the beater alone or the beater and the freezer when the parts are in the relation shown in Figure 6. In that position, the cams close the temperature switch 3 which then controls the operation.

The spring 4 in effect bears against the end of the Sylphon 10. The pressure operating this Sylphon is then transmitted through the spring to the shaft 1, and thus, adjustment rotation of the shaft 1 alters the compression on the spring

4. The point 11 of the Sylphon is not an integral part of or connected to the operating rod 9 of Figure 1, and the member 11 is not connected to the rod 9. The switch arm 7 may, thus, be contacted on one side by the pointer 11 and on the other by the rod 9 or by the spring 4 directly. The switch arm 7, thus, is contacted on one side by the pointer 11 of the Sylphon 10 but the parts are separable. Correspondingly, the switch arm is contacted on the other side either by the pointer 9 or the spring 4. The parts 9 and 11 were referred to as "pointers or contact points" but they are not electrical contacts. They are merely mechanical means which contact the switch arm 7 to move it to accomplish the opening and closing of the circuit from the points 6 to 8. The structure of the valve assembly within the housing 3 has been illustrated only diagrammatically since it forms no essential part of the present invention. Switch mechanisms of this sort are on the market and are made by several manufacturers.

The switch 47 is used purely to start the beater motor 44 when it is desired to discharge the heavy, viscous beverage or ice cream within the freezer which would not of itself be discharged by gravity alone. The opening of the freezer gate for discharge closes the circuit and, thus, energizes the beater motor while closing of the gate opens the circuit and turns off the beater motor.

I claim:

1. In combination with a freezer having a mechanical beater, electrical means for driving the beater and means for accomplishing a refrigeration of the freezer, including a compressor, an expansion coil and conduits connecting the coil and the compressor, means defining an electric circuit and means for supplying current to said circuit, and a plurality of manually operable switches in said circuit, a unitary operating means for said switches comprising a single handle, a cam for each of said switches, a connection between said handle and said cams whereby the handle operates the cams simultaneously.

2. In combination with a freezer having a mechanical beater, electrical means for driving the beater and means for accomplishing refrigeration of the freezer, including a compressor, a plurality of expansion coils and conduits connecting the coils and the compressor, means defining an electric circuit and means for supplying current to said circuit, and a plurality of manually operable switches in said circuit, a unitary operating means for said switches comprising a single handle, a cam for each of said switches, a connection between said handle and said cams whereby the handle operates the cams simultaneously.

3. In combination with a freezer having a mechanical beater, electrical means for driving the beater and means for accomplishing refrigeration of the freezer, including a compressor, an expansion coil and conduits connecting the coil and the compressor, means defining an electric circuit and means for supplying current to said circuit, and a plurality of manually operable switches in said circuit, a unitary operating means for said switches comprising a single handle, a cam for each of said switches, a connection between said handle and said cams whereby the handle operates the cams simultaneously, a temperature responsive means arranged adjacent said freezer, an additional switch, a connection between said means and said additional switch

whereby said additional switch is opened and closed in response to temperature variations.

4. In combination with a freezer having a mechanical beater, electrical means for driving the beater and means for accomplishing refrigeration of the freezer, including a compressor, an expansion coil and conduits connecting the coil and the compressor, means defining an electric circuit and means for supplying current to said circuit, and a plurality of manually operable switches in said circuit, a unitary operating means for said switches comprising a single handle, a cam for each of said switches, a connection between said handle and said cams whereby the handle operates the cams simultaneously, an additional switch, means responsive to the variations of temperature of said freezer for operating said switch for automatically controlling the operation of said beater, and a connection between said handle and said additional switch for adjusting the latter.

5. In combination with a freezer having a mechanical beater, electrical means for driving the beater and means for accomplishing refrigeration of the freezer, including a compressor, an expansion coil and conduits connecting said coil and the compressor, means defining an electric circuit and means for supplying current to said circuit, and a plurality of manually operable switches in said circuit, a unitary operating means for said switches comprising a single handle, a cam for each of said switches for operating the same, a mechanical connection between said handle and said cams whereby the handle operates the cams simultaneously, a third switch, temperature responsive means for opening and closing said switch in response to variations of temperature within said freezer, temperature responsive means associated with said coil and adapted in response to temperature variations in said coil to control the operation of said compressor.

6. In combination with a freezer having a mechanical beater, electrical means for driving the beater and means for accomplishing refrigeration of the freezer, including a compressor, an expansion coil and conduits connecting said coil and the compressor, means defining an electric circuit and means for supplying current to said circuit, and a plurality of manually operable switches in said circuit, a unitary operating means for said switches comprising a single handle, a cam for each of said switches, a mechanical connection between said handle and said cams whereby the handle operates the cams simultaneously, an additional switch, means, including temperature responsive mechanism actuated by variations in temperature within said freezer, for opening and closing said additional switch, a connection between said handle and said switch for adjusting the latter for varying the range of temperature within which said mechanism will operate for opening and closing said additional switch, and temperature responsive means associated with said coil and adapted in response to temperature variations in said coil to control the operation of said compressor.

7. In combination with a freezer having a mechanical beater, electrical means for driving the beater and means for accomplishing refrigeration of the freezer, including a compressor, a plurality of coils and conduits connecting the coils and the compressor, means defining an electric circuit and means for supplying current to said circuit, and a plurality of manually operable switches in

said circuit, a unitary operating means for said switches comprising a single handle, a cam for each of said switches, a connection between said handle and said cams whereby the handle operates the cams simultaneously, an additional switch, means, including temperature responsive mechanism arranged adjacent said freezer for opening and closing said additional switch, and a connection between said handle and said switch for adjusting the latter, temperature responsive means associated with one of said coils and adapted in response to temperature variations in said coil to control the operation of said compressor.

8. In combination with a freezer having a mechanical beater, electrical motor means, including a circuit, for driving the beater and means for accomplishing refrigeration of the freezer, including a compressor, an expansion coil and fluid conduits connecting the coil and the compressor, means defining an electric circuit and means for supplying current to said circuit, and a plurality of manually operable switches in said circuit, a unitary mechanical operating means for operating said switches comprising a single handle, a cam for each of said switches, a connection between said handle and each of said cams whereby movement of the handle operates the cams simultaneously, a discharge gate for said freezer, a switch in the beater-drive circuit, said gate adapted to move said switch to turn on the beater drive whenever the gate is opened.

9. In combination with a freezer having a mechanical beater, electrical motor means, including a circuit, for driving the beater and means for accomplishing refrigeration of the freezer, including a compressor, an expansion coil and conduits connecting the said coil and the compressor, means defining an electric circuit and means for supplying current to said circuit, and a plurality of manually operable switches in said circuit, a unitary operating means for operating said switches comprising a single handle, a cam for each of said switches, a connection between said handle and each of said cams whereby movement of the handle operates the cams simultaneously, a temperature responsive means arranged adjacent said freezer, an additional switch, an operating connection between said last-named means and said switch whereby said switch is opened and closed in response to temperature variations, temperature responsive means associated with said expansion coil and adapted in response to temperature variations in said expansion coil to control the operation of said condenser, a discharge gate for said freezer, a separate switch in the beater-drive circuit, said gate adapted to move said switch to turn on the beater drive whenever the gate is opened.

10. In combination in a freezer circuit adapted to be associated with a freezer assembly, a freezer container having a discharge and a discharge gate, a beater in said freezer, an electric drive therefor and a cooling coil for said freezer, a second cooling coil in communication with said first coil, a compressor and fluid conduits connecting said compressor to said coils, means for driving said compressor, means defining an electric circuit, connected with a source of electric power and adapted to energize the beater drive and the compressor drive, a plurality of switches in said circuit, temperature responsive means for operating some of said switches and a unitary assembly for manually and simultaneously operating a

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plurality of said switches, said assembly including a single handle, a plurality of cams and a single means for operating said cams simultaneously by the movement of said handle.

11. The combination in a freezer circuit of a freezer container having a discharge and a discharge gate, a beater in said freezer, an electric drive therefor and a cooling coil for said freezer, a second cooling coil in communication with said first coil, a compressor for the refrigerant system, means for driving said compressor, means defining an electric circuit, connected with a source of electric power and adapted to energize the beater drive and the compressor drive, a plurality of switches in said circuit, temperature responsive means for operating one of said switches and a unitary assembly for manually operating a plurality of said switches, said assembly including a single handle, a plurality of cams and a single means whereby said cams are operated simultaneously by the movement of said handle, and a connection between said handle and said temperature-actuated switches whereby movement of the handle adjusts said last mentioned switches.

12. In combination in a freezer system, a beater, a motor for operating said beater, an expansion coil, a compressor, electric means for driving said compressor, conduits for conducting refrigerant from said compressor to said coil and from said coil to said compressor, electrically controlled valves in each of said conduits adapted to act upon the stopping of said compressor driving means to prevent the withdrawal of refrigerant from said coil upon stoppage of the compressor, a plurality of switches for opening and closing the circuits through said electrically controlled valves, a pressure controlled switch for opening and closing a circuit through said motor, a handle member, means operated by said handle member for opening and closing circuit through said plurality of switches and for adjusting said pressure controlled switch so that it will operate at variable pressures for closing circuits through said motor and through said electrically controlled valves.

13. In a freezer system having a mechanical beater, an electric motor for operating said beater, an expansion coil for cooling said beater, means for supplying a refrigerant to said coil, electrically operated valves for controlling the flow of refrigerant to and from said coil, electric circuits for operating said motor and valves, a plurality of control switches for closing circuits through said motor, a pressure operated switch for closing circuits through said valves, and a single operating handle for operating said control switches and for adjusting said pressure operated switch to operate at different pressures.

14. In a freezer system having a mechanical beater, an electric motor for operating said beater, an expansion coil for cooling said beater, means for supplying a refrigerant to said coil, means for controlling the flow of refrigerant to said coil, an electric circuit for operating said motor, control switch means for closing a circuit through said motor, a pressure operated switch for closing a circuit through said motor, and a single operating handle for operating said control

switch means and for adjusting said pressure operated switch to operate at different pressures.

15. In a refrigeration system, a freezing chamber for freezing confection, an expansion coil for cooling said chamber, pressure controlled means for supplying refrigerant to said coil, a beater within said chamber, a motor for operating said beater, an electric circuit for said motor, a pressure-controlled switch for automatically opening and closing said circuit, a manually operated switch for said circuit, and means including a single handle member for operating said last-named switch and for adjusting said pressure operated switch to operate at different pressures.

16. In a refrigeration system, a freezing chamber for freezing confection, an expansion coil for cooling said chamber, pressure controlled means for supplying refrigerant to said coil, a beater within said chamber, a motor for operating said beater, a shut-off gate for said chamber through which the frozen confection is discharged, a switch operated by said gate, a circuit through said switch and motor so arranged that when said gate is opened the circuit through said motor is closed for operating said beater, another electric circuit for said motor, a pressure operated switch controlled by the temperature within said chamber for automatically opening and closing said last-named circuit through said motor, a manually operated switch for said circuit, and means including a single handle member for operating said last-named switch and for adjusting said pressure operated switch to operate at different pressures.

17. In a refrigerating system provided with a freezing chamber and having a beater therein, an expansion coil for cooling said chamber, means for supplying a refrigerant to said coil, a motor for operating said beater, an electric circuit for operating said motor, a switch in said circuit, temperature sensitive means controlled by the temperature within said chamber for automatically operating said switch for closing said circuit, a manually operated switch for said circuit, and means including a single handle member for operating said last-named switch and for adjusting said temperature sensitive means for operating said first-named means for controlling the operation of said first-named switch.

18. In a refrigerating system provided with a freezing chamber and having a beater therein, an expansion coil for cooling said chamber, means including a compressor and suction and pressure conduits between said compressor and coil for supplying a refrigerant to said coil and for withdrawing the same therefrom, an electrically operated valve in said suction conduit adjacent said coil, a motor for operating said beater, electric circuits for operating said motor and valve, switches in said circuits, temperature sensitive means for operating one of said switches, means including a single handle member for operating certain of said switches for opening and closing circuits for controlling the operation of said motor and valve, and means whereby on turning said handle the temperature at which said temperature sensitive means will operate may be varied.

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