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APPARATUS FOR PROCESSING CANNED FOODS AND THE LIKE

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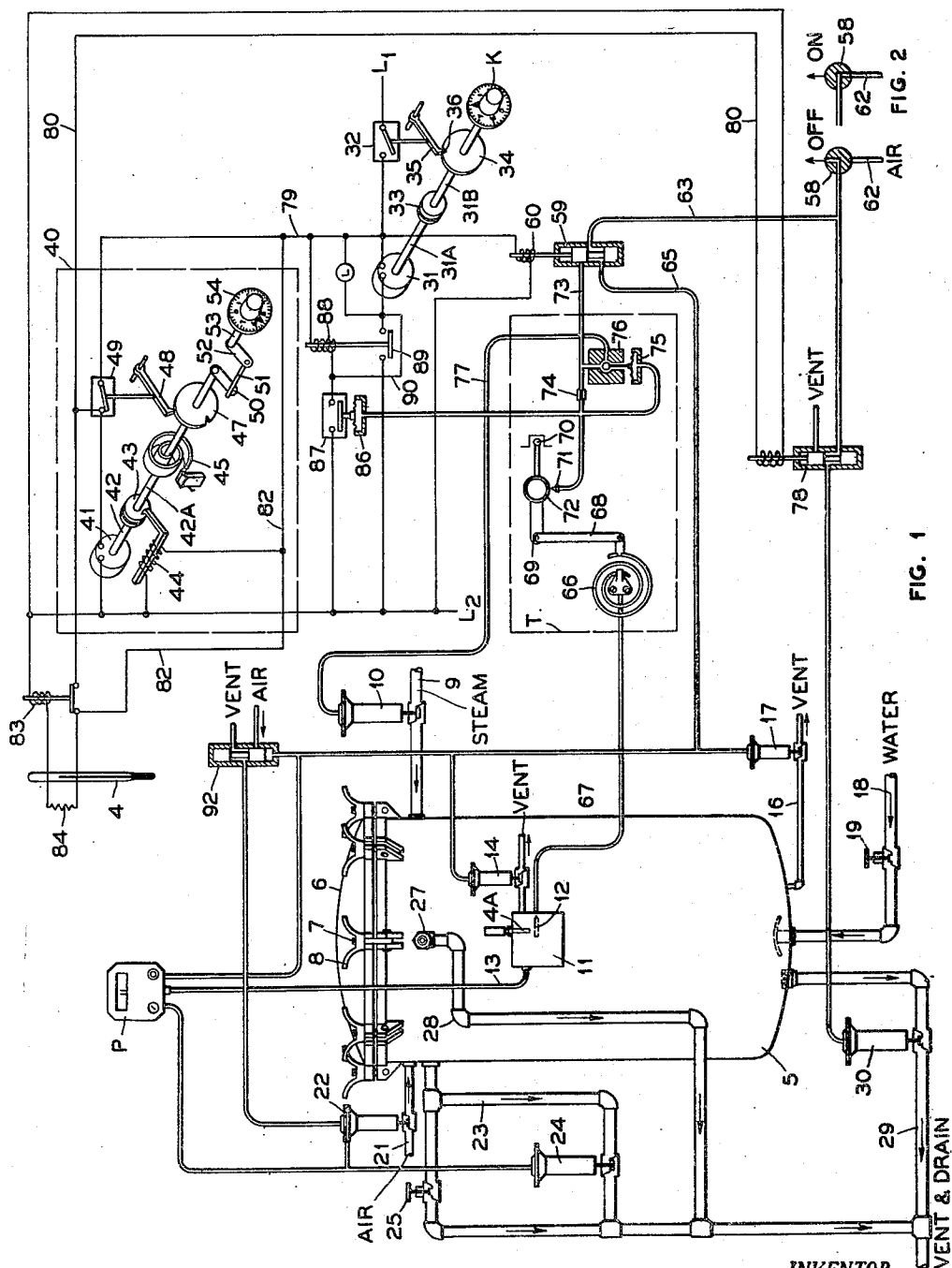


FIG. 1

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APPARATUS FOR PROCESSING CANNED
FOODS AND THE LIKE

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This invention relates to apparatus for processing canned foods and the like.

In the sterilization of canned foods in retorts where steam is used as the heating medium, it is essential that the retorts be completely free from air at the beginning of each processing cycle. Otherwise, improperly sterilized canned goods may result with consequent spoilage thereof.

In accordance with the present invention, there is provided a novel system whereby at the beginning of each cycle, the retort will be automatically vented to the atmosphere until two conditions have been satisfied, namely the existence of a predetermined temperature in the retort and the passing of a given time interval.

For a clearer understanding of the invention reference is made to the following description and claims when taken with the drawing in which Fig. 1 illustrates a well known canner's retort and auxiliary temperature and pressure control equipment together with pneumatic and electric circuits shown in diagrammatic form; and Fig. 2 is a detail view of the air supply valve in its open position.

In the drawings, the numeral 5 designates a well-known type of canner's retort open at its top but having a cover 6 which can be removably sealed in position by the clamping bolts 7 mounted on the rim of the retort. These bolts engage notches in the edge of the cover, and cooperate with the butterfly nuts 8 to clamp the cover in the position illustrated. The retort is heated by steam supplied through pipe 9 to the upper part thereof, under the control of a diaphragm motor valve 10 which is opened by the application of compressed air to its motor.

The retort is provided on its side with a communicating chamber 11 into which there extends the thermosensitive bulb 12 of a temperature controller T and with which chamber there also communicates the pressure measuring pipe 13 of a pressure controller P. The temperature controller T and the pressure controller P are effective to maintain a given temperature and a given pressure within the retort during predetermined portions of the processing cycle. Although the chamber communicates with the interior of the retort, the heating steam in this chamber tends to become stagnant and therefore would not provide an accurate sample of the temperature conditions in the retort. For this reason the chamber is provided with a bleed pipe 14 of the diaphragm motor type, which is closed

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by the application of compressed air to its motor. As will be pointed out, this bleed valve is open to the atmosphere during the cooking portion of the process cycle to insure circulation of the steam in the chamber and to purge noncondensables from the chamber during the cooking cycle. The bottom of the retort is likewise provided with a pipe 16 controlled by the bleed valve 17 of the diaphragm motor type. This valve which is closed when compressed air is applied to its motor, is maintained open during the cooking portion of the process cycle so that sufficient steam can bleed from the pipe 16, to vent noncondensables that may be introduced during cooking period. A pipe 18 having the hand valve 19 thereon, communicates with the bottom of the retort to supply cooling water at the end of the cooking period.

It is essential that a uniform given pressure prevail in the retort especially during the cooling cycle. To this end, the retort can be supplied with compressed air through pipe 21 under the control of the motor valve 22. It should be pointed out that valve 22 comprises two superimposed diaphragm motors either of which is operated by compressed air at a pressure of from one to nine pounds per square inch, tending to throttle this valve.

An overflow pipe 23 leading to the top of the retort, is throttled to its open position when compressed air at a pressure of ten to eighteen pounds per square inch is applied to the top of the motor valve 24, under control of the pressure controller P. A hand valve 25 in a branch of drain pipe 23 is closed when the pressure in the retort is to be automatically controlled, but serves to provide manual control of this pressure when so desired. A well-known safety valve 27 is provided near the top of the retort to open into a branch 28 of the drain pipe 23 and thereby relieve abnormal pressures in the retort.

In order to insure that the interior of the retort is completely free from air, the bottom of the retort has a vent pipe 29 which is opened by a diaphragm motor valve 30 until compressed air is applied to the valve motor.

The system utilizes a process timer to control the duration of the cooking portion of the cycle. This timer comprises the synchronous timing motor 31 having its shaft 31A terminating in one plate of clutch 33. The other plate of the clutch is carried by shaft 31B which terminates in adjusting knob K, the clutch serving to permit adjustment of knob K without rotating motor 31. This timer includes timing switch contacts 32 which are closed by means of the time adjust-

ing knob K in the setting of the timer for the given cooking period but are opened by the motor at the close of the measured period. In setting the process timer, the knob K is turned to rotate the shaft 31B which carries the cam 34. As the shaft and the cam are manually rotated, the follower 35 rides on the high part of the cam to close the switch contacts 32. When, however, the motor operates to measure the process interval, the cam 34 rotates until the follower drops into the cam notch 36 at the end of the interval, to open the switch contacts 32.

This system also utilizes a self-restoring auxiliary timer 40 which measures a predetermined time interval, for example five minutes, during which the retort 5 is to be vented. This timer includes a synchronous motor 41 having its shaft 42 terminating in one plate of a clutch 43. The other plate of the clutch is carried by the resetting shaft 42A which is rotated by the motor in one sense and is reset in the reverse sense to its normal position, by the spring 45. It will be understood that the plates of the clutch are brought into engagement by the solenoid 44 which is energized simultaneously with the operation of the motor 41. The resetting shaft 42A carries a cam 47 which is engaged by a cam follower 48. This follower closes a switch 49, as shown, until the follower drops into the notch in the cam 47 at the conclusion of the timed interval as will be further described. The resetting shaft 42A is provided with arm 50 alined with the notch in cam 47. The rotation of the arm 50 in one direction during restoration, is terminated by a stop 51 which is adjustable at will to change the duration of the time interval to be measured by the auxiliary timer. While this stop can be adjusted in any convenient manner, it is herein shown as carried by a crank arm 52 on a rotatable shaft 53 which terminates in the adjusting knob 54. The functioning of this auxiliary timer will be set forth in the further description of the operation of the system.

The system also utilizes an electric contact thermometer 4 with its bulb projecting into a protective well 4A, although in the diagram, for simplifying the disclosure, the thermometer is shown spaced apart from its well. This thermometer may be of the type disclosed in the Norwood Patent 986,023, granted March 7, 1911.

The operation and control of the processing cycle in the report will best be understood by explaining a complete cycle of operation. At the beginning of a new cycle the retort is filled with cans or jars to be processed and the cover 6 is then closed on the retort in sealed position, by means of the bolts 7 and the butterfly nuts 8.

At the start of the cycle, the process timer is set for a given cooking period and the manual stop cock 58 is opened to the position shown. As a result of setting the process timer, the switch contacts 32 are closed. As soon as the timer contacts 32 are closed, circuits to be described, operate the motor 41 of the auxiliary timer 40 and energize the solenoid of valve 78 which is moved to its alternate position from that shown, so that compressed air exhausts to the atmosphere from the motor of valve 30, permitting it to open and thereby vent the retort. The operating circuit for the motor 41 extends from one side of the power source L₁, the switch 32 (now closed), conductor 79, switch 49 (now closed), winding of the motor 41 to the other side of the power source L₂. At the same time a circuit is completed for the winding of magnet 44 which causes the clutch plate 43 to engage a related plate

whereby the shaft 42A of the timer is rotated to measure the duration of the venting period.

Also when contacts 32 are closed the winding of the solenoid valve 59 is energized to move the plug of this valve to its alternate position. The energizing circuit for this valve can be traced from one side L₁ of the commercial power source, through the timer contacts 32, winding 60 of the solenoid valve 59 to the other side L₂ of the power source. When this solenoid is thus energized in this circuit, it moves the plunger of its valve to its upper position wherein compressed air is supplied from the pipe 62, branch pipe 63, through the valve 59, to the mechanism of the temperature controller T. On the operation of valve 59, compressed air is cut off from pipe 65 so that the bleed valves 14 and 17 open to vent steam to the atmosphere and compressed air is cut off from the pressure controller P. Since the temperature within the retort is below the predetermined value, the Bourdon spring 66 with capillary 67 and bulb 12 comprising a well-known tube system, as well as the filling medium therein, respond to the retort temperature. Bourdon spring 66 acts through link 68 to elevate the baffle lever 69 which is pivoted at 70 so that the baffle 72 is spaced from the nozzle 71. It will be understood that air supplied through the solenoid valve 59 and the pipe 73 escapes through the orifice 74 and through nozzle 71, depending on the position of the baffle 72. Under the condition assumed, the back pressure in the nozzle will be relatively low so that the capsular chamber 75 of relay valve 76 will be contracted to open relay valve 76. Compressed air from the pipe 73 is thus applied through the open relay valve 76 and the pipe 77 to the diaphragm motor top of the steam valve 10. The application of compressed air to the top of this motor, opens this valve to permit steam to be supplied through the steam pipe 9 to the interior of the retort. This steam continues to be supplied to the retort in this manner until the temperature therein reaches a predetermined value for example 240° F. At this time the Bourdon spring 66 operating through the link 68 lowers the baffle lever 69 and the baffle 72 toward the nozzle 71 until the back pressure at this nozzle is sufficient to expand the capsular chamber 75, to close the relay valve 76. If, during the processing cycle, the temperature in the retort drops below the predetermined value, the Bourdon spring tends to move the baffle away from the nozzle to operate the relay valve again, thereby supplying throttled compressed air through the pipe 77 to the motor of the valve 10. This valve thus supplies throttled steam to the retort to maintain the given temperature therein.

In accordance with the present invention, the retort 5 is vented to the pipe 29 through valve 30, to expel all air therefrom, under the joint control of the electric contact thermometer 4 which closes a break point in an electric control circuit, when a given temperature, for example 220° F., prevails in the retort, and under control of the auxiliary timer 40 which measures a predetermined interval of time and opens its contacts 49 at the end of this period. Until both of these conditions have been satisfied, the solenoid valve 78 will be held in its energized position wherein the motor top of valve 30 exhausts to the atmosphere so that the restoring spring of this valve, maintains it open. Valve 30 will continue to vent the retort until the solenoid valve 78 is released to its closed position wherein compressed air is applied to the diaphragm motor of valve 30 to close it. It should be pointed out

that the winding of the solenoid valve is maintained energized by either of two circuits. One of these circuits is traceable from lead L₁ of the power source, contacts 32 of the timer (now closed) conductor 79, switch contacts 49 of the auxiliary timer, conductor 80, winding of solenoid valve 78, to the other lead L₂ of the commercial power source. The other energizing circuit of the solenoid valve, is traceable from the lead L₁ of the power source, switch contacts 32 of the process timer, conductors 79 and 82, contacts of relay 83 (now closed), conductor 80, winding of valve 78, to the other lead L₂ of the power source. When, however, the temperature in the retort reaches a predetermined value, for example, 220° F., the electric contact thermometer 4, which is protected by the resistor 84, closes its contacts. On the closure of these contacts, the relay 83 is energized in an obvious circuit, and at its contacts breaks, one of the energizing circuits of the solenoid valve 78. However the other energizing circuit of this valve is maintained for a predetermined time interval, for example five minutes, by the auxiliary timer. At the conclusion of this interval, the auxiliary timer opens its contacts 49, to open the other energizing circuit and to stop the motor 41. In this manner the solenoid valve 78 will control the venting of the retort for the given interval and until the given temperature is reached in the retort.

While these operations have been taking place, steam has been supplied to heat up the retort and its contents under the control of the temperature controller T. When the predetermined process temperature, for example 240° F., is reached, the back pressure in the nozzle 71 will expand the capsular diaphragm 75 of the relay valve 76, to close this valve. When relay valve 76 closes it cuts off compressed air from the motor of the valve 10 which cuts off the steam. It will be understood that if the temperature in the retort tends to drop during the cooking cycle, the temperature controller T will operate the valve 10, to throttle the steam supplied to the retort so that a given uniform temperature will be maintained. When the back pressure in the nozzle 71 operates the relay valve 76 at the time that the process temperature is reached, this pressure causes the chamber 86 to expand and thereby close its switch contacts 87. On the closure of the contacts 87, the relay 88 is energized from one side L₁ of the power line, through contacts 32 of the primary timer, conductor 79, winding of relay 88, through the contacts 87, to the other side L₂, of the power line. Under the control of this circuit the relay 88 is energized and closes a locking circuit for itself through its winding, through conductor 90, and through its armature 89 and contacts to the other side L₂ of the power line. In this manner, the relay 88 is locked in, even if contacts 87 should open when the back pressure at the nozzle 71 temporarily drops. The operation of this relay thus maintains an operating circuit for the process timing motor 31 until this motor opens the timer switch contacts 32 at the conclusion of the cooking cycle.

At the end of the cooking portion of the cycle when the timer switch contacts 32 are opened, the energizing circuit of the winding 60 of the solenoid valve will be interrupted so that this valve assumes the position illustrated. With the valve in this position compressed air will be cut off from the temperature controller T so that the steam valve 10 cuts off the supply of steam

to the retort. Also with the solenoid valve in this position, compressed air is supplied to the pipe 65. With compressed air in this pipe and in the branch pipes connected thereto, the vent valves 14 and 17 are closed and the pilot valve 92 is moved to the position shown, wherein the upper motor chamber of valve 22 is vented to the atmosphere. Compressed air from pipe 65, is also supplied to the pressure controller P which maintains a predetermined pressure in the retort during the cooling period. During the cooling period the operator gradually admits cooling water to the retort through stop cock 19. While the cooling water is being admitted, the pressure controller P, throttles the air pressure supplied to the lower motor chamber of valve 22 and to the overflow valve 24, thereby maintaining the desired pressure in the retort.

At the end of the cooling portion of the cycle, the operator closes the hand valve 19 to stop the flow of cooling water to the retort. Also the operator closes the stop cock 58. This results in opening of the bleed valves 14 and 17 as well as the opening of the vent and drain valve 30. The cover 6 can then be opened and the processed cans removed ready for recharging the retort for the unprocessed cans after which the described cycle is repeated.

What I claim is:

1. In a food processing system, a retort arranged to be sealed during a process cycle, said retort having a vent therein, a steam pipe communicating with said retort for heating the contents thereof, a temperature controller governing the steam admitted through said pipe to said retort for maintaining a predetermined cooking temperature therein, a settable process timer for measuring and controlling the duration of a given cooking cycle in the retort, means responsive to the cooking temperature value being attained in the retort for starting said process timer, a lapsed time interval measuring mechanism the operation of which is initiated responsive to the setting of said process timer and including a device operated at the conclusion of said interval, a temperature actuated device operated in response to a given temperature in said retort but below the cooking temperature, and means jointly controlled by both of said devices for maintaining said vent open for the given interval and until said given temperature is reached in the retort, and then closing the same.

2. In a food processing system, a retort arranged to be sealed during a process cycle, said retort having a vent therein, a steam pipe communicating with said retort for heating the contents thereof, a temperature controller governing the steam admitted through said pipe to said retort for maintaining a predetermined cooking temperature therein, a settable process timer for measuring and controlling the duration of a given cooking cycle in the retort, means responsive to the given cooking temperature value being attained in the retort for starting said process timer, a lapsed time interval measuring mechanism including a device operated at the conclusion of said interval, means including said process timer for initiating the operation of said mechanism, a temperature device having a portion subjected to the temperature within the retort and operated in response to a given temperature therein but below the cooking temperature; and means jointly controlled by both of said devices for maintaining said vent open for the given interval and until said given tem-

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perature is reached in the retort, and then closing the same.

3. In a food processing system, a retort arranged to be sealed during a process cycle, said retort having a vent therein, mechanism controlling the opening of said vent, a steam pipe communicating with said retort for heating the contents thereof, a temperature controller governing the steam admitted through said pipe to said retort for maintaining a predetermined cooking temperature therein, a primary timer settable for measuring and controlling the duration of a given cooking cycle in the retort, means responsive to the given cooking temperature value being attained in the retort for starting said timer, a lapsed time interval measuring mechanism started into operation in response to the setting of said primary timer and including a closed switch operated to open at the conclusion of said interval, an electric contact thermometer

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operated in response to a given temperature in said retort lower than said cooking temperature, and electrical means jointly actuated in response to the operation of both of said thermometer and said switch for operating said mechanism to close said vent.

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