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(54) **STEAM OVEN WITH QUICK RECOVERY FEATURE AND METHOD**

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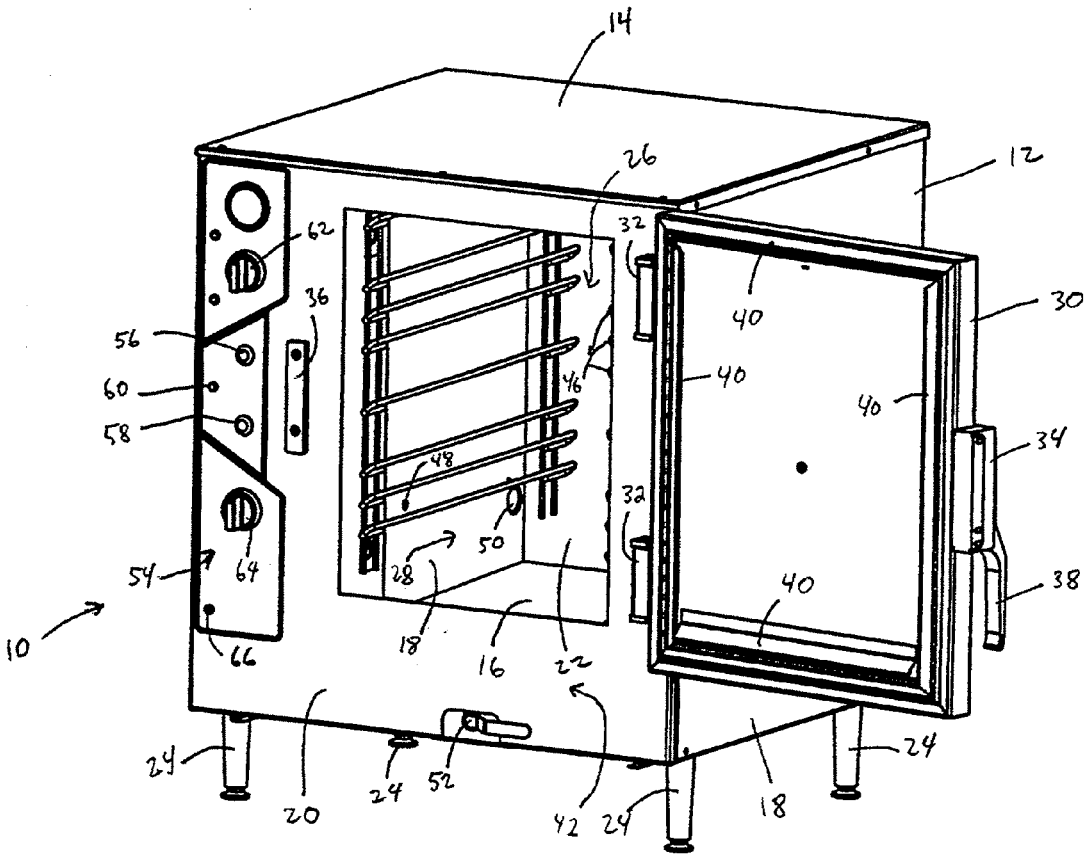
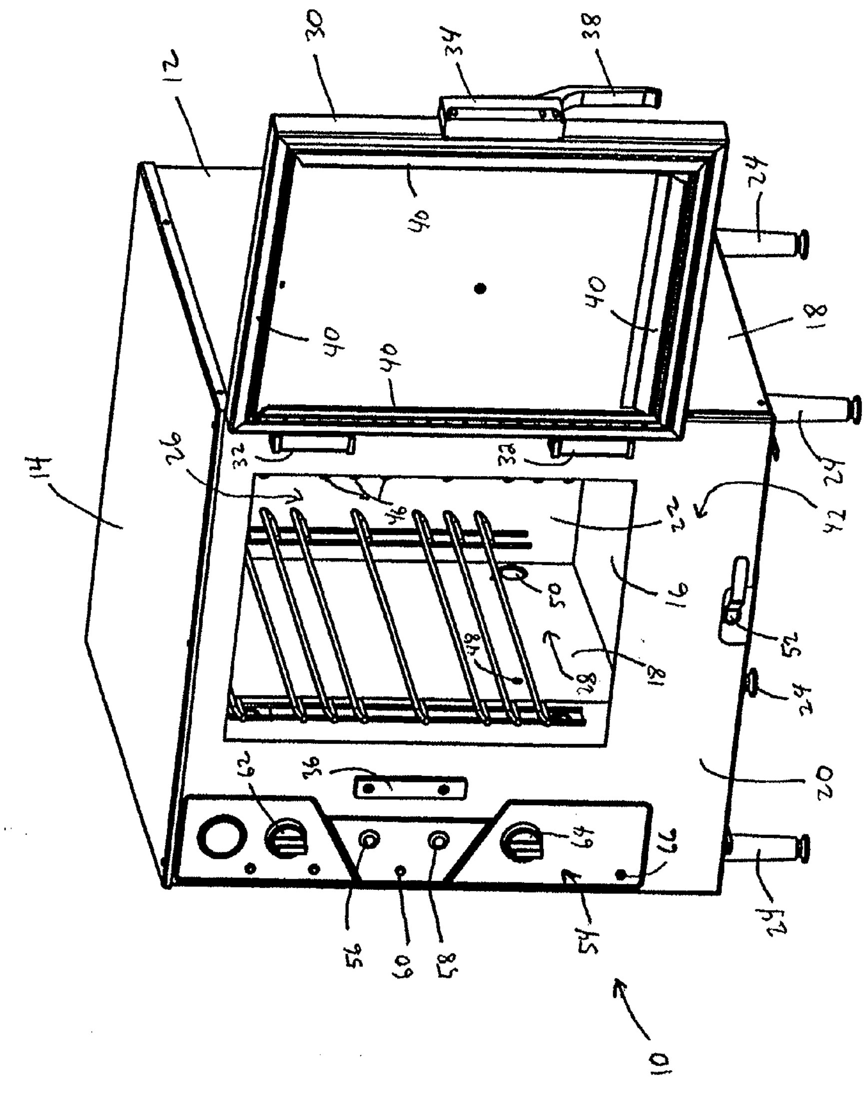
(57) **ABSTRACT**

A steam oven with a housing defining a cooking cavity therein and a door for accessing the cooking cavity. A water reservoir may be provided configured to hold a quantity of water that is turned to steam using a heating element. The oven may include one or more a steam supply conduits for directing steam generated in the water reservoir to the cooking cavity. A pressure sensor may be provided to detect a pressure within the cooking cavity. A control circuit regulates the heating element based on a pressure detected by the pressure sensor. However, the control circuit includes a quick recovery feature that turns on the heating element for a period of time regardless of whether the pressure within the cooking cavity is greater than a threshold pressure.

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66

FIG. 1

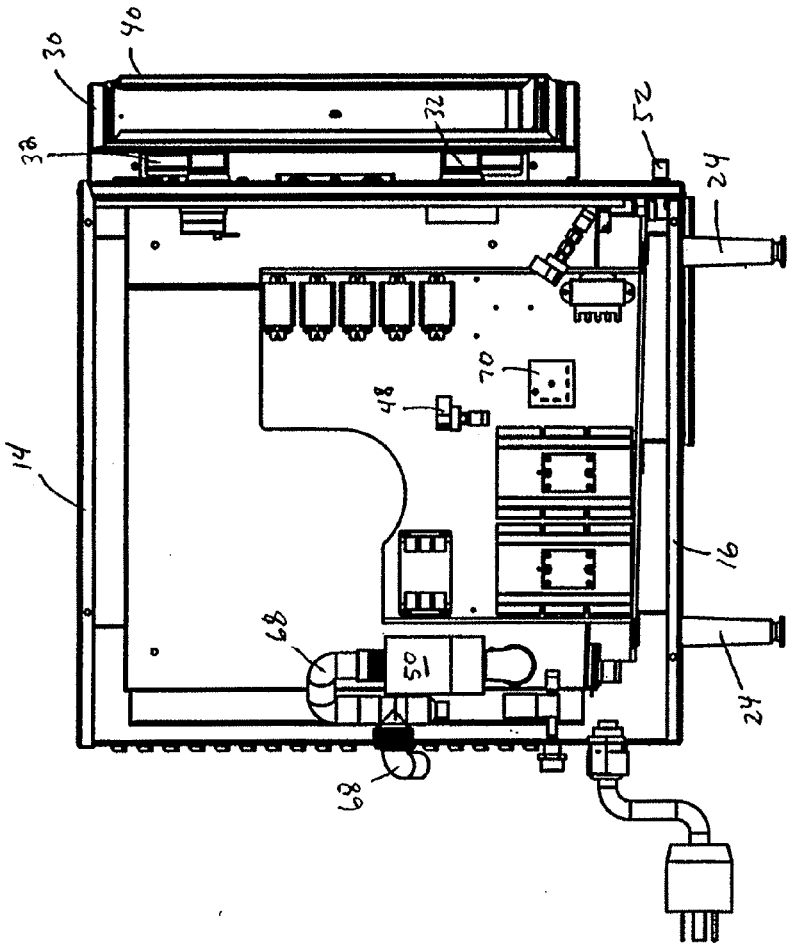

FIG. 2

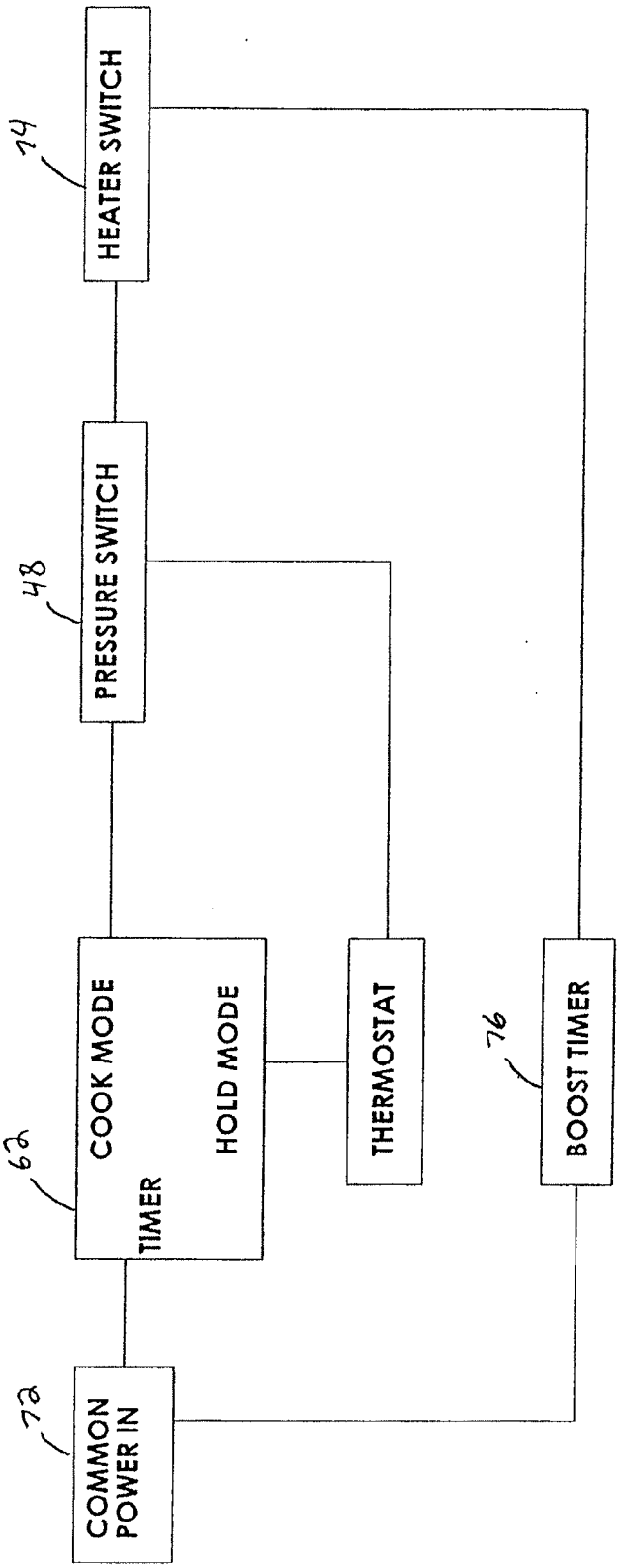
74
HEATER SWITCH
48
PRESSURE SWITCH
68
COOK MODE
TIMER
HOLD MODE
THERMOSTAT
76
BOOST TIMER
72
COMMON
POWER IN

FIG. 3

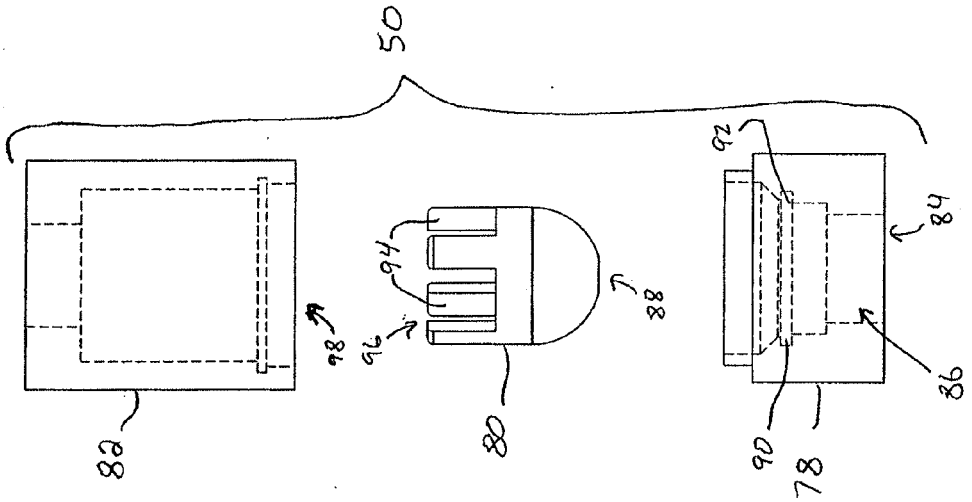

FIG. 4

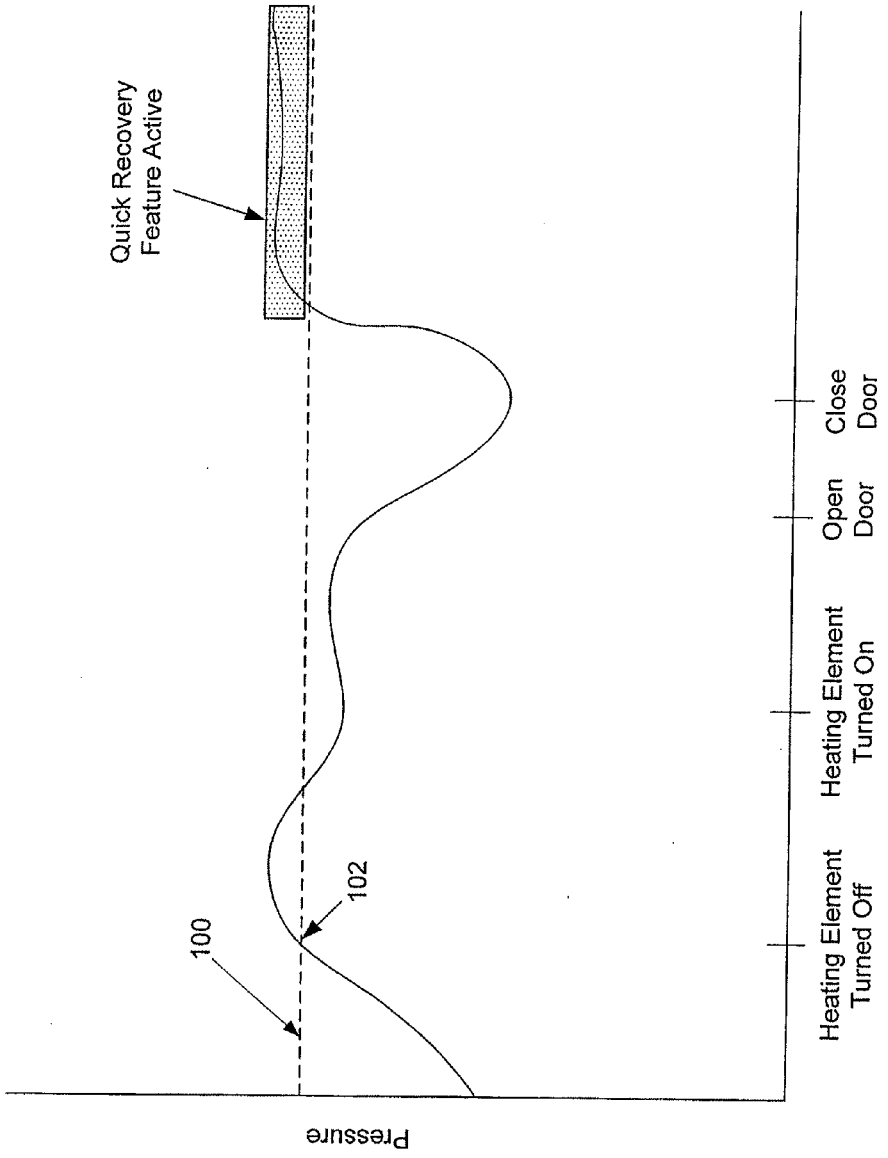
Quick Recovery Feature Active
100
102
Pressure
Heating Element Turned Off
Heating Element Turned On
Open Door
Close Door

FIG. 5

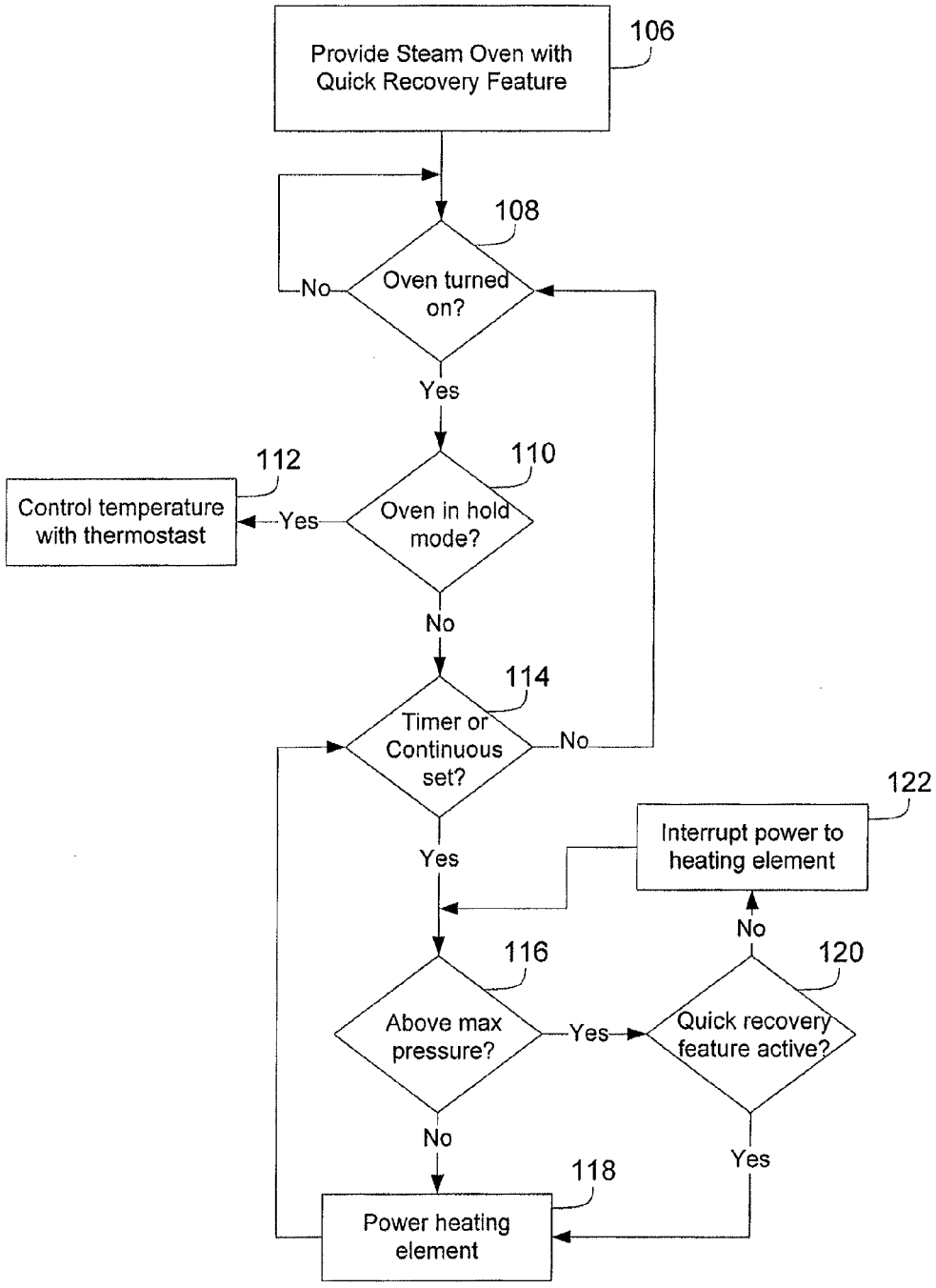
Provide Steam Oven with Quick Recovery Feature
106
108
Oven turned on?
No
Yes
110
Oven in hold mode?
112
Control temperature with thermostast
Yes
No
114
Timer or Continuous set?
No
Yes
122
Interrupt power to heating element
No
116
Above max pressure?
Yes
120
Quick recovery feature active?
No
Yes
118
Power heating element

FIG. 6

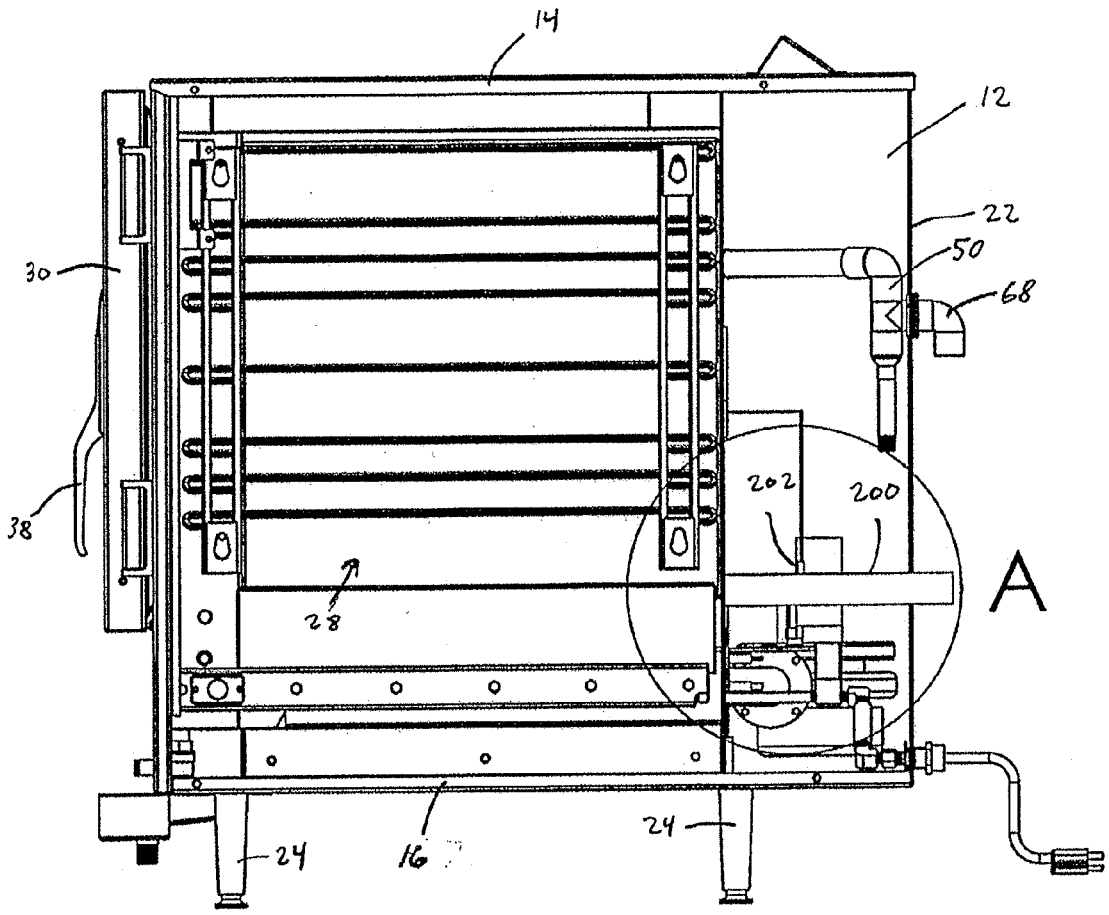

FIG. 7

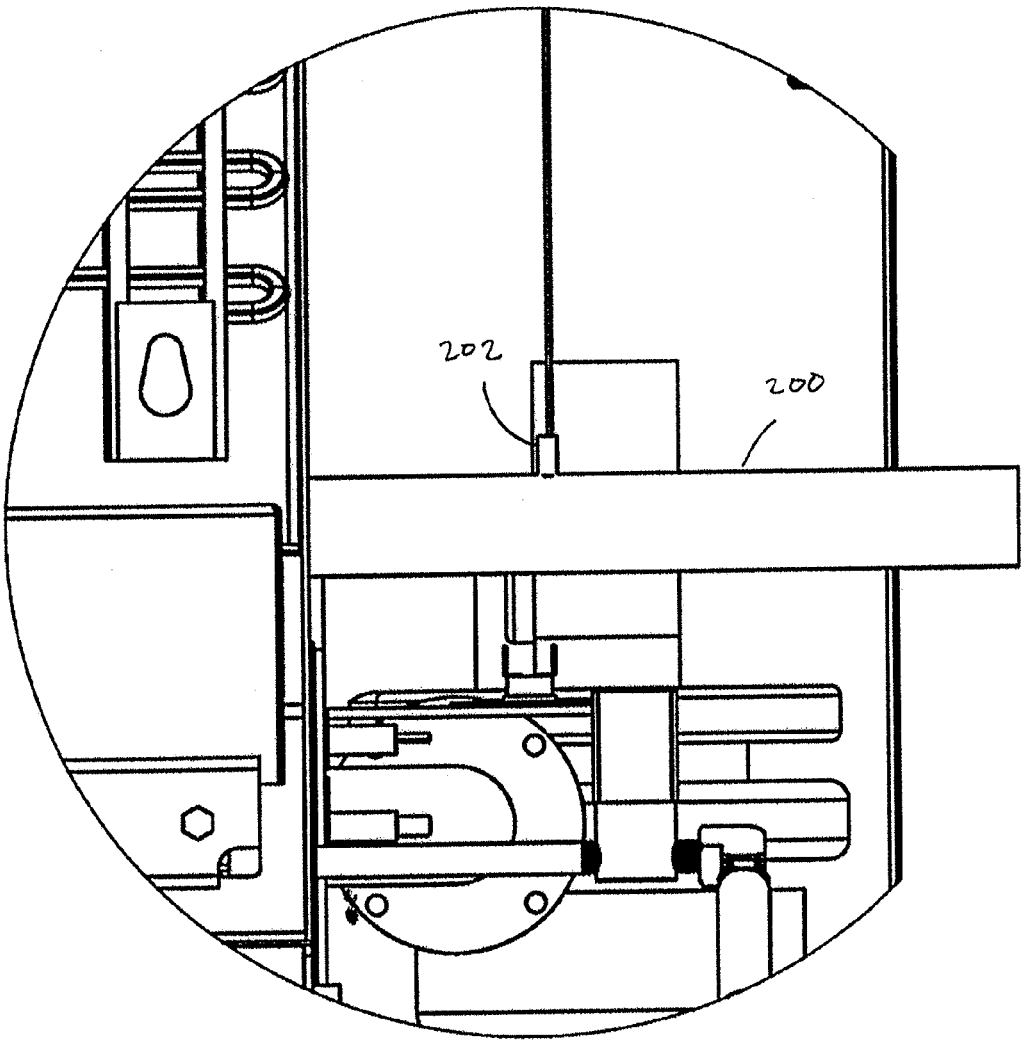

FIG. 8

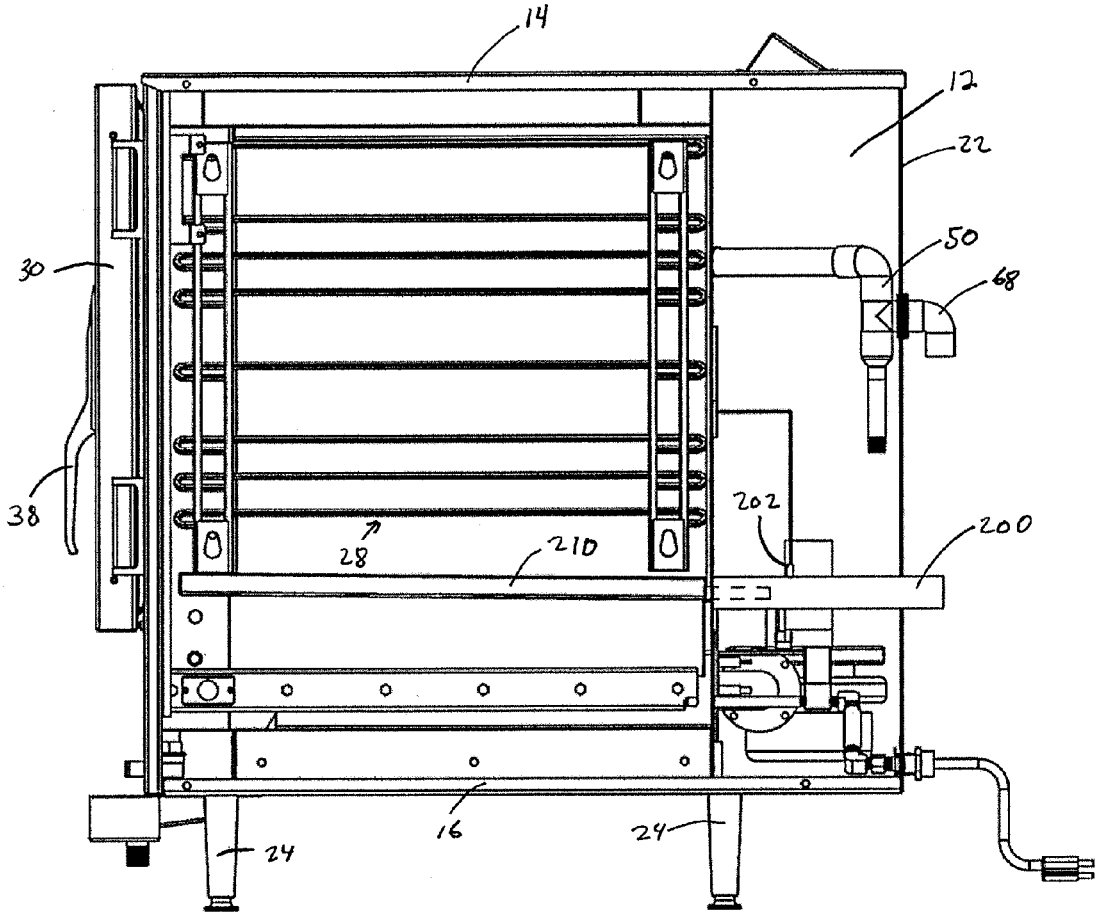

FIG. 9

STEAM OVEN WITH QUICK RECOVERY FEATURE AND METHOD

RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application Ser. No. 61/379,803 filed on Sep. 3, 2010, the entire disclosure of which is hereby incorporated by reference.

TECHNICAL FIELD

[0002] This invention relates generally to steam ovens and more particularly to a steam oven with a quick recovery feature that recovers to an operating temperature quickly after the introduction of ambient temperature air into the cooking cavity, such as due to opening/closing of the oven door.

BACKGROUND

[0003] Steam cooking offers many healthy benefits. One benefit is that food items retain their natural color and taste that may be lost with other cooking methods. Another benefit is that vitamins, minerals and other nutrients are not lost in the cooking process.

[0004] Steam ovens that cook food items using steam are well known. One type of steam oven continuously introduces steam to cook food items. With this type of steam oven, steam is continuously introduced even if the food items are fully saturated by the amount of steam already in the cooking cavity. This leads to inefficiencies in which the oven uses more water and power than really necessary. Another type of steam oven exists, which is often called "boilerless," that does not continuously introduce steam. Instead, this type of steam oven uses a pressure switch to detect a pressure within the cooking cavity and turn off the heating element when a threshold pressure has been reached. After the heating element is turned off, the pressure within the cooking cavity eventually lowers below the threshold pressure. When this happens, the pressure switch turns back on the heating element. Accordingly, with a boilerless steam oven, the heating element is turned on/off during the cooking process depending on the pressure within the cooking cavity.

[0005] Although boilerless steam ovens tend to be efficient, these type of ovens take a longer period of time after the oven door is opened to recover, which slows the cooking process. One reason for this issue is that the pressure within the cooking cavity increases after the oven door is closed due to the introduction of ambient temperature air into the cooking cavity. This increase in pressure trips the threshold pressure detected by the pressure switch, which causes the heating element to be turned off. Although reaching the threshold pressure normally indicates that a sufficient amount of steam is already in the cooking cavity, the increase in pressure caused by opening/closing the oven door creates a "false signal" when the heating element should actually stay on. Indeed, turning off the heating element in this circumstance delays the evacuation of the ambient temperature air from the cooking cavity, which slows the cooking process. Accordingly, there is a need for a boilerless steam oven that more quickly recovers from the opening/closing of the oven door.

SUMMARY

[0006] According to one aspect, the present invention provides a steam oven. The oven has a housing defining a cooking cavity and a water reservoir. A heating element transfers heat to the water reservoir for generating steam. The steam is directed to the cooking cavity with one or more steam supply conduits. An exhaust valve provides fluid communication between the cooking cavity and the atmosphere when a pressure within the cooking cavity is reached. The oven includes a pressure switch that controls the heating element based on a pressure within the cooking cavity. The pressure switch turns on the heating element when the pressure within the cooking cavity is less than a threshold pressure and turns off the heating element when the pressure within the cooking cavity is greater than the threshold pressure. An override circuit is provided that overrides the pressure switch so the heating element is turned on regardless of whether the pressure within the cooking cavity is greater than the threshold pressure. The override circuit turns on the heating element for a predetermined period of time or until a sensed condition, such as temperature within the cooking cavity or in gas flowing through the exhaust valve, reaches a threshold value.

[0007] In one embodiment, the oven includes a switch configured to actuate the override circuit. For example, the switch may be manually actuated by a user. Embodiments are contemplated in which the override circuit is configured to actuate responsive to detection of a pressure change in the cooking cavity that is greater than a predetermined pressure change. Depending on the circumstances, the override circuit could be configured to actuate responsive to detection of a pressure in the cooking cavity being reduced below a predetermined pressure. In some cases, where the housing includes a door for accessing the cooking cavity, the override circuit could include a door sensor configured to detect whether the door is open or closed, and circuit is actuated based on the door sensor. For example, the door could include a magnetic portion and the door sensor could be a magnetic sensor.

[0008] Embodiments are contemplated in which the exhaust valve includes a body defining a passageway therethrough that provides fluid communication between the cooking cavity and the atmosphere. The exhaust valve includes a plunger disposed in the passageway that is movable between an open position that allows flow through the passageway and a closed position that prevents flow through the passageway. Instead of relying on a spring, the plunger is configured with a weight sufficient to urge the plunger to the closed position due to gravity until a predetermined pressure within the cooking cavity is reached to overcome the weight of the plunger to open the passageway. In one embodiment, the passageway is dimensioned between approximately 1.75 inches and 2.25 inches. In some cases, the plunger has a hemispherical first end and an opposing second end with a plurality of elongated prongs that reduce lateral movement of the plunger.

[0009] According to another aspect, the invention provides a steam oven with a housing defining a cooking cavity therein and a door for accessing the cooking cavity. A water reservoir may be provided configured to hold a quantity of water that is turned to steam using a heating element. The oven may include one or more a steam supply conduits for directing steam generated in the water reservoir to the cooking cavity. A pressure sensor may be provided to detect a pressure within the cooking cavity. A control circuit regulates the heating element based on a pressure detected by the pressure sensor. The control circuit is turns on the heating element when the pressure within the cooking cavity is less than a threshold pressure and turns off the heating element when the pressure within the cooking cavity is greater than the threshold pressure. However, the control circuit includes a quick recovery

feature that turns on the heating element for a predetermined period of time regardless of whether the pressure within the cooking cavity is greater than the threshold pressure. Depending on the circumstances, the quick recovery feature is actuated by: a manually actuated switch, a detection of a pressure change in the cooking cavity that is greater than a predetermined pressure change, and/or a detection of a pressure in the cooking cavity being reduced below a predetermined pressure. In some cases, the quick recovery feature is actuated by a door sensor detecting that the door has been opened or closed.

[0010] According to a further aspect, the invention provides a method for controlling a heating element in a steam oven. The method involves the step of providing a steam oven with a cooking cavity. The steam oven is one that has a heating element that transfers heat to a water reservoir to generate steam. The heating element is controlled by providing power in an interrupted manner to the heating element based on the following conditions: (a) powering the heating element if a pressure detected within the cooking cavity is less than a predetermined minimum pressure; (b) powering the heating element for a predetermined period of time after introduction of air having an ambient temperature into the cooking cavity; and (c) interrupting power to the heating element if a pressure detected within the cooking cavity is greater than a predetermined maximum pressure, subject to (b).

[0011] Additional features and advantages of the invention will become apparent to those skilled in the art upon consideration of the following detailed description of the illustrated embodiment exemplifying the best mode of carrying out the invention as presently perceived. It is intended that all such additional features and advantages be included within this description and be within the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The present disclosure will be described hereafter with reference to the attached drawings which are given as non-limiting examples only, in which:

[0013] FIG. **1** is a front perspective view of an example steam oven according to an embodiment of the present invention;

[0014] FIG. **2** is a left side view of the steam oven shown in FIG. **1** with a panel removed to expose interior components;

[0015] FIG. **3** is a diagrammatical view of a control circuit to control the heating element according to an embodiment of the present invention;

[0016] FIG. **4** is an exploded view of an example exhaust valve according to an embodiment of the present invention;

[0017] FIG. **5** is a graphical example of pressure within the cooking cavity during various circumstances; and

[0018] FIG. **6** is a flow chart showing example steps that may be performed during operation of a steam oven according to an embodiment of the present invention.

[0019] Corresponding reference characters indicate corresponding parts throughout the several views. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principals of the invention. The exemplification set out herein illustrates embodiments of the invention, and such exemplification is not to be construed as limiting the scope of the invention in any manner.

DETAILED DESCRIPTION OF THE DRAWINGS

[0020] While the concepts of the present disclosure are susceptible to various modifications and alternative forms, specific exemplary embodiments thereof have been shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that there is no intent to limit the concepts of the present disclosure to the particular forms disclosed, but on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the disclosure.

[0021] FIG. **1** shows an example steam oven **10** according to an embodiment of the present invention. In the example shown, the steam oven includes a housing **12** with a top wall **14**, bottom wall **16**, side walls **18**, front wall **20**, and rear wall **22**. Typically, the walls are formed from a metal, such as stainless steel. The walls could be connected together using a variety of fasteners, such as rivets, screws, welds, and other fastening devices. In the example shown, the housing **12** is suspended above the ground by a plurality of legs **24**.

[0022] In the example shown, the front wall **20** defines an opening **26** through which a cooking cavity **28** can be accessed. For example, the user could place food items in the cooking cavity **28** through the opening **26**. Although this example shows the opening **26** for accessing the cooking cavity on the front wall **20**, one skilled in the art should appreciate that the oven **10** could have openings on other walls to access the cooking cavity **28**.

[0023] As shown, a door **30** is pivotably connected to the front wall **20** to open and close the opening **26** to the cooking cavity **28**. In this embodiment, the door **30** is mounted on the front wall **20** using hinges **32** and pivots between an open position and closed position. Although the door **30** pivots about a vertical axis in example shown, the door **30** could pivot about a horizontal axis. Likewise, other arrangements could be used to move the door **30** between an open and closed position.

[0024] The door **30** includes a latch assembly **34** to securely close the door **30** using a strike plate **36**. In this example, a user could open or close the door **30** by swinging the door **30** on the hinges **32** such that the latch assembly **34** is either engaged or disengaged with the strike plate **36**. A handle **38** is provided in this example to allow the user to engage or disengage the latch assembly **34**. Typically, the interior surface of the door **30** includes a seal **40** to prevent escape of gas from the cooking cavity **28** through the opening **26** when the door **30** is closed.

[0025] The oven **10** includes a water reservoir **42** for holding a quantity of water. Although the water reservoir **42** could be manually refilled, embodiments are contemplated in which the water reservoir **42** could be in fluid communication with a source of water and automatically refilled. For example, the oven **10** could include a low water sensor that electrically triggers a valve, such as a solenoid, to open fluid communication with the water source until the water reservoir **42** is refilled.

[0026] A heating element **44** is provided to transfer heat to the water reservoir **42** to generate steam. A plurality of steam supply conduits **46** or ports provide fluid communication between the cooking cavity **28** and the water reservoir **42** to direct steam into the cooking cavity **28**. As shown, the housing **12** includes a drain valve **52** configured to drain the water reservoir **42**. As discussed in more detail below, a pressure switch **48** is provided to detect a pressure within the cooking

cavity **28** and control the heating element **44** based on the pressure detected within the cooking cavity **28**.

[0027] In the example shown, the oven **10** includes an exhaust valve **50** for providing fluid communication between the cooking cavity **28** and the atmosphere if the pressure within the cooking cavity **28** exceeds a predetermined pressure. For example, an inlet port of the exhaust valve **50** is in fluid communication with the cooking cavity **28**. Although the exhaust valve **50** is urged to a closed position to block escape of gas to the atmosphere, the pressure within the cooking cavity **28** can become sufficient to overcome the exhaust valve **50** to release gases to the atmosphere. This allows, for example, cooler air to be evacuated from the cooking cavity to increase cooking speeds.

[0028] In the example shown, a control panel **54** is provided with access on the front wall **20** of the oven **10**. Although the control panel **54** is on the front wall **20** of this embodiment, it should be appreciated that the control panel could be in other locations. As shown, the control panel **54** includes an "on" switch **56** and an "off" switch **58** to turn on and turn off the oven **10**, respectively. Although a separate on and off switch **56**, **58** are shown in this example, one skilled in the art should understand that these switches could be combined into a single switch that both turns on and off the oven **10**. As shown, the control panel **54** includes an on indicator light **60** that would illuminate if the oven **10** is turned on.

[0029] In some embodiments, the control panel **54** includes a control selector or knob **62** that allows the user to select the type of cooking that is desired. For example, the control knob **62** could be set to a "hold" setting for an untimed, continuous hold of a set temperature. A temperature selector or knob **64** could be set to the desired holding temperature in conjunction with setting the control knob **62** to the "hold" setting.

[0030] Another example control setting that could be selected by the control knob may be a setting of "CONT" to indicate an untimed continuous steam cook. If the "CONT" setting is selected using the control knob **62**, the oven **10** would steam cook continuously. As discussed below, this does not mean that the heating element **44** would be continuously powered; instead, the heating element would be turned on/off depending on the pressure within the cooking cavity **28**, subject to the quick recovery feature described below.

[0031] By way of another example, the control knob **62** may also have a setting that would allow a user to select the timed cook, such as a number of minutes and/or hours for a steamed cook. If the amount of time is set, the oven **10** would steam cook until the timer expires. In this example shown, the control panel **54** includes a low water indicator light **66** that would indicate the water in the water reservoir **42** is almost gone. In one example, a pressure sensor may be provided in the water reservoir **42** to determine the level of the water therein. If the pressure sensed by the pressure sensor reaches a predetermined pressure, the low water indicator light **66** may be turned on to indicate that the water should be refilled.

[0032] FIG. **2** shows a side view of the example steam oven **10** with a panel removed to expose certain internal components. In the example shown, the pressure switch **48** can be seen which includes a portion that extends into the cooking cavity **28** to detect the pressure therein. The exhaust valve **50** can be seen with a pipe **68** extending out to the atmosphere. As explained above, the exhaust valve **50** allows gas within the cooking chamber **28** to escape to the atmosphere if the pressure within the cooking chamber **28** exceeds a predetermined pressure. A quick recovery feature **70** can be seen in FIG. **2** which allows the heating element **44** to be turned on even if the pressure within the cooking cavity **28** exceeds a predetermined pressure. This allows a quicker recovery time so that air introduced into the cooking cavity **28** that has an ambient temperature. Other electronic components, such as relays and other control items are shown in FIG. **2**, but one skilled in the art should appreciate that the operation of the oven could be performed by various circuitry and/or software and/or a combination of circuitry and software.

[0033] FIG. **3** shows a block diagram with various control elements that may electronically control the cooking of the oven **10**. In the example shown, the electronics have a common power supply **72** to provide a source of power to the various components. The control knob **62** includes a cooking mode which may be continuous or timed.

[0034] If in the cooking mode, the heating element **44** is turned on to transfer heat to the water reservoir **42**, which generates steam. This steam is introduced into the cooking cavity **28**, such as using one or more steam supply conduits **46**. As steam is introduced into the cooking chamber, the pressure will increase within the cooking chamber **28**. The pressure switch **48** will monitor the pressure and control a heater switch **74**, which could be separate or integrated with the heating element **44**, if a predetermined pressure is exceeded. In other words, the pressure switch **48** will interrupt power to the heating element **44** if a threshold pressure is exceeded within the cooking cavity **28**. Accordingly, the heating element **44** will reciprocate between generating steam and not generating steam depending on the pressure within the cooking cavity **28**. If the continuous cook mode is selected, this will continue until the user turns off the oven **10**. If in the timed cook mode, this will continue until the timer expires, which will turn off the heating element **44**.

[0035] In the example shown, the control circuit includes a boost timer **76** which is also referred to as a quick recovery feature or override circuit. The boost timer **76** allows the heating element **44** to be turned on regardless of the pressure sensed by the pressure switch **48**. This is important when the pressure switch **48** senses a pressure that would falsely indicate that the heating element **44** should be turned off. In one embodiment, the boost timer **76** turns on the heating element **44** for a predetermined period of time. Consider an example in which the door **30** to the oven **10** is opened and then closed. When this happens, air at an ambient temperature within the room will be introduced into the cooking cavity **28**. When the door **30** is closed, this ambient temperature will expand due to the temperature within the cooking cavity **28**. Although this pressure may exceed the threshold pressure that would trip the pressure switch **48** to turn off the heating element **44**, there is no reason why the heating element **44** should be turned off, as this will slow the cooking process. Instead, the air at ambient temperature should be evacuated from the cooking cavity **28**. Accordingly, the boost timer **76** will override the pressure switch **48** so that the heating element **44** will be turned on regardless of the pressure switch **48** for a predetermined amount of time. Since the pressure within the cooking cavity **28** will increase above the threshold pressure for the exhaust valve **50**, the air with the ambient temperature will be exhausted to atmosphere through the exhaust valve **50**. When the predetermined amount of time that the boost timer **76** turns on the heating element **44** is expired, the heating element **44** is again controlled by the pressure switch **48**. The predetermined amount of time will vary depending on the wattage of heating element and size of the cooking cavity. For

example, the predetermined amount of time may be between one to four minutes in some cases. Higher and lower times for the quick recovery feature may be used depending on the circumstances. If the control knob **62** is in the hold mode, the thermostat will maintain the temperature within the cooking cavity in conjunction with the pressure switch **48**.

[0036] Embodiments are contemplated in which the quick recovery feature may override the pressure switch **48** based on a measured condition associated with the oven **10** rather than using a predetermined period of time. For example, the quick recovery feature may turn on/off the heating element **44** based on a temperature sensed within the cooking cavity **28** remote from the steam supply conduits **46** or based on a temperature of exhaust gases. The temperature may indicate that the heating element **44** should be turned on to evacuate air within the cooking cavity **28** so that steam saturates the cooking cavity **28**.

[0037] Consider an example in which frozen food items are placed into the cooking cavity **28** and the door **30** closed. In this example, the user selects a timed cook for thirty minutes. Based on this selection, the heating element **44** will turn on and generate steam directed into the cooking cavity **28** via the steam supply conduits **46**. Since the steam will be absorbed by the frozen food items, the pressure within the cooking cavity **28** will not initially rise, but will generally be that of atmosphere. As the cooking cycle continues, the pressure within the cooking cavity **28** will rise enough to trip the pressure switch **48**, but this would slow the cooking process. At this point, the quick recovery feature may be activated to keep the heating element on. In this embodiment, rather than using a predetermined time, the quick recovery feature includes a thermocouple (or other temperature control circuit) to control when the quick recover feature should be deactivated. When the temperature rises to a sufficiently high temperature, for example, this will indicate that the cooking cavity **28** is saturated with steam and the ambient air introduced when the door **30** was opened has been evacuated from the oven cavity **28**; accordingly, the heating element may be turned off and control is returned to the pressure switch **48**. The temperature at which the thermocouple turns off the heating element **44** may vary depending on circumstances; however, it is believed that at a temperature greater than approximately 205° F., the thermocouple could be configured to interrupt power to the heating element **44**. Although a temperature of greater than 205° F. is provided for purposes of example as a temperature in which steam would generally saturate the cooking cavity, one skilled in the art should appreciate that the thermocouple could be configured to turn off the heating element **44** at lower temperatures depending on the circumstances.

[0038] In embodiments in which a temperature is sensed to determine when the quick recovery feature should be deactivated, the thermocouple (or associated temperature sensor) could be located in various locations. For example, the thermocouple could sense a temperature within the cooking cavity **28**. In such situations, however, the sensor would typically need to be remote enough from the steam supply conduits **46** to measure the overall temperate within the cooking cavity **28** instead of the steam flowing through the steam supply conduits **46**. In some cases, the sensor could be outside the cooking cavity. For example, the temperature sensor could be configured to measure a temperature of exhaust gases flowing through (or out of) the exhaust valve **50**.

[0039] FIG. **4** shows an example exhaust valve **50** that could be used to exhaust gas from the cooking cavity **28** if the pressure exceeds a predetermined threshold. In the example shown, the exhaust valve **50** includes a base portion **78**, a plunger **80**, and a body **82**.

[0040] As shown in this example, the base portion **78** includes an inlet port **84** that is in fluid communication with the cooking cavity **28**. The base portion **78** has a passageway **86** therethrough. The passageway **86** is shaped to receive a first end **88** of the plunger with a shelf **90** that receives a seal **92** such as an o-ring. In the embodiment shown, the first end **88** of the plunger **80** has substantially hemispherical shape. The seal **92** is dimensioned to receive the first end **88** of the plunger **80**. When the first end **88** of the plunger **80** is seated on the shelf **90**, the plunger **80** blocks flow through the passage **86**.

[0041] A plurality of prongs **94** extend from a second end **96** of the plunger. These prongs **94** are received within a passageway **98** of the body **82**. These prongs **94** are dimensioned to prevent lateral movement of the plunger **80** due to interference between the prongs **94** and the interior surface of the passageway **98** in the body **82**. The passageway **98** in the body **82** is in fluid communication with the atmosphere.

[0042] In the embodiment shown, the exhaust valve **50** operates without a spring to urge the plunger to a closed position. Instead, the weight of the plunger is configured to urge the plunger to be seated on the shelf **90** via gravity to block flow through the passageway **86**. This prevents gas from escaping the cooking cavity **28** when the plunger **80** is in this position. The pressure within the cooking cavity **28** acts on the first end **88** of the plunger and will overcome the weight of the plunger **80** if the pressure within the cooking cavity **28** is sufficient. When this happens, the plunger **80** is unseated from the shelf **90** and moves toward the body **82**, which allows flow through the passages **86**, **98** and exhausts gas within the cooking cavity **28** to the atmosphere.

[0043] FIG. **5** is a graph showing an example of pressure within the cooking cavity **28** during operation of the oven **10**. In this example, the oven **10** may already be turned on prior to the start of the graph. In any event, the pressure within the cooking cavity **28** increases due to steam being introduced therein because the heating element **44** is on, which transfers heat to water in the water reservoir **42** to generate steam. As this happens, the pressure switch **48** continuously monitors the pressure within the cooking cavity **28** for a pressure that exceeds a predetermined threshold pressure. In this example, the excess pressure amount which will cause the pressure switch **48** to turn off the heating element **44** is indicated by the dotted line **100**. As can be seen, when the pressure crosses over the threshold pressure at point **102**, the pressure switch turns off the heating element **44**. Although the pressure may increase somewhat even after the heating element **44** is turned off, the pressure will eventually reduce until the pressure is below the threshold pressure amount indicated by dotted line **100**. When this happens, the pressure switch **48** turns the heating element **44** back on to continue generation of steam.

[0044] In this example, there is an event in which the door **30** to the oven **10** is opened, such as to insert additional food into the cooking cavity **28**. When this happens, the pressure drops and the air at ambient temperature in the room is introduced within the cooking cavity **28**. When the door **30** is closed, the pressure within the cooking cavity **28** will increase again. Due to the introduction of air at ambient temperature within the cooking cavity **28**, however, the pressure detected

by the pressure switch **48** falsely indicates that the heating element **44** should be turned off. If the heating element **44** is turned off, this will delay the cooking process because there is not sufficient steam within the cooking cavity **28**. Accordingly, the quick recovery feature may be activated so the heating element **44** is turned on for a predetermined period of time to evacuate the air at ambient temperature within the cooking cavity **28**. This air is evacuated through the exhaust valve **50** opening due to the increase of pressure within the cooking cavity **28**.

[0045] The quick recovery feature could be activated in numerous ways. Embodiments are contemplated in which the door **30** may be associated with a sensor that detects when the door opens and/or closes. When the door closes, the quick recovery feature would be automatically activated. For example, a portion of the door **30** may be magnetic and a magnetic sensor could be provided to detect when the door opens and closes. In other embodiments, a switch may be provided to allow a user to manually activate the quick recovery feature. For example, a switch could be provided on the control panel **54** that would allow the user to activate the quick recovery feature when the door is closed. In other embodiments, a change in the pressure within the cooking cavity **28** that exceeds a predetermined threshold, indicating the door has been opened, could trigger the quick recovery feature. Regardless of the manner in which the quick recovery feature is activated, it will turn on the heating element **44** for a predetermined period of time regardless of the pressure detected by the pressure switch **48**. After the predetermined period of time has expired, the pressure switch **48** will continue to control the heating element **44**.

[0046] FIG. **6** is a flow chart showing a series of example steps that may be provided to operate the steam oven **10**. In this example, a steam oven with a quick recovery feature like that discussed above has been provided at block **106**. If the oven has been turned on, the oven could be put in hold mode, such as using the control knob **62**. (Blocks **108**, **110**). If the oven is in hold mode, the thermostat along with the pressure switch **48** could control the temperature to the desired amount as described above. (Block **112**). If the oven is not set to the hold mode, the oven could be placed in either a timed or continuous cook mode. (Block **114**). If so, the pressure within the cooking cavity **28** could be detected to determine whether it exceeds a predetermined maximum pressure. (Block **116**). If the predetermined maximum pressure has not yet been reached, the heating element **44** could be powered to generate steam. (Block **118**). If the maximum pressure has been exceeded, however, the quick recovery feature could be activated if needed. (Block **120**). If the quick recovery feature is active, the heating element should be powered for a predetermined period of time. If the quick recovery feature is not active, the power to the heating element should be interrupted so that the pressure within the cooking cavity **28** can be reduced. (Block **122**).

[0047] Although the present disclosure has been described with reference to particular means, materials, and embodiments, from the foregoing description, one skilled in the art can easily ascertain the essential characteristics of the invention and various changes and modifications may be made to adapt the various uses and characteristics without departing from the spirit and scope of the invention.

What is claimed is:

1. A steam oven comprising:
- a housing defining a cooking cavity therein;
- a water reservoir configured to hold a quantity of water;
- a heating element configured to transfer heat to the water reservoir for generating steam;
- a steam supply conduit configured to direct steam generated in the water reservoir to the cooking cavity;
- an exhaust valve configured to provide fluid communication between the cooking cavity and the atmosphere when a pressure within the cooking cavity is reached;
- a pressure switch configured to control the heating element based on a pressure within the cooking cavity, wherein the pressure switch turns on the heating element when the pressure within the cooking cavity is less than a threshold pressure, and wherein the pressure switch turns off the heating element when the pressure within the cooking cavity is greater than the threshold pressure; and
- an override circuit configured to override the pressure switch so the heating element is turned on regardless of whether the pressure within the cooking cavity is greater than the threshold pressure, wherein the override circuit is configured to turn on the heating element for at least a predetermined period of time or until a sensed condition reaches a threshold value.

2. The steam oven of claim **1**, further comprising a switch configured to actuate the override circuit, wherein the switch is manually actuated.

3. The steam oven of claim **1**, wherein the override circuit is configured to turn on the heating element until a sensed temperature is reached within the cooking cavity or in exhaust gas flowing through the exhaust valve.

4. The steam oven of claim **1**, wherein the override circuit is configured to actuate responsive to detection of a pressure change in the cooking cavity that is greater than a predetermined pressure change.

5. The steam oven of claim **1**, wherein the override circuit is configured to actuate responsive to detection of a pressure in the cooking cavity being reduced below a predetermined pressure.

6. The steam oven of claim **1**, wherein the housing includes a door for accessing the cooking cavity, wherein the override circuit includes a door sensor configured to detect whether the door is open or closed, and wherein the override circuit is actuated based on the door sensor.

7. The steam oven of claim **6**, wherein the door includes a magnetic portion, wherein the door sensor is a magnetic sensor.

8. The steam oven of claim **1**, wherein the exhaust valve includes a body defining a passageway therethrough that provides fluid communication between the cooking cavity and atmosphere, wherein the exhaust valve includes a plunger disposed in the passageway that is movable between an open position that allows flow through the passageway and a closed position that prevents flow through the passageway, wherein the plunger is configured with a weight sufficient to urge the plunger to the closed position due to gravity until a predetermined pressure within the cooking cavity is reached to overcome the weight of the plunger to open the passageway.

9. The steam oven of claim **8**, wherein the passageway is dimensioned between approximately 1.75 inches and 2.25 inches.

10. The steam oven of claim **8**, wherein the plunger has a first end and an opposing second end, wherein the first end has a substantially hemispherical shape.

11. The steam oven of claim **10**, wherein the plunger has a plurality of elongated prongs extending from the second end, wherein the prongs are configured to reduce lateral movement of the plunger.

12. The steam oven of claim **11**, wherein the plunger has approximately a cylindrical shape between the first end and the second end.

13. The steam oven of claim **1**, further comprising a water level sensor associated with the water reservoir, wherein the water level sensor determines a level of water in the water reservoir by detecting a pressure within the water reservoir.

14. A steam oven comprising:

a housing defining a cooking cavity therein, wherein the housing includes a door for accessing the cooking cavity;

a water reservoir configured to hold a quantity of water;

a heating element configured to transfer heat to the water reservoir for generating steam;

a steam supply conduit configured to direct steam generated in the water reservoir to the cooking cavity;

a pressure sensor configured to detect a pressure within the cooking cavity;

a control circuit configured to control the heating element based on a pressure detected by the pressure sensor, wherein the control circuit is configured to turn on the heating element when the pressure within the cooking cavity is less than a threshold pressure, and wherein the control circuit is configured to turn off the heating element when the pressure within the cooking cavity is greater than the threshold pressure; and

wherein the control circuit includes a quick recovery feature configured to turn on the heating element for a predetermined period of time regardless of whether the pressure within the cooking cavity is greater than the threshold pressure.

15. The steam oven of claim **14**, wherein the control circuit is configured such that the quick recovery feature is actuated by one or more of the following: a manually actuated switch, a detection of a pressure change in the cooking cavity that is greater than a predetermined pressure change, or a detection of a pressure in the cooking cavity being reduced below a predetermined pressure.

16. The steam oven of claim **14**, wherein the control circuit is configured such that the quick recovery feature is actuated by a door sensor detecting that the door has been opened or closed.

17. A method for controlling a heating element in a steam oven, the method comprising the steps of:

providing a steam oven with a cooking cavity, wherein the steam oven has a heating element that transfers heat to a water reservoir to generate steam;

controlling the heating element by providing power in an interrupted manner based on the following conditions:

(a) powering the heating element if a pressure detected within the cooking cavity is less than a predetermined minimum pressure;

(b) powering the heating element for a predetermined period of time after introduction of air having an ambient temperature into the cooking cavity; and

(c) interrupting power to the heating element if a pressure detected within the cooking cavity is greater than a predetermined maximum pressure, subject to (b).

18. The method of claim **17**, wherein the steam oven includes a door for access to the cooking cavity, further comprising the step of detecting whether the door has been opened or closed to determine whether air having an ambient temperature has been introduced into the cooking cavity.

19. The method of claim **17**, wherein the steam oven includes a user-actuated switch for indicating an introduction of air having an ambient temperature into the cooking cavity, further comprising the step of detecting actuation of the user-actuated switch to determine whether air having an ambient temperature has been introduced into the cooking cavity.

20. The method of claim **19**, further comprising the step of detecting a reduction in pressure below a predetermined pressure in the cooking cavity to determine whether air having an ambient temperature has been introduced into the cooking cavity.

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