Sept. 30, 1969 S. H. TORREY ET AL 3,469,568

DOOR LOCKING MEANS AND ASSOCIATED CONTROL CIRCUIT FOR SELF-CLEANING OVEN

Filed May 31, 1968 3 Sheets-Sheet 1

FIG. 2

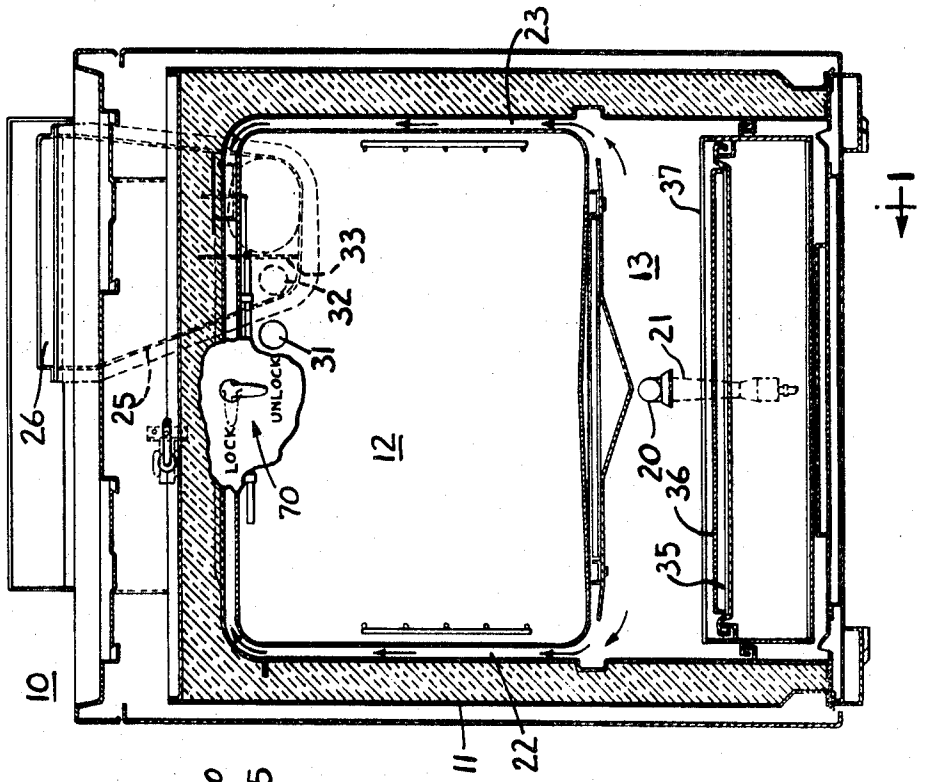
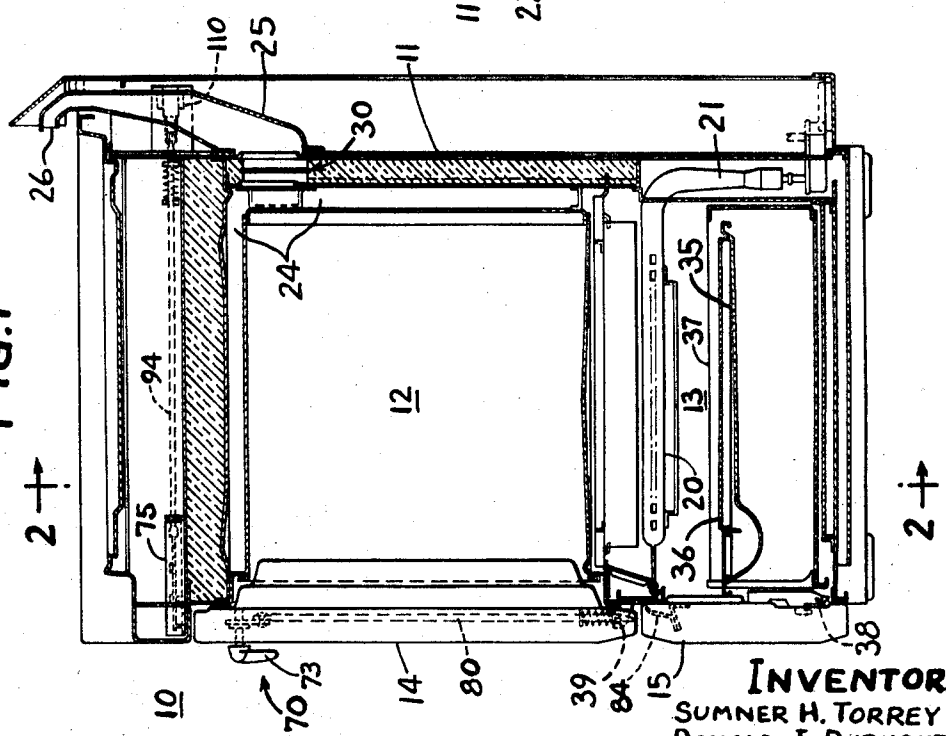


FIG. 1



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FIG. 3

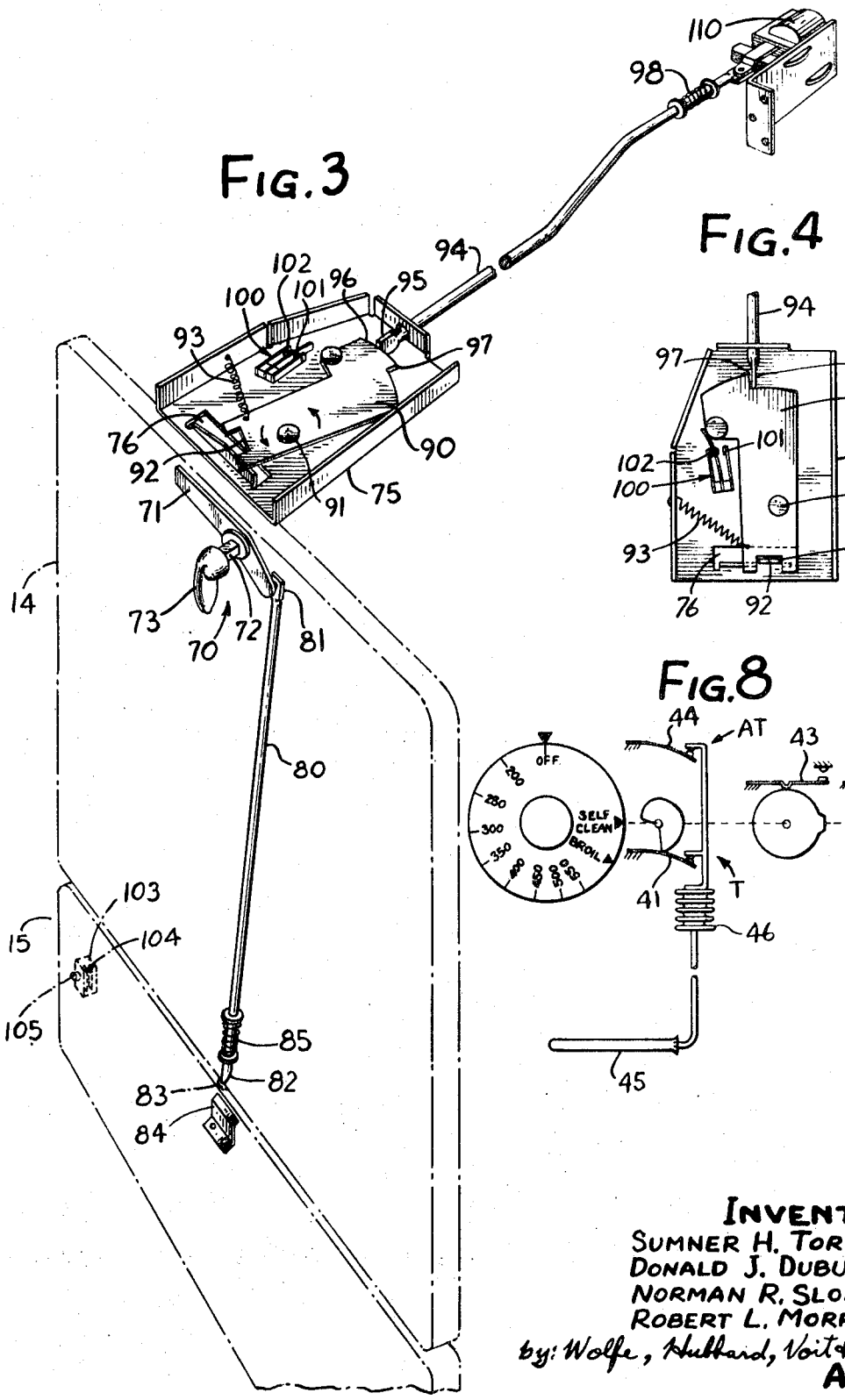


FIG. 4

FIG. 8

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FIG. 5
BAKING

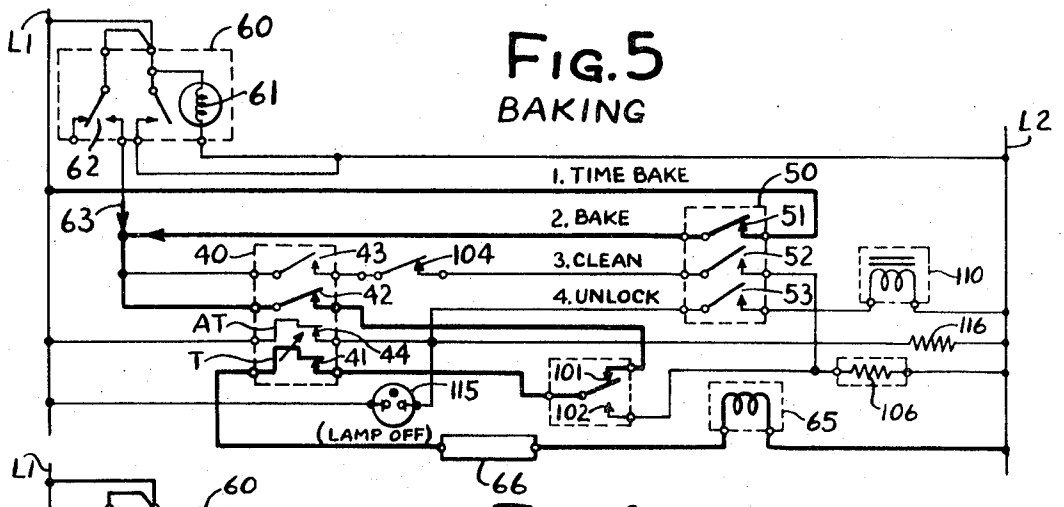


FIG. 6
SELF CLEANING

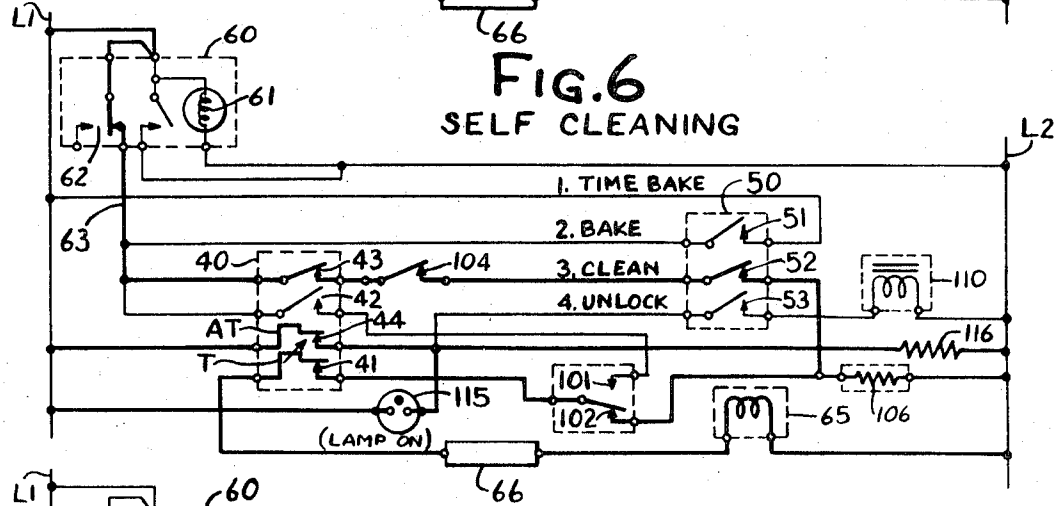
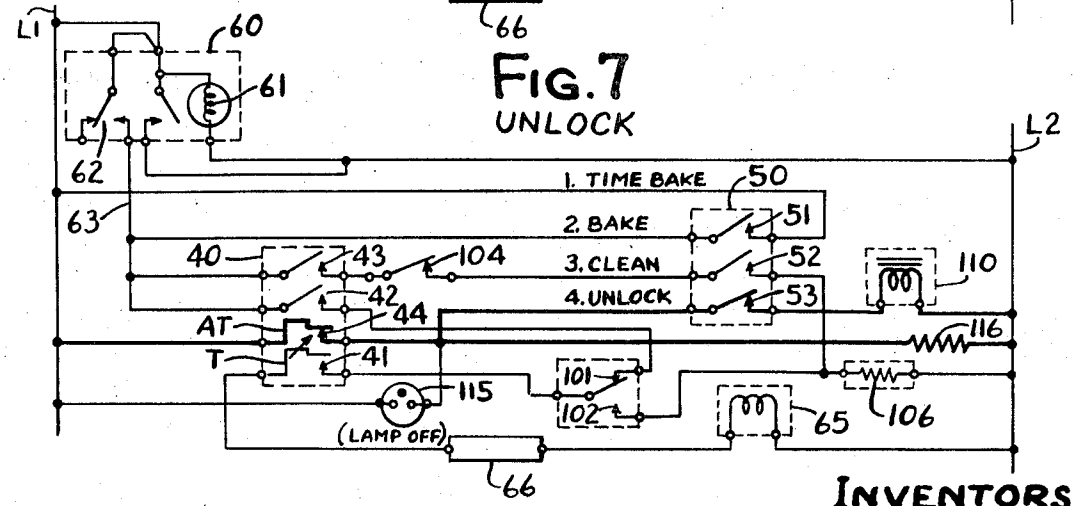


FIG. 7
UNLOCK



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3,469,568

DOOR LOCKING MEANS AND ASSOCIATED CONTROL CIRCUIT FOR SELF-CLEANING OVEN

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U.S. Cl. 126—39 10 Claims

ABSTRACT OF THE DISCLOSURE

A self-cleaning range having an oven cavity and a broiler cavity with a mechanical lock for locking both of them simultaneously during the cleaning cycle and with a control circuit so arranged that both doors must be closed and locked for a cleaning cycle to be initiated. Electrical interlock switches are associated with the doors and enablingly connected to the thermostat when the later is turned to the upper end of its range.

It is an object of the present invention to provide a novel mechanical locking arrangement for both the oven door and the broiler door during a self-cleaning cycle and which has provision for insuring that both doors are closed and locked before the self-cleaning cycle may be initiated. It is a related object to provide a mechanical lock for an oven door with a mechanical interlock extending to the broiler door, and with the doors being provided in addition with electrical interlocks for effectively disabling the source of heat unless and until both doors are closed and locked. In this connection it is a more specific object to provide a door interlocking and latching arrangement for adjacent oven and broiler cavities which are heated during normal usage and self-cleaned by the same broiler burner.

In general it is an object of the invention to provide both electrical and mechanical interlocks for associated oven and broiler doors with an associated selector for selecting between the various modes of operation which combines a high degree of safety with inherent mechanical and electrical simplicity.

Other objects and advantages of the invention will become apparent upon reading the attached detailed description and upon reference to the drawings in which:

FIGURE 1 is a side sectional view of a range employing the present invention and taken along the line 1—1 in FIG. 2;

FIG. 2 is a front sectional view taken along the line 2—2 in FIG. 1;

FIG. 3 is a perspective view of the mechanical locking and interlocking arrangement employed in the present invention;

FIG. 4 is a plan view of the lock body showing the lock member in latched condition;

FIGS. 5, 6 and 7 show a circuit diagram comprising part of the present invention under conditions of baking, self-cleaning, and cooling, respectively, with the active portion of the circuit indicated by the bold lines; and

FIG. 8 is a diagram showing a typical control used in the above circuit.

While the invention has been described in connection with a preferred embodiment there is no intention to be limited to the embodiment shown but it is intended, on the contrary, to cover the various alternative or equivalent constructions included within the spirit and scope of the appended claims.

Turning now to the drawings there is disclosed in FIGURES 1 and 2 a free-standing range **10** having a frame

11 defining an oven cavity **12** and a broiler cavity **13**. The latter are enclosed by doors **14**, **15**. For heating the oven cavity, and for purposes of broiling in the lower cavity, a gas burner **20** is provided having an inlet manifold **21** which is connected via an electric valve, as will appear, to the usual domestic gas line.

As shown in FIG. 2, the oven is of the muffled type in which the heated air and products of combustion do not enter the oven cavity but are, instead, directed through passageways **22–24** at the sides, top and back, discharging into a flue **25** which has a vent **26** above the level of the cooking top. The oven cavity has a catalytic smoke eliminator **30** with an inlet opening **31** and an outlet **32** which discharges into the same flue structure **25** adjacent a barrier **33** to prevent products of combustion and associated air from entering the oven cavity.

Arranged below the broiler burner **20** is a drip pan **35** having a rack **36**, the drip pan **35** being supported in a sliding drawer **37**. The broiler door **15** and the drawer **37** are connected together along a hinge **38** so that when the door is pulled outwardly it tips forward while pulling the drawer **37** into full view. The door **14** which encloses the oven cavity is pivoted to the frame along a hinge axis **39**. To understanding more fully the details of the range construction, reference is made to copending application Serial 733,433, filed May 31, 1968.

A control circuit is provided for modulating the admission of gas to the burner under normal baking conditions as shown in FIG. 5, the active portion of the circuit during baking being indicated by the bold lines. It will be helpful to have this control circuit in mind in order to understand the mechanical and electrical interlocking devices which are to be described and which distinguish the present invention. Two manually settable controls are preferably provided, an oven control and a selector switch. The oven control, indicated at **40**, includes a thermostat T having a contact **41**. The thermostat T corresponds to the usual oven control thermostat except that, in addition to having a lower range covering the usual cooking temperatures, it is settable to a high range during the self-cleaning cycle. A normally open contact **42** closes when the control is in its low range and a normally open contact **43** closes when the control is set to its high range. An auxiliary thermostat AT, having a normally closed contact **44**, is used to prevent opening of the oven under high temperature conditions as will appear.

For selecting the mode of oven operation a selector switch **50** is provided having normally open contacts **51**, **52**, **53**. The switch is provided with a 4-position selector knob which provides a "time bake" mode with all of the switches open, a "bake" mode with switch **51** closed, a "clean" mode with switch **52** closed and an "unlock" or cooling mode with switch **53** closed. For timing the baking and cleaning operations, a time clock **60** is used having a motor winding **61** and having a normally open contact **62** which supplies a timed bus **63**. An electric gas valve **65** controlled by the contacts **41** of the thermostat, and in series with the usual flame switch **66**, permits passage of gas to the burner when the valve is energized.

Under non-timed baking conditions shown in FIG. 5 a circuit is established through contacts **51** and **42** thence through contacts **41** on the thermostat T to turn on the gas valve **65**, the gas flowing to the burner being lit by a suitable pilot P, and with the valve being thereafter cycled automatically by the thermostat to maintain the set temperature.

In accordance with the present invention a mechanical locking arrangement is provided for both the oven and broiler doors with electrical interlock switches which are effective, when both of the doors are closed and locked and when the oven control is set in its high range, to complete a circuit from the thermostat to the gas control valve

for heating of the oven and broiler cavities to a self-cleaning temperature. More specifically, a mechanical lock is provided for the oven door having an interlock for engaging the broiler door with electrical interlock switches for initiating the flow of gas and with a latch for maintaining both doors closed and locked until such time that the temperature is again reduced to a safe level. Thus, referring to FIG. 3, the oven door **14** is provided with a lock **70** in the form of a rotary striker **71** mounted on a shaft **72** and manually operated by a handle **73**. For receiving the striker there is mounted in the frame of the oven a lock body **75** having a receiving slot **76** which is positioned to receive the striker when the door is closed. For simultaneous locking of the broiler door **15**, a mechanical interlock is provided in the form of a rod **80** having its upper end **81** cranked with respect to the striker **71** and having its lower end **82** movable between the retracted position shown in the drawing and a projecting position in which the lower end extends into an opening **83** in the upper edge of the broiler door and into obstructing position with respect to a striker plate **84** mounted in the door. Telescoped over the end of the rod is a return spring **85**.

For the purpose of maintaining the striker captive within the lock body, a lock member, or lever, **90** is provided centrally pivoted at **91** and having a striker-receiving notch **92** at its forward end. The lock member is held in the receptive position shown by means of a return spring **93**. It will be apparent that when the striker is rotated into the slot **76** and engaging the notch **92**, the lock member will rotate counterclockwise into a latched position. For latching the lock member a latching rod **94** is provided having a tip **96** which rides against a land **96** until reaching a point of drop-off **97**. When the point of drop-off is reached, the latching rod moves forwardly under the urging of a spring **98** for positive holding of the member **90** in its locking position shown in FIG. 4.

For insuring that both doors are closed and locked before gas is admitted to the burner **20** to begin the self-cleaning cycle, a single pole, double-throw switch **100** is provided having normally closed contacts **101** and normally open contacts **102**, which switch is in the path of movement of the lock member **90** and operated incident to moving the member into its fully latched position. In addition a normally open switch **103** having contacts **104** is mounted so as to be responsive to complete closure of the broiler door. The switch is preferably mounted in the door jam with a forwardly extending actuator **105** facing the backside of the door.

To initiate a self-cleaning cycle (see FIG. 6), the oven control **40** is set at the high cleaning range. This, as stated, closes contacts **43** in the oven control. Moving the selector switch **50** to its third or "clean" position closes contacts **52**. Rotating the door handle **73** to the "clean" position with the broiler door closed, not only locks, and latches, both doors but causes contacts **102**, **104** of the interlock switches to be closed which completes an electrical circuit from the clock contacts **62** through the thermostat contacts **41** to the electric valve **65**. As a final step, the time clock **60** is set to the desired cleaning interval closing the contacts **62** and energizing the bus **63** to open the electric valve to begin the cleaning cycle. A circuit is simultaneously completed to the heater **106** in the smoke eliminating, or catalytic, unit **30**. With the broiler burner on, the temperature within the oven and broiler cavities quickly rises to the self-cleaning level which may, for example, be 750° to 900° F. where cycling will take place under the control of the thermostatically operated contacts **41**. When the clock has timed out the interval, contacts **62** open thereby de-energizing the electric valve **65** which turns off the gas permitting the oven and broiler cavities to cool.

In carrying out the invention an auxiliary thermostat is provided which closes when the temperature is reduced to a safe level and which, acting through "unlock" contacts

in the selector switch, energizes a latch release solenoid to release the latching rod **94**, thereby to permit the oven lock to be manually rotated to its unlocking position. To establish this unlocking mode, the selector switch is moved to its fourth or "unlock" position closing contacts **53** which are connected to a solenoid **110**, the armature of which is pinned to the rear end of the rod **94**. When a safe oven temperature is reached, which may be approximately 550° F., closure of contacts **44** on the thermostat AT, completing the circuit shown in FIG. 7, energizes the solenoid **110** so that the latching rod is moved out of its obstructing position. Cleaning completed, the oven and broiler may thereaftre be used in the regular way.

For indicating that the oven and broiler are at an elevated temperature, and that the doors are latched in closed position, a lock indicator **115** is provided which is preferably in the form of a gaseous discharge lamp energized through a high value series resistor **116** and with the lamp being connected in parallel with the contacts **44**. Thus, as long as these contacts are open, indicating that the temperature is at a high level, the lamp is turned on, but when the contacts close the lamp is shorted out and thus extinguished, indicating that the selector switch can be moved to the "unlock" position.

The combination of mechanical and electrical interlocking described above produces a safety system which has a high degree of reliability and which is practically impossible to defeat. The gas cannot be turned on for a self-cleaning cycle unless all of the conditions for safety have been fulfilled, i.e., unless both doors are fully closed and unless the rotary striker is fully bottomed in the receiving slot in the frame. It is only then that the electrical interlock switches are actuated to complete the circuit between the oven control thermostat and the electric gas valve. Moreover the controls are eminently simple so that no question is raised in the mind of the user. To establish the cleaning cycle the oven control is rotated to the high end of its range, preferably designated by the word "clean," and the selector switch is similarly moved to its "clean" position. Setting the cleaning interval on the time clock turns the burner on. It is only after the indicator lamp goes out, indicating that the temperature has been reduced to a safe level, that moving the selector switch to the "unlock" mode is capable of energizing the latch releasing solenoid. Such foolproof operation has been achieved at low cost using a mechanical lock having a minimum number of parts and using readily obtainable switch elements.

In the following claims the term "striker" will be understood to mean any bolt-like locking element. The term "latch" is intended to include any means for insuring that the door lock continues to be engaged while the oven and broiler are at elevated temperature. The term "rod" is intended to cover a force transmitting member. Also, the term "enabling" shall be understood to mean conditioning for operation, the opposite of "disabling," the term "electric valve" has to do with an electrically operated gas supply valve either electro-magnetic or the electrically heated bi-metal type while the term "slot" is intended to denote any recess in which the striker is received.

We claim:

1. In a self-cleaning gas range, the combination comprising a frame having an oven cavity and a broiler cavity arranged below it each having a closeable door, means including a broiler burner for heating the cavities, a mechanical lock including a manually operated striker in the oven door cooperating with a slot in the frame, a mechanical interlock including a rod in the oven door coupled to the striker for movement therewith and having means at its lower end for lockingly obstructing the broiler door when the striker is moved to its locking position, means including an electric gas valve for passing gas to the burner, oven controller means including a thermostat for controlling the electric valve, contact means for completing a circuit from the thermostat to

the electric valve during the time that the oven controller means is set in its normal baking range, means including interlock switches associated with the mechanical lock and broiler door respectively and actuated when the doors are closed and locked for completing the circuit from the thermostat to the electric valve when the thermostat means is set at the upper end of its range to achieve and maintain a self-cleaning temperature, means for turning off the gas after a predetermined length of time, and means for latching the doors closed until the temperature drops below the self-cleaning level.

2. In a self-cleaning gas range, the combination comprising a frame having an oven cavity and a broiler cavity arranged below it, each having a closeable door, a broiler burner for heating the cavities, an oven controller including thermostat means manually settable for maintaining a temperature in a baking range and a high self-cleaning temperature, said oven door having a mechanical lock and said broiler door having an interlock coupled to the lock for maintaining the doors locked during a self-cleaning cycle, means including electrical interlock switches respectively associating with the doors and operated incident to closing and locking both of the doors for enabling control of the burner by the thermostat means when the controller is set for the self-cleaning temperature, and means for latching the mechanical lock in closed position during the time that the temperature is above the baking range.

3. In a self-cleaning gas range, the combination comprising a frame having an oven cavity and a broiler cavity arranged below it each having a closeable door, a broiler burner for heating the cavities, a mechanical lock including a manually operated rotatable striker in the oven door cooperating with a slot in the frame, a reciprocable push rod in the oven door having a cranked connection with the rotatable striker at its upper end and having means at its lower end for obstructing the broiler door when the striker is moved to locking position, means including a controller having a thermostat and settable to a high level for operating the burner to achieve a self-cleaning temperature, means including electrical interlock switches associated with the respective doors and operated when the doors are closed and locked for enabling operation of said thermostat, means for turning off the gas after the self-cleaning temperature has been maintained for a predetermined length of time, and means for latching the striker in locking position during the time that the temperature in the oven cavity is above a predetermined level.

4. In a self-cleaning gas range, the combination comprising a frame having an oven cavity and a broiler cavity arranged below it, each having a closeable door, a broiler burner for heating the cavities, said oven door having a mechanical lock including a manually operated rotary striker in the door cooperating with a slot in the frame, a movable locking member adjacent the slot for receiving the tip of the striker and for holding it captive in the slot, a mechanical interlock including a rod in the oven door having a cranked connection with the striker at its upper end and having means at its lower end for obstructing the broiler door when the striker is moved to locking position, a latch for latching the locking member, controller means including a thermostat and electric valve associated with the burner for causing the latter to develop a self-cleaning temperature in the cavities, electrical interlock switch means operated when the doors are closed and locked for enabling the thermostat to maintain a high self-cleaning temperature, means for turning off the burner after the self-cleaning temperature has existed for a predetermined length of time, and means operated incident to a drop in temperature to below the self-cleaning level for releasing the latch thereby to permit manual opening of the door.

5. In a self-cleaning gas range, the combination comprising a frame having an oven cavity and a broiler cavity arranged below it each having a closeable door, a broiler burner for heating the cavities, a mechanical lock for simultaneous locking of both of the doors and manually throwable from open to locked position, an oven controller including a thermostat and solenoid valve for supplying gas to the burner, said controller being settable to a baking range and a high self-cleaning temperature, a first switch contact on the controller for establishing a circuit between the thermostat and electric valve when the thermostat is set within its baking range, a second switch contact on the controller arranged for closure when the controller is set at the self-cleaning temperature, electrical interlock switch means associated with said doors and operated when the doors are closed and locked, said electrical interlock switch means being connected in series with the second switch contact to prevent turning on of the burner and achieving of a self-cleaning temperature until the doors are closed and locked, means for turning off the burner after passage of a predetermined time at the self-cleaning temperature, and means including a latch for maintaining the lock in locked condition as long as the temperature is above a predetermined level and for releasing the latch when the temperature is reduced below such level.

6. In a self-cleaning gas range, the combination comprising a frame having an oven cavity and a broiler cavity arranged below it each having a closeable door, a broiler burner for heating the cavities, means including a mechanical interlock between the doors for locking both of the doors simultaneously, means including an electric gas valve for passing gas to the burner, an oven controller including a thermostat settable to a high and low range, a selector switch settable between "bake," "clean," and "door unlock" modes and having first, second, and third contacts respectively closed in such modes, a "bake" circuit including the first contact for operatively connecting the thermostat to the electric valve when the thermostat is in its low range, electrical interlock switch means associated with said doors and arranged for actuation when the doors are closed and locked, a "clean" circuit including the second contact for connecting the thermostat and the interlock switch means in operative series connection with the electric valve when the thermostat is in its high range to establish a high self-cleaning temperature, means including a latch for holding the locking means in locked condition and having an associated unlocking solenoid for releasing the latch, means for turning off the flow of gas after a predetermined length of time at self-cleaning temperature, an auxiliary thermostat arranged to close when the temperature falls below the self-cleaning temperature, and a "door unlock" circuit including the third contact for coupling together the auxiliary thermostat and the unlocking solenoid for unlatching the lock when the temperature is safely below the self-cleaning temperature.

7. In a self-cleaning gas range, the combination comprising a frame having an oven cavity and an adjacent broiler cavity each having a closeable door, burner means for heating the cavities, a mechanical lock including a manually operated striker in one of the doors cooperating with a recess in the frame, a mechanical interlock coupled to the striker and extendable into obstructing relation with the other door for holding the other door closed as long as the said one door is closed and locked, means including a gas valve for passing gas to the burner means, oven controller means including thermostat means selectively settable to maintain a baking temperature and a high self-cleaning temperature, means including an interlock switch actuated when both of the doors are closed and locked for completing a circuit from the thermostat means to the electric valve to turn on the gas when the thermostat means is set to the high self-cleaning temperature, means for turning off the flow of gas after the high temperature has existed for a predetermined length of time, and means for maintaining the mechanical lock in locked condition until the temperature falls to a predetermined safe level.

8. In a self-cleaning range, the combination comprising

a frame defining an oven cavity having a closeable door, a burner for heating the cavity, said oven door having a mechanical lock including a manually operated rotary striker in the door cooperating with a slot in the frame, a pivoted locking member adjacent the slot having a notch for receiving the tip of the striker and movable therewith into a locking position in which the striker is captive in the slot, a latch for latching the locking member in locking position, controller means including a thermostat arranged to control the burner for causing the latter to develop a self-cleaning temperature in the cavity, an electrical interlock switch in the path of movement of the locking member and closed as the locking member moves into its locking position for coupling the thermostat to the burner, means for turning off the burner after the self-cleaning temperature has existed for a predetermined length of time, and means operated incident to a drop in temperature to below the self-cleaning level for releasing the latch thereby to permit manual opening of the door.

9. In a self-cleaning oven assembly, the combination comprising a frame defining an oven cavity having a closeable door, a burner for heating the cavity, a mechanical lock for locking the door and manually throwable from open to locked position, means including an oven controller having a thermostat controllably coupled to the burner for controlling the heat output thereof, said controller being settable to a baking range and a high self-cleaning temperature, normally open and normally closed switch contacts actuated incident to closing and locking the door, a first switch contact on the controller closed when the thermostat is set within its baking range, a second switch contact on the controller closed when the controller is set at the self-cleaning temperature, a "baking" circuit including the first switch contact on the controller and said normally closed contact for coupling the thermostat to the burner to establish a baking temperature, and a "self-cleaning" circuit including the second switch contact on the controller and said normally open contact for coupling the thermostat to the burner thereby to prevent turning on of the burner and achieving of a self-cleaning temperature until the door is closed and locked, means for turning off the burner after passage of a predetermined time at the self-cleaning temperature, and means including a latch for maintaining the lock

in locked condition as long as the temperature is above a predetermined level and for releasing the latch when the temperature is reduced below such level.

10. In a self-cleaning oven assembly, the combination comprising a frame defining an oven cavity having a closeable door, a burner for heating the cavity, a mechanical lock for locking the door and throwable manually from open to locked position, means including an oven controller having a thermostat controllably coupled to the burner for controlling the heat output thereof and settable to a high and low range, a selector switch settable between "bake," "clean," and "door unlock" modes and having first, second, and third contacts respectively closed in such modes, a "bake" circuit including the first contact for operatively coupling the thermostat to the burner when the thermostat is in its low range, an electrical interlock switch associated with the lock for actuation when the door is closed and locked, a "clean" circuit including the second contact and the interlock switch for coupling the thermostat to the burner when the thermostat is in its high range to establish a high self-cleaning temperature, means including a latch for holding the lock in locked condition and having an associated unlacthing solenoid for releasing the latch, means for turning off the burner after a predetermined length of time at self-cleaning temperature, an auxiliary thermostat arranged to close when the temperature is safely below the self-cleaning temperature, and a "door unlock" circuit including the third contact for connecting the auxiliary thermostat and the unlocking solenoid for unlatching the lock when the temperature drops to below the safe value.

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U.S. Cl. X.R.

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