April 4, 1967 H. S. BEACH ETAL 3,312,271

OUTSIDE PILOT ARRANGEMENT

Filed March 6, 1964

Fig. 1

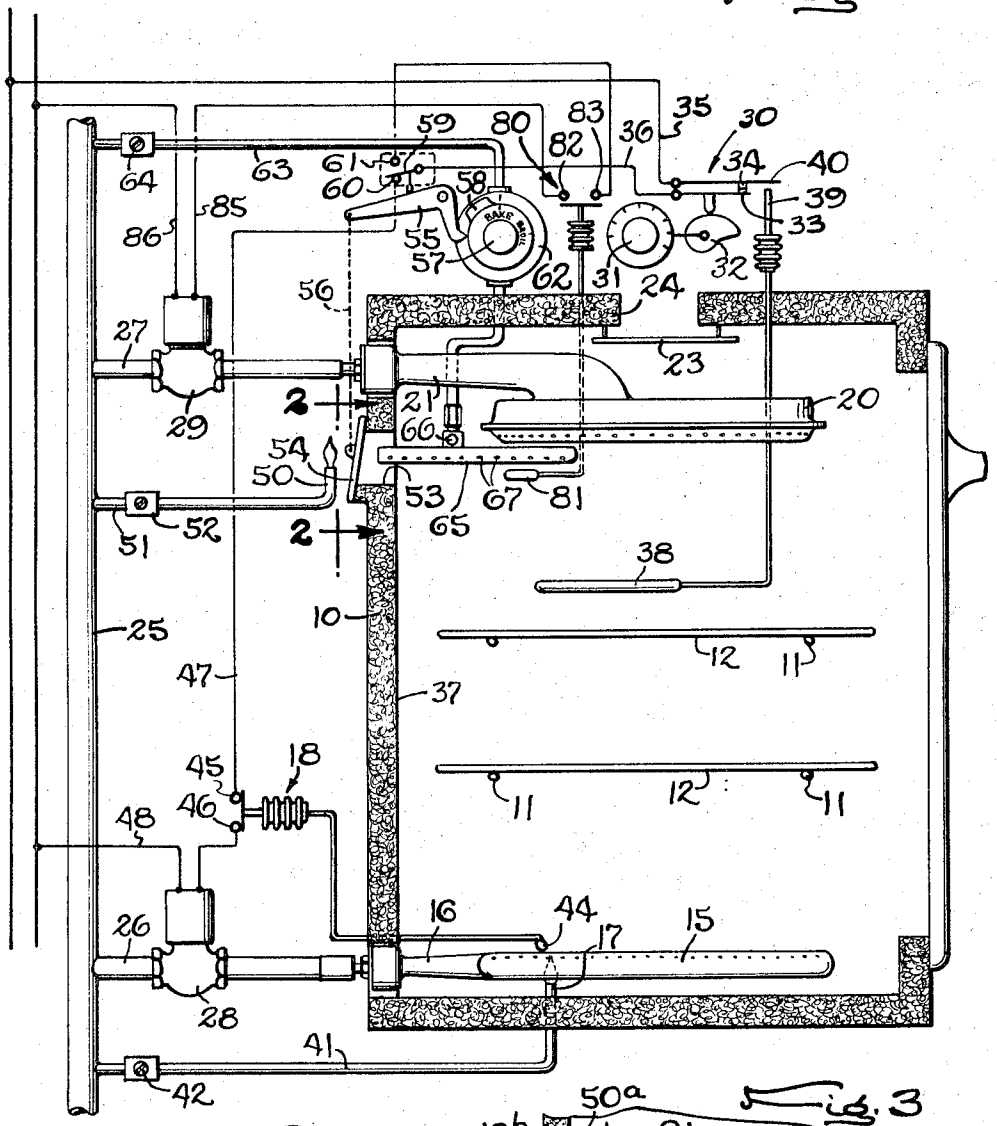


Fig. 2

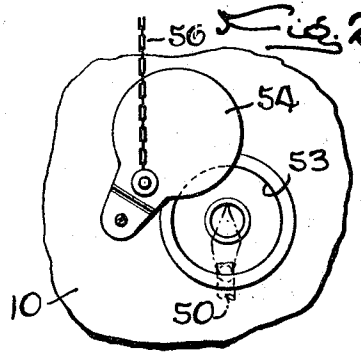
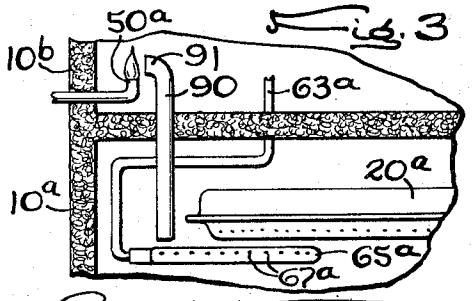


Fig. 3



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United States Patent Office 3,312,271 Patented Apr. 4, 1967

3,312,271

OUTSIDE PILOT ARRANGEMENT

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Filed Mar. 6, 1964, Ser. No. 350,007
1 Claim. (Cl. 158—127)

This invention relates generally to gas ovens and is more particularly concerned with an outside pilot arrangement for igniting the broiler burner in a single cavity gas oven.

Conventional ovens which are used for normal baking typically have the oven burner located in the bottom of the oven chamber or cavity so that the circulating convection currents will evenly distribute the heat throughout the cavity. Ordinarily, a standing or continuous pilot flame may be maintained adjacent the oven burner so that the oven burner may be maintained adjacent the oven burner so that the oven burner may be intermittently lit by merely turning on a supply of gas to the burner.

When the same oven cavity is used for broiling purposes, it is necessary to have a separate broiler burner at the top of the cavity. Moreover, a standing pilot flame in the top of the cavity for lighting the broiler burner has not proven satisfactory since the products of combustion from the oven burner tend to extinguish the broiler pilot flame. Thus, in the past, it has usually been necessary to manually control the broiler burner in the top of a single cavity oven and to light the broiler burner with a match in order to prevent the accumulation of pilot gas due to an extinguished broiler pilot flame.

Accordingly the primary aim of the present invention is to provide an outside pilot arrangement and apparatus which is effective to intermittently light the broiler burner in a single cavity gas oven when broiler operation is selected and which is arranged so that the standing broiler pilot flame will not be extinguished when the oven burner is operated.

It is a more particular object to provide a standing pilot flame which is located outside the oven cavity adjacent the broiler burner with means for selectively opening a flash port through the wall of the oven cavity in order to light the broiler burner. A correlated object is to provide means for automatically closing the flash port when the oven burner is selected so that the standing pilot is not extinguished by the products of combustion resulting from the operation of the oven burner.

Another object is to provide safety means for sensing the presence of a standing flame on the broiler pilot and for automatically blocking the supply of gas to the broiler burner in the event that the standing pilot flame goes out.

It is also an object to provide means for admitting a supply of pilot gas inside the oven cavity adjacent the broiler burner when broiler operation is selected so that a flame from the standing broiler pilot will flash into the oven cavity and become established adjacent the broiler burner.

A further object is to provide additional safety means for the broiler burner whereby the flow of gas to the broiler burner is precluded until a broiler pilot flame has been established inside the oven cavity adjacent the broiler burner. Similarly, it is an object to provide means for blocking the supply of gas to the broiler burner if the broiler pilot flame inside the oven cavity goes out.

Yet another object is to provide a control arrangement for a single cavity oven having a single control knob for selecting the operation of either the oven burner or the broiler burner and including a selector switch which precludes operation of the burner which is not selected.

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

FIGURE 1 is a schematic diagram showing a single cavity gas oven in cross section including a broiler burner and outside pilot arrangement in accordance with the present invention;

FIG. 2 is an enlarged fragmentary portion of the rear wall of the oven cavity as seen along line 2—2 in FIG. 1; and

FIG. 3 is a fragmentary view of the upper portion of the oven shown in FIG. 1 including a modified outside pilot arrangement.

While the invention will be described in connection with a preferred embodiment, it will be understood that we do not intend to limit the invention to that embodiment. On the contrary, we intend to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

Turning now to the drawings, FIGURE 1 diagrammatically illustrates an oven cavity to which the present invention has been applied. The insulated housing indicated at **10** is provided with the usual shelf supports **11** for mounting a series of supporting shelves **12**. For ordinary baking, a regular oven burner **15** occupies a position at the bottom of the cavity with a gas-air mix being supplied through a tube **16**. The oven burner is ignited by a standing pilot **17** which controls a flame switch **18**.

At the top of the oven cavity a broiler burner **20** is provided which receives gas-air mix through a tube **21**. This burner may, for example, be of the type covered in copending application Serial No. 214,655, filed August 3, 1962, now abandoned, and assigned to the same assignee as the present application. This type of burner is distinguished by a downwardly angled pattern of flames well suited for broiling purposes. Arranged above the burner **20** is a draft plate **23** with the products of combustion being vented through a vent **24**.

To supply gas to the burners **15** and **20**, the oven is provided with a gas manifold **25** which feeds an oven burner supply line **26** and a broiler burner supply line **27**, respectively connected to the burner tubes **16**, **21**. For controlling the passage of gas to the burners, the supply lines **26** and **27** are respectively provided with solenoid operated valves **28** and **29**.

For regulating the operation of the solenoid valves **28**, **29** and thus to control the gas supplied to either of the burners **15**, **20** and the operating temperature in the oven, an electrical control circuit is provided. In the electrical control circuit, an oven thermostat **30** is selectively connected in series with the solenoid valves **28**, **29**. The thermostat **30** includes a control knob **31** coupled to a cam **32** which operates contacts **33** and **34** connecting the thermostat **30** through a wire **35** to the "hot" wire of an electrical supply line and through a wire **36** to a selector switch **37**, coupled to the solenoid valves **28**, **29**.

A temperature sensing element **38** is disposed in the wall of the oven cavity and includes a control element **39** which operates against a switch blade **40** to open and close the contacts **33**, **34** in response to changes in the temperature within the cavity. It will be seen that rotating the control knob **31** and cam **32** in a counterclockwise direction, as seen in FIG. 1, moves the contacts **33**, **34** away from the control element **39** and thus the contacts remain closed until a higher temperature is reached.

In order to light the oven burner **15**, the pilot burner

17 has a continuous or standing pilot flame which is provided fuel by a pilot supply line 41 connected to the manifold 25 through a filter 42. It will be understood that when gas is admitted to the oven burner 15, the flame from the oven pilot 17 will ignite the burner. To insure that no gas escapes from the oven burner 15 when there is no flame on the pilot 17, the oven flame switch 18 has a sensing element 44 disposed to detect the presence of a flame on the oven pilot 17. The flame switch 18 has normally open contacts 45 and 46 which close when the sensing element 44 detects a flame. The contacts thereby complete a circuit through a "cold" wire of the electrical supply line and wires 47 and 48 forming part of the selective control circuit for actuating the oven solenoid 28. Therefore, if there is no pilot flame, the oven solenoid 28 will not operate and gas cannot escape from the oven burner and accumulate in the oven.

In accordance with the present invention, an outside pilot 50 is provided which is effective to intermittently light the broiler burner 20 when "broiler" operation is selected. In the preferred embodiment, the broiler pilot 50 is located outside the oven cavity adjacent the broiler burner so that a continuous or standing flame on the broiler pilot will not be extinguished by the products of combustion when the oven burner 15 is operated. The broiler pilot 50 is supplied with pilot gas by a pilot tube 51 connected to the manifold 25 through a filter 52.

To admit a flame from the outside pilot 50 into the cavity for igniting the broiler burner 20, a flash port 53 is formed in the oven housing 10. When the broiler burner is not in use, the flash port 53 is normally closed by a damper 54 which is pivoted on the housing 10. In order to open the flash port 53 when "broiler" operation is selected, the damper 54 is coupled to a control lever 55 through a link 56. The control lever 55 is pivotally mounted adjacent a selector knob 57 which includes a cam lobe 58 effective to rock the control lever when the knob is rotated to the "broil' position. Rocking the lever 55 also actuates a switch blade 59 between contacts 60 and 61 of the selector switch 37. As shown in FIG. 1, the switch blade 59 and contact 60 place the thermostat 30 in series with the oven solenoid 28. When the lever 55 is rocked to the "broil" position, the switch blade 59 and contact 61 place the thermostat in series with broiler solenoid 29.

To establish a pilot flame inside the cavity for igniting the broiler burner 20, a pilot valve 62 is coupled to the control knob 57. The pilot valve 62 is located in a pilot supply line 63 connected to the manifold 25 through a filter 64. Thus it will be understood that when the control knob 57 is rotated to the "broil" position, counterclockwise as seen in FIG. 1, the damper 54 is pivoted away from the flash port 53 (see FIG. 2), pilot gas is simultaneously admitted through the supply line 63 and the broil solenoid 29 is placed in series with the thermostat 30. For bringing the flame from the outside pilot 50 to a position adjacent the broiler burner 20, a pilot tube 65 is coupled through an aspirator 66 to the supply line 63 and extends outwardly through the flash port 53. The pilot tube 65 includes a plurality of gas ports 67 along which the flame progressively "runs" from the outside pilot 50 to a position adjacent the broiler burner 20.

It is another feature of the invention that no gas is supplied to the broiler burner 20 if the flame on the outside pilot 50 has gone out. To insure that no gas escapes from the broiler burner 20 before a flame has been established inside the cavity adjacent the broiler burner, a broiler flame switch 80 is provided having a sensing element 81 disposed to detect the presence of a flame adjacent the broiler burner 20. The flame switch 80 has normally open contacts 82 and 83 which close when the sensing element 81 detects a flame on runner arm 65. The contacts thereby complete the broiler control circuit including the "cold" wire of the electrical supply line

and wires 84, 85 and 86 through the selector switch 37 and thermostat 30 for actuating the broiler solenoid 29.

The operating sequence for igniting the broiler burner with the outside pilot arrangement illustrated in FIGS. 1 and 2 may now be briefly described as follows. To ignite the broiler burner 20, the control knob 57 is turned to the "broil" position. This is effective to rock the control lever 55 in a clockwise direction as seen in FIG. 1, urging the switch blade 59 in contact with the "broil" contact 61 of the selector switch 37, and opening the damper 54 outside the flash port 53. The pilot valve 62 is also opened admitting gas through the line 63 into the pilot tube 65. A flame from the standing pilot 50 flashes through the flash port 53 and "runs" along the ports 67 of the pilot tube 65 to an established position adjacent the broiler burner 20. The sensing element 81 detects the presence of a flame adjacent the broiler burner and closes normally open contacts 82, 83 of the broiler flame switch 80. The thermostat knob 31 turned to the desired setting and the thermostat 30 then calls for heat in the oven cavity. Thus, the contacts 33, 34 are closed to complete the circuit through selector switch 37 to the solenoid valve 29. Therefore, the solenoid valve 29 opens and gas flows through the supply line 27 to the burner 20 where it is ignited by the flame on the pilot tube 65 adjacent the broiler burner.

For ordinary operation of the broiler, the thermostat 30 is customarily set at or near the full scale setting for continuous flame heat until the broiling is completed. However, if the temperature in the cavity reaches the selected setting, the control element 39 opens the contacts 33, 34 which deenergize the solenoid valve 29 thereby interrupting the flow of gas to the broiler burner. Then, as the temperature cools inside the cavity, the thermostat contacts 33, 34 again close and gas flows to the broiler burner 20. In this case, since a pilot flame is maintained inside the cavity on the pilot tube 65 adjacent the broiler burner, the burner is immediately reignited when the contacts 33, 34 close. In the event, however, that the flame adjacent the broiler burner goes out due to the products of combusion from the broiler operation, the sensing element 81 is effective to open the contacts 82, 83 thus closing the solenoid valve 29.

When the oven is used for ordinary baking, the control knob 57 is turned to the "bake" position. This allows the lever 55 to rock in a counterclockwise direction as seen in FIG. 1 dropping the damper 54 over the flash port 53 and closing the switch blade 59 with the oven contact 60. It will be appreciated that the oven solenoid is thereby placed in series with the thermostat 30 provided that the flame switch 18 is closed indicating a flame on the standing pilot 17. Gas then flows through the supply line 26 to the oven burner 15 where it is ignited by the pilot 17. Operation of the oven burner 15 continues under control of the thermostat 30 and oven solenoid 28 for the desired baking period.

It will also be apparent that the selector switch 37 is effective to prevent simultaneous operation of both the oven burner 15 and broiler burner 20. Thus when the switch blade 59 is closed with the oven contact 60, the oven solenoid is coupled in series with the thermostat 30 but the control circuit to the broiler solenoid 29 is open. Conversely, when the switch blade is urged into contact with the broiler contact 61, the broiler solenoid 29 is placed in series with the thermostat 30, but the oven control circuit is open and thus the oven solenoid 28 is closed.

Turning now to FIG. 3, a modification of the novel outside pilot arrangement is illustrated as installed in a single cavity oven housing 10*a*. In the modified arrangement an outside pilot 50*a* is mounted above the housing 10*a* and is preferably located adjacent an upstanding wall 10*b* on top of the oven housing and which customarily contains an exhaust vent (not shown). A modified pilot tube 65*a* with gas ports 67*a* is disposed adjacent the broiler burner 20*a*. The pilot tube 65*a* selectively receives a sup-

ply of pilot gas through a pilot supply line **63***a* which is under control of a selector valve similar to the valve **62** shown in FIG. 1.

For igniting the broiler burner **20***a*, a flash tube **90** extends downwardly through the housing **10***a* between the outside pilot **50***a* and the pilot tube **65***a*. As gas is selectively admitted through the pilot supply line **63***a* into the pilot tube **65***a*, the gas escapes from the ports **67***a* and rises through the flash tube **90**. Then the flame from the outside pilot **50***a* flashes down through the flash tube **90** and to the pilot tube **65***a* and "runs" along the ports **67***a* to ignite the broiler burner **20***a*. It will be understood that the control circuit and safety features discussed above in connection with the outside pilot **50** are also incorporated for use with the modified outside pilot **50***a*.

In the preferred form, the upper end of the flash tube **90** is constructed with an elbow **91** which opens toward the outside pilot **50***a*. This construction not only facilitates the downward flashing of the pilot flame through the flash tube **90**, but also, prevents the outside pilot flame from being extinguished by the products of combustion which pass out through the flash tube **90** during ordinary baking or broiling operations. This latter feature is due to the fact that the elbow **91** is spaced from the pilot **50***a* in order to allow free air for the pilot flame, and also because the products of combustion tend to escape upwardly from the flash tube **90**. Thus, the flash tube **90** of the modified arrangement may be used to replace the flash port **53** and damper **54** in the embodiment illustrated in FIGURE 1. This is particularly advantageous for "built-in" oven installations because it is usually not desirable to have the outside pilot located behind the oven cavity where it is more difficult to service, repair or reignite.

It will also be appreciated that in either arrangement, the outside pilot of the present invention provides a simple yet effective way for igniting a broiler burner in a single cavity gas oven. Moreover, the present broiler control system provides double safety protection since no gas can escape from the broiler burner if the standing flame on the outside pilot goes out or does not ignite the pilot flame established adjacent the broiler burner. In addition, the positive selector control insures that gas can be supplied to only one burner in the oven cavity at a time thereby eliminating the danger of excessive gas accumulation and explosion.

We claim as our invention:

In a gas oven having a housing defining a single cavity with an oven burner in the bottom and a broiler burner in the top of the cavity, the combination comprising, a flash port located in a wall of the housing, a gas manifold, an outside pilot with a supply line connected to said manifold and having a standing flame disposed adjacent said flash port, a pilot tube having an inner end and an outer end with the inner end adjacent said broiler burner and the outer end disposed in said flash port, an inside pilot supply line connected between said manifold and said inner end of said pilot tube, selector means including a valve in said inside pilot supply line for admitting gas to said pilot tube incident to the selection of broiler operation so that said standing flame on said outside pilot is propagated on said pilot tube for igniting the broiler burner, and means coupled to said selector means for blocking said flash port when broiler operation is not selected so that said standing flame on said outside pilot is not extinguished incident to the operation of the oven burner.

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