

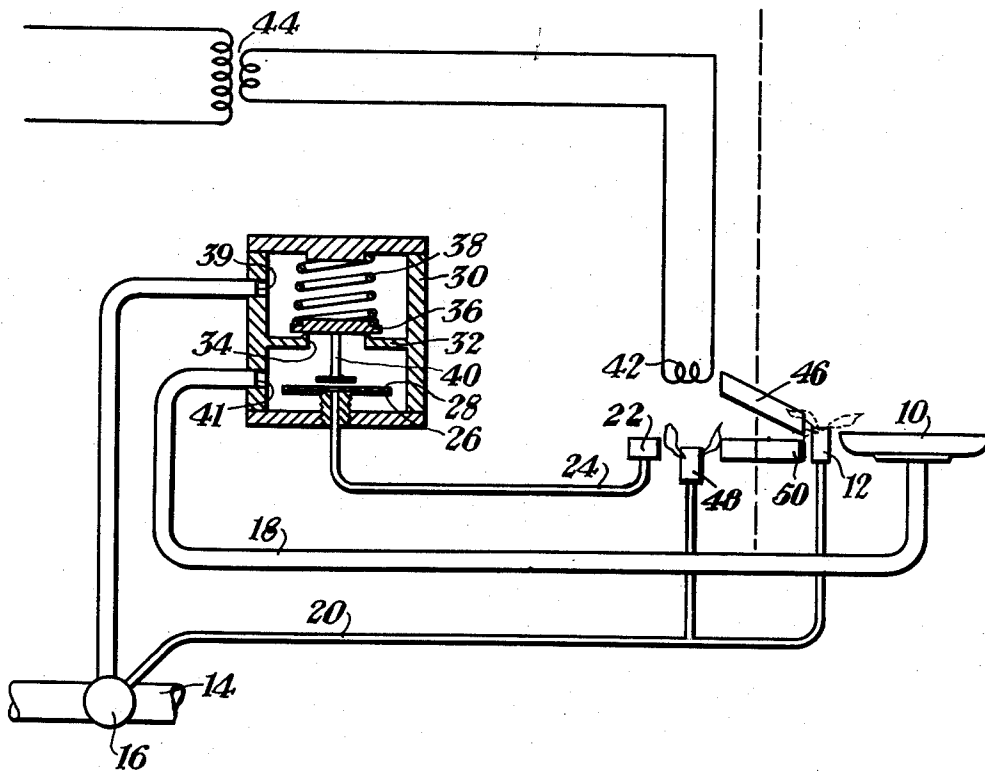
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AUTOMATIC PILOT AND IGNITION SYSTEMS FOR FUEL BURNER

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AUTOMATIC PILOT AND IGNITION SYSTEMS
FOR FUEL BURNER

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1 Claim. (Cl. 158—143)

As disclosed in my copending application Serial No. 90,151 filed of even date herewith, a catalytic ignition system with flash tubes can be combined with an automatic pilot control to provide automatic ignition for fluid fuel burners while preventing the escape of unburned fuel. The present invention includes in such systems provision for instantaneous recycling in the event of flame failure and an instantaneous resetting operation in the event of rapid off-on operation under steady state operating conditions.

With these and other objects in view, the preferred embodiment utilizes an electrically energized "hot" type catalytic igniter which is adapted to ignite an oven pilot burner through a flash tube and thus cause operation of an hydraulic type pilot control to admit fuel to the main burner. The igniter is continuously energized and its temperature is raised to ignition value only when unburned fuel impinges upon it. Consequently, a pilot outage results in immediate reignition as does a rapid off-on operation during steady state conditions, even though the pilot control has not had time to shut off the main burner fuel.

The accompanying drawing which is a schematic view of the automatic pilot and ignition apparatus in conjunction with a gaseous fuel burner shows by way of example the preferred embodiment of the invention.

Referring more particularly to the drawing, the oven burner 10 is positioned in the oven compartment of a gas range as indicated by the broken lines in the drawing. A pilot burner 12 is positioned in lighting proximity to the main burner 10 and both burners are adapted to receive a supply of fuel from the usual manifold 14. Thus, a combined thermostatic valve and gas cock 16, such as disclosed in Weber Patent No. 2,303,011, may be incorporated in the manifold 14 with a supply pipe 18 for the main burner 10 and a by-pass 20 for the pilot burner 12. The arrangement is such that the flow of fuel through the by-pass 20 to the pilot burner 12 is not interrupted or throttled by thermostatic operation as is the flow of fuel in the main fuel pipe 18.

The automatic control associated with the pilot burner 12 takes the form of a vapor-pressure thermal element comprising a bulb 22, capillary tube 24, and expansible actuating element 26. The bulb 22 in this embodiment is located exterior of the oven compartment to be heated by a flame from a heater pilot burner 48 which is also connected to the by-pass 20 to receive a supply of fuel substantially simultaneously with the pilot burner 12. The thermal element so constructed operates on well-known principles and contains a partial filling of mercury which becomes vaporized when the bulb element 22 is sufficiently heated. The actuating element 26 embodies a diaphragm element 28 of highly flexible material which will not interfere with the rapid vaporization of the mercury. However, it is not beyond the scope of this disclosure to utilize any common form of corrugated metallic diaphragm if desired in place of the diaphragm 28 depicted.

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The actuating element 26 is supported in a casing 30 on one side of a partition 32 therein which is provided with an axial opening 34. The partition 32 defines, on the side thereof opposite the actuating element 26, a seat for a valve member 36 which is biased to a position for closing the opening 34 by means of a valve spring 38. A valve stem 40 projects from the underside of the valve member 36 through the opening 34 to adjacent the actuating element 26, but is preferably slightly spaced from the diaphragm 28 thereof. The construction is intended to be such as to prevent operation of the valve member 36 by the actuating element 26 until such time as rapid vaporization of the mercury in the thermal element has commenced.

The casing 30 is interposed in the main fuel pipe 18 in such manner that the valve member 36 can control the flow of fuel between the combined thermostat and gas cock 16 and the main burner 10. To this end, one portion of the main fuel pipe 18 forms an inlet 39 communicating with the interior of the casing 30 on one side of the partition 32 while the opposite end of the main fuel pipe 18 forms an outlet 41 communicating with the interior of the casing 30 on the other side of the partition 32. Consequently, when the valve member 36 is in the closed position shown in the drawing no flow of fuel to the main burner 10 can occur. However, upon suitable expansion of the actuating element 26 and corresponding movement of the diaphragm 28 thereof, the bias of the valve spring 38 is overcome and the valve member 36 is moved to open position relative to the opening 34. Under such circumstances flow of fuel to the main burner 10 can occur provided, of course, that the fuel cock associated with the combined valve and fuel cock 16 is in open position or the thermostat portion thereof is not operating to shut off the flow of fuel.

The ignition system of the apparatus comprises an electrically energized igniter 42 which is formed of catalytic material. No particular forms of "hot" type catalytic igniters need be described in detail herein as such devices are well-known. Suffice it to say that the active components may comprise small pellets of activated platinum or other suitable catalytic material supported on a platinum or other wire of suitable catalytic material. When a combustible gas-air mixture impinges on such an igniter the small pellets become sufficiently hot to increase the temperature of the wire to the point where catalytic action occurs. Consequently, the wire attains the required temperature and ignition of the combustible mixture takes place. As previously indicated, the structure of the igniter 42 forms no part of the present invention.

The igniter 42 is energized continuously from a suitable source of current supply through a transformer 44. In this embodiment, the transformer 44 is of the step-down type and the secondary thereof need only have a rating of about two volt-amperes. As indicated in the drawing, the igniter 42 is connected in series circuit with the secondary of transformer 44 and is located exterior of the oven compartment. Consequently, a short flash tube 46 is positioned in the oven wall between the igniter 42 and the pilot burner 12 for effecting ignition of the latter. Similarly, a short flash tube 50 is positioned in the oven wall between the pilot burner 12 and the auxiliary pilot burner 48 for lighting the latter after ignition of the pilot burner 12.

The operation of the system shown in the drawing occurs when the combined valve and thermostat 16 is turned to the "on" position so that fuel is admitted through the by-pass 20 to the pilot burners 12, 48. Simultaneously, fuel will flow in the main fuel pipe 18 to the inlet 39 of the casing 30 but cannot flow through the outlet 41 therein to the main burner 10 due to the closed position of the valve member 36 when the bulb 22 is cold.

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The fuel flowing from the pilot burner 12 enters the flash tube 46 and is ignited by the igniter 42 due to the catalytic action previously described. The resulting flame travels back through the flash tube 46 and causes ignition of the pilot burner 12. The fuel supplied to the heater pilot burner 48 is in turn ignited from the pilot burner 12 through the flash tube 50. Shortly thereafter the bulb 22 of the thermal element becomes sufficiently heated by the flame now present at the pilot burner 48 to vaporize the mercury therein and expand the actuating element 26. The corresponding movement of the diaphragm 28 of the actuating element 26 causes opening of the valve member 36 and admission of fuel from the outlet 41 to the main burner 10. As the fuel flowing from the main burner 10 is immediately ignited by the pilot burner 12, the system is set in steady state operation.

During such steady state operation under control of the thermostat combined with the main fuel cock 16, the oven compartment is maintained at the desired temperature. It should be noted that at no time during such steady state operation, or when the oven is cold, is the catalytic igniter 42 operated beyond a relatively low temperature which may be approximately 900 degrees F. The temperature of such an electrically energized catalytic igniter is only raised to ignition values when unburned fuel impinges upon it.

In case of flame failure, the fuel flowing from the pilot burner 12 will immediately be reignited through the flash tube 46 by operation of the igniter 42. In case of ignition failure such as may be caused by breakage of the igniter 42 when the bulb 22 is heated, then this latter element will cool and cause closure of the valve member 36. The disclosed embodiment of this invention reduces the effects of a possible delayed ignition in the case of flame failure by providing for rapid cooling of the flame sensitive element 22 located exteriorly of the oven compartment where the temperature of the atmosphere is somewhat cooler than the interior thereof. In the event that the main fuel cock 16 is operated from open to closed position and then immediately back to open position so that a rapid off-on operation from steady state conditions is conducted, then the pilot burner 12 will immediately be reignited by the igniter 42 even though the valve member 36 has not had time to move to its closed position.

It is apparent that the foregoing described system provides for both instantaneous recycling and instantaneous reset with no purge period needed as previously indicated. Furthermore, the system has the particular advantage of requiring no electrical contacts or electrical switches. However, it is not beyond the scope of this disclosure to provide a switch on the combined valve and

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thermostat 16 to open the circuit of the primary of the transformer 44 when the oven compartment is not in use. On the other hand, it would be advantageous to utilize the system as shown without such a switch so that a second igniter could also be connected across the secondary of the transformer 44 to provide ignition for the usual top burner elements of the gas stove without the use of switching devices on the top burner gas cocks. In such event the second igniter would be used to replace the customary top burner pilot and ignite the top burners through short flash tubes, as will be apparent.

In case of the illustrated embodiment of the invention many changes may be made in the details of construction and arrangement of parts without departing from the scope of the invention so that this description and accompanying drawing is intended by way of illustration only and is not to be construed in a limiting sense.

I claim:

An ignition and automatic pilot control for gaseous fuel burners having a main burner and a pilot burner located within an oven compartment comprising an electric catalytic igniter adapted to be located exterior of the compartment, means for constantly energizing said igniter below igniting temperature, a flash tube for conveying a combustible mixture from the pilot burner to adjacent said igniter and producing a flame at the pilot burner, an auxiliary pilot burner located without the oven compartment, a second flash tube extending between said pilot burners for producing a flame at said auxiliary pilot burner, and means responsive to the presence or absence of a flame at said auxiliary pilot burner for controlling the fuel supply to the main burner.

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