COOKING APPARATUS WITH A THERMAL-ACTUATED SWITCH

This invention relates to a cooking apparatus, more particularly to a cooking apparatus that includes a gas burner with a thermal-actuated switch for controlling gas flow to a main burner of the gas burner.

Figs. 1 and 2 illustrate a conventional cooking apparatus 1 that includes an annular main burner 2 for providing a main flame, a pilot burner 410 for providing a pilot flame to ignite the main flame, a secondary burner 404' for providing a secondary flame, an igniting assembly 3 for igniting the pilot flame, and a gas switch 4 for distributing gas from a gas supply (not shown) to flow to the main burner 2, the pilot burner 410, and the secondary burner 404'. A pot (not shown) can be disposed above the main burner 2 so as to receive food that is to be cooked, such as rice.

The gas switch 4 includes a valve body that is adapted to receive gas from the gas supply (not shown) and that has a gas inlet tube 401, a gas outlet tube 402, a pilot valve rod 403 disposed in the valve body for controlling gas to flow to the pilot burner 410, a main valve rod 405 disposed in the valve body for controlling gas to flow to the gas burner 2, a secondary valve rod 404 disposed in the valve body for controlling gas to flow to the secondary burner

404', an ignition button 406 for actuating the pilot valve rod 403 upon pressing so as to permit gas to flow to the pilot burner 410 to result in the pilot flame, a secondary button 407 which is synchronously pressed upon pressing of the ignition button 406 for actuating the secondary valve rod 404 so as to permit gas to flow to the secondary burner 404' and to be ignited via the pilot flame, a main button 408 for actuating the main valve rod 405 to move between an ON position which permit gas to flow to the main burner 2 and to be ignited via the pilot flame, and an OFF position which prevents any gas from flowing to the main burner 2. A retaining device 5 is disposed underneath the main burner 2, and engages the main button 408 upon pressing of the latter so as to maintain the latter at the ON position. A thermal-actuated rod member 6 extends through the main burner 2 to make contact with the pot, and engages the retaining device 5. A thermally expandable member (not shown) is disposed at a bottom of the pot, is in contact with the rod member 6, and is thermally expandable upon heating for actuating the rod member 6 to move the retaining device 5, which, in turn, disengages the main button 408 and permits the latter to automatically return to the OFF position when the temperature of the pot exceeds a predetermined temperature during cooking.

The aforesaid cooking apparatus 1 is disadvantageous in that the mechanism for turning the main button 408 from the ON position to the OFF position operates by undergoing a series of mechanically engaging and disengaging actions, and thus tends to malfunction after a period of use. Moreover, such mechanism is complex, and assembly thereof is laborious.

Therefore, it is an object of the present invention to provide a cooking apparatus that is capable of overcoming the aforementioned drawbacks associated with the prior art.

Accordingly, a cooking apparatus of this invention comprises: a support seat having an annular wall that defines an inner space; an annular main burner disposed in the inner space for providing a main flame; a pilot burner disposed in the inner space adjacent to the main burner for providing a pilot flame so as to ignite gas at the main burner; a gas switch including an elongated switching valve confining a chamber therein, and a hollow cock disposed in the chamber, the switching valve having a main gas inlet adapted to receive gas from a gas supply, a main gas outlet for permitting gas to flow to the main burner, a pilot gas inlet adapted to receive gas from the gas supply, and a pilot gas outlet for permitting gas to flow to the pilot burner, the

cock having a pilot gas passage and a main gas passage, and being rotatable about a center line of the switch valve among an off position, in which the cock blocks the main gas inlet and the pilot inlet so as to prevent any gas from flowing to the pilot burner and the main burner, a pilot position, in which the pilot gas passage is in fluid communication with the pilot gas inlet and the pilot gas outlet so as to permit gas to flow to the pilot burner, and an on position, in which the pilot gas passage is in fluid communication with the pilot gas inlet and the pilot gas outlet and in which the main gas passage is in fluid communication with the main gas inlet and the main gas outlet so as to permit gas to flow to the pilot burner and the main burner; a solenoid valve mounted on the gas switch and operable between an off state, in which the solenoid valve closes the main gas outlet of the switching valve so as to prevent any gas from flowing to the main burner, and an on state, in which the solenoid valve opens the main gas outlet of the switching valve so as to permit gas to flow to the main burner; a thermocouple disposed in the inner space adjacent to the main burner for detecting the main flame and capable of generating an electrical current upon detecting presence of the main flame; and a thermal-actuated switch including a pair of spaced apart conductive members and a conductive

bridging member that is movable between a connected position, in which the conductive members are bridged by the bridging member, and a disconnected position, in which the conductive members are disconnected when the thermal-actuated switch detects a temperature that exceeds a predetermined temperature, the thermocouple, the thermal-actuated switch, and the solenoid valve being electrically and serially connected so that the current generated by the thermocouple can be received by the solenoid valve via the conductive members and the bridging member of the thermal-actuated switch when the bridging member is at the connected position, the solenoid valve being electrically disconnected from the thermocouple and thus being positioned at the off state when the bridging member is at the disconnected position.

In drawings which illustrate an embodiment of the invention,

Fig. 1 is a fragmentary perspective view of a conventional cooking apparatus;

Fig. 2 is a top view of the cooking apparatus of Fig. 1;

Fig. 3 is a top view of a cooking apparatus embodying this invention;

Fig. 4 is a side view of the cooking apparatus of Fig. 3, with a pot disposed thereon;

Fig. 5 is a fragmentary cross-sectional side view of the cooking apparatus of Fig. 3; and

Figs. 6 to 11 are fragmentary cross-sectional side views to illustrate a cock turning to different positions in a switching valve of the preferred embodiment.

Figs. 3 to 5 illustrate a preferred embodiment of a cooking apparatus of this invention. The cooking apparatus includes a support seat 10, an annular main burner 20, a pilot burner 370, a gas switch 30, a thermocouple 50, a solenoid valve 40, a thermal-actuated switch 60, a switch support 80, and a pot 70.

The pot 70 includes inner and outer shells 72, 71. The support seat 10 has an annular wall 11 that defines an inner space 111 and that supports the pot 70.

The annular main burner 20 is disposed in the inner space 111 in the support seat 10, has an annular body 21 that defines an inner space 22, and is connected to a gas pipe 23 so as to receive gas from a gas supply (not shown) via the gas switch 30 for providing a main flame on the main burner 20.

The pilot burner 370 is disposed in the inner space 111 in the support seat 10 adjacent to the main burner 20, and is connected to a gas tube 37 so as to receive gas from the gas supply via the gas switch

30 for providing a pilot flame which is ignited via a spark member 91 and which serves to ignite gas at the main burner 20.

The gas switch 30 includes an elongated switching valve 31 confining a chamber 311 therein, and a hollow cock 32 disposed in the chamber 311. The switching valve 31 has a main gas inlet 313 adapted to receive gas from the gas supply via a gas inlet conduit 36, a main gas outlet 381 for permitting gas to flow to the main burner 20 via the gas pipe 23, a pilot gas inlet 312 adapted to receive gas from the gas supply via the gas inlet conduit 36, and a pilot gas outlet 314 for permitting gas to flow to the pilot burner 50 via the gas tube 37. The hollow cock 32 has a pilot gas passage 324, a main gas passage 325, and an inner face 328 that defines an elongated channel 321 which extends along a center line of the switch valve 31. The gas switch 30 further includes a shaft 323 that axially extends through the channel 321, and an O-ring 326 that is sleeved in an air-tight manner on the shaft 323 and that abuts in an air-tight manner against the inner face 328 so as to divide the channel 321 into a pilot partition 3211 that is in fluid communication with the pilot gas passage 324, and a main partition 3212 that is in fluid communication with the main gas passage 325. The cock 32 is rotatable about the center line of the switching valve 31 among

an off position, in which the cock 32 blocks the main gas inlet 313 and the pilot inlet 312 so as to prevent any gas from flowing to the pilot burner 370 and the main burner 20 (see Figs. 6 and 7), a pilot position, in which the pilot gas passage 324 is in fluid communication with the pilot gas inlet 312 and the pilot gas outlet 314 so as to permit gas to flow to the pilot burner 370 (see Figs. 8 and 9), and an on position, in which the pilot gas passage 324 is in fluid communication with the pilot gas inlet 312 and the pilot gas outlet 314 and in which the main gas passage 325 is in fluid communication with the main gas inlet 313 and the main gas outlet 381 so as to permit gas to flow to the pilot burner 370 and the main burner 20 (see Figs. 10 and 11). A driving rod 34 extends through the annular wall 11 of the support seat 10 and into the switching valve 31 to engage the cock 32 so as to drive the cock 32 to rotate about the center line of the switching valve 31. A knob 35 is connected to the driving rod 34 for driving the latter.

The solenoid valve 40 is mounted on the gas switch 30, and includes a plunger 41 that is axially movable between an off state, in which the plunger 41 closes the main gas outlet 381 of the switching valve 31 so as to prevent any gas from flowing to the main burner 20, and an on state, in which the plunger

41 opens the main gas outlet 381 of the switching valve 31 so as to permit gas to flow to the main burner 20. The shaft 323 has one end connected to the plunger 41 and the other end connected to the driving rod 34 so as to be movable in an axial direction defined by the center line of the switching valve 31 and so as to push the plunger 41 to move away from the main gas outlet 381 when the main flame on the main burner 20 is to be ignited.

The thermocouple 50 is disposed in the inner space 111 in the support seat 10 adjacent to the main burner 20 for detecting the main flame, and is capable of generating an electrical current upon detecting presence of the main flame.

The thermal-actuated switch 60 includes a pair of spaced apart conductive members 64, 65, a conductive bridging member 641 extending from one of the conductive members 64, 65 toward the other one of the conductive members 64, 65, a thermally-deformable plate 67 that is thermally deformable so as to move the bridging member 641 between a connected position, in which the conductive members 64, 65 are bridged by the bridging member 641, and a disconnected position, in which the conductive members 64, 65 are disconnected when the temperature of the thermally-deformable plate 67 exceeds a predetermined temperature.

One of the conductive members 64, 65 is electrically connected to the thermocouple 50 via a first conductive plate 63, and the other one of the conductive members 64, 65 is electrically connected to the solenoid valve 40 via a second conductive plate 62. The thermocouple 50, the thermal-actuated switch 60, and the solenoid valve 40 are electrically and serially connected so that the current generated by the thermocouple 50 can be received by the solenoid valve 40 via the conductive members 64, 65, the first and second conductive plates 63, 62, and the bridging member 641 of the thermal-actuated switch 60 when the bridging member 641 is at the connected position. The solenoid valve 40 is electrically disconnected from the thermocouple 50 and thus is positioned at the off state when the bridging member 641 is at the disconnected position.

The switch support 80 is mounted in the inner space 111 in the support seat 10, and includes a tubular seat 81 that is secured to the support seat 10 and that extends upright from a bottom of the support seat 10 and through the main burner 20, and a spring-loaded inner tube 84 that is mounted fittingly and movably in the tubular seat 81 and that extends outwardly from a top end of the tubular seat 81 into a bottom space between the inner and outer shells 72, 71 of the pot 70 when the pot 70 is mounted

on the support seat 10. The thermal-actuated switch 60 is mounted on a top end of the inner tube 84 so as to be urged by the latter to stay in contact with a bottom of the inner shell 72 when the pot 70 is mounted on the support seat 10. As such, when the temperature of the pot 70 exceeds the predetermined temperature upon cooking, the thermally-deformable plate 67 will be deformed and will move the bridging member 641 to the disconnected position, which, in turn, will electrically disconnect the solenoid valve 40 from the thermocouple 50 and will close the main gas outlet 381, thereby preventing any gas from flowing to the main burner 20.

The cooking apparatus of this invention can further include a timer (not shown) electrically and serially connected to the solenoid valve 40, the thermocouple 50, and the thermal-actuated switch 60 for preventing any gas from flowing to the main burner 20 and the pilot burner 370.

With the thermocouple 50, the thermal-actuated switch 60, and the solenoid valve 40, the drawbacks associated with the prior art can be eliminated.

With the invention thus explained, it is apparent that various modifications and variations can be made without departing from the spirit of the present invention. It is therefore intended that the invention be limited only as recited in the appended

claims.

CLAIMS:

1. A cooking apparatus comprising:

a support seat having an annular wall that defines an inner space;

an annular main burner disposed in said inner space for providing a main flame;

a pilot burner disposed in said inner space adjacent to said main burner for providing a pilot flame so as to ignite gas at said main burner;

a gas switch including an elongated switching valve confining a chamber therein, and a hollow cock disposed in said chamber, said switching valve having a main gas inlet adapted to receive gas from a gas supply, a main gas outlet for permitting gas to flow to said main burner, a pilot gas inlet adapted to receive gas from the gas supply, and a pilot gas outlet for permitting gas to flow to said pilot burner, said cock having a pilot gas passage and a main gas passage, and being rotatable about a center line of said switch valve among an off position, in which said cock blocks said main gas inlet and said pilot inlet so as to prevent any gas from flowing to said pilot burner and said main burner, a pilot position, in which said pilot gas passage is in fluid communication with said pilot gas inlet and said pilot gas outlet so as to permit gas to flow to said pilot burner, and an on position, in which said pilot gas passage is in fluid

communication with said pilot gas inlet and said pilot gas outlet and in which said main gas passage is in fluid communication with said main gas inlet and said main gas outlet so as to permit gas to flow to said pilot burner and said main burner;

a solenoid valve mounted on said gas switch and operable between an off state, in which said solenoid valve closes said main gas outlet of said switching valve so as to prevent any gas from flowing to said main burner, and an on state, in which said solenoid valve opens said main gas outlet of said switching valve so as to permit gas to flow to said main burner;

a thermocouple disposed in said inner space adjacent to said main burner for detecting said main flame and capable of generating an electrical current upon detecting presence of said main flame; and

a thermal-actuated switch including a pair of spaced apart conductive members and a conductive bridging member that is movable between a connected position, in which said conductive members are bridged by said bridging member, and a disconnected position, in which said conductive members are disconnected when said thermal-actuated switch detects a temperature that exceeds a predetermined temperature, said thermocouple, said thermal-actuated switch, and said solenoid valve being electrically and serially connected so that the

current generated by said thermocouple can be received by said solenoid valve via said conductive members and said bridging member of said thermal-actuated switch when said bridging member is at said connected position, said solenoid valve being electrically disconnected from said thermocouple and thus being positioned at said off state when said bridging member is at said disconnected position.

2. The cooking apparatus of Claim 1, wherein said hollow cock has an inner face that defines an elongated channel which extends along said center line, said gas switch further including a shaft that axially extends through said channel, and an O-ring that is sleeved in an air-tight manner on said shaft and that abuts in an air-tight manner against said inner face so as to divide said channel into a pilot partition that is in fluid communication with said pilot gas passage, and a main partition that is in fluid communication with said main gas passage, said solenoid valve including a plunger that is axially movable to close and to open said main gas outlet, said shaft having one end connected to said plunger, and being movable in an axial direction defined by said center line so as to push said plunger to move away from said main gas outlet.

3. The cooking apparatus of Claim 2, further comprising a switch support mounted in said inner



space in said support seat and including a tubular seat that is secured to said support seat and that extends upright from a bottom of said support seat and through said main burner, and a spring-loaded inner tube that is mounted fittingly and movably in said tubular seat and that extends upwardly and outwardly from a top end of said tubular seat, said thermal-actuated switch being mounted on a top end of said inner tube so as to be movable upwardly and downwardly relative to said support seat.

