AUTO-IGNITION STOVE

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UNITED STATES PATENTS
2,896,704 7/1959 Aleweld 431/255
3,273,628 9/1966 Puttfarcken 431/255
2,462,234 8/1969 Branson et al. 431/255
3,676,047 7/1972 Soma 431/255

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ABSTRACT
A campstove having a plurality of burners each of which is controlled by a separate regulator has, for igniting the burners, a single piezoelectric assembly. The piezoelectric assembly is actuated by a slide which is arranged to be acted upon by each of the burner regulators when the regulators are used to first cause fuel to flow to the respective burners which they control. A spark is produced at each burner upon actuation of any of the regulators to turn a particular burner on.

5 Claims, 7 Drawing Figures
AUTO-IGNITION STOVE

This invention concerns a multi-burner stove which is fueled with gaseous fuel, such as propane, which fuel is ignited at the burners by a spark produced adjacent each burner. More particularly, this invention contemplates the use of a single actuating slide which is acted upon by movement of the fuel flow regulators when the latter are caused to open the burners to fuel, and which slide in turn acts upon the sparking device to cause the latter to create a spark at each burner. Each burner has its own fuel flow regulator control, and each regulator is selectively operable to act upon the actuating slide when fuel is initially caused to flow to a burner.

There is disclosed in the prior art the concept of coordinating spark ignition of a gas burner in a stove with manipulation of the fuel flow regulator to initiate flow of the gas to the burner. U. S. Pat. No. 3,298,421 issued Jan. 17, 1967 to Tezuka et al. discloses this concept. The disclosure of U. S. Pat. No. 3,298,421 is, however, limited in that the arrangement shown requires a separate piezoelectric crystal for each burner to be ignited, and further requires a separate actuator interconnecting each piezoelectric igniter with its associated fuel regulator.

The concept of utilizing a single piezoelectric crystal for spark igniting any of a plurality of fuel burners on a stove is disclosed in U. S. Pat. No. 3,459,172 issued Aug. 5, 1969 to C. D. Branson. Each of the burners in the disclosure of U. S. Pat. No. 3,459,172 is controlled by a separate fuel regulator and each fuel regulator is associated with a separate link, cam, and rocker arm assembly to squeeze the crystal when the regulator is actuated to initially direct fuel to a burner. Thus the prior art disclosures concerning coordination of fuel feed to burners on a stove by ignitions with means of sparking are rather complex in that a separate actuator for acting upon the sparking means is required to be associated with each fuel regulator.

This invention concerns an improvement in gas-fueled, multi-burner stoves having a fuel regulator for each burner, wherein actuation of the fuel regulator to initiate feeding of fuel to the respective burner results in formation of a spark at the particular burner to ignite the latter. The improvement lies in the provision of a single actuating mechanism which is acted upon by each of the fuel regulators and which, in turn, acts upon the electrical current source to provide a spark at the burner which has been turned on. The actuating mechanism is preferably in the form of a slide which is normally positioned so as to permit the full range of adjustment of the burner regulators from full "off" to full "on" without having the regulators engage the actuating slide. The burner regulators, however, are free to be moved additionally beyond the full "on" position during which additional movement they engage the slide actuator and cause the latter to enable the current source to produce electrical current for causing a spark at the burner from which fuel is newly issuing. Provision is also made for preventing the actuating slide, as it is being operated, from contacting any of the other fuel regulators which are already on. Thus the preset positions of "on" fuel regulators will not be affected by turning another fuel regulator on. After the burner has been ignited, and the fuel regulator momentarily released, means are provided for automatically returning the actuating slide to its normal position while, at the same time, returning the fuel regulator to its full on position. Thereafter, preferred adjustment of the flame can be made without contacting the actuating slide.

It is, therefore, an object of this invention to provide a multi-burner stove assembly with a separate fuel regulator for each burner, an ignitor for creating sparks to ignite fuel issuing from each particular burner, and a single actuator which is selectively acted upon by each fuel regulator and which actuator in turn acts upon the ignitor to cause the latter to provide fuel ignition sparks.

It is a further object of the invention to provide a multi-burner stove assembly of the character described wherein the actuator is free of contact with the fuel regulators throughout substantially the full range of movement of the regulators from maximum or "full on" to "full off."

These and other objects and advantages of the invention will become more readily apparent from the following detailed description of a preferred embodiment of the invention when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a plan view of a portion of a multi-burner stove including a preferred embodiment of the invention;

FIG. 2 is a perspective view of the mounting bracket used on the stove of FIG. 1;

FIG. 3 is a perspective view of the actuating slide used on the stove of FIG. 1;

FIG. 4 is a horizontal view, taken partially in section, of the igniter mechanism used on the stove of FIG. 1;

FIG. 5 is a vertical sectional view of one of the fuel regulators of the stove shown in the off position;

FIG. 6 is a front elevational view of the stove, taken partially in section and with the front panel removed for clarity, showing both fuel regulators in the maximum or full on position; and

FIG. 7 is a view similar to FIG. 6, but showing the right hand fuel regulator in the off position and the left hand fuel regulator in the spark-actuating or igniting position.

Referring now to the drawings, there is shown in FIG. 1 an L. P. gas-burning stove having a base 2 on which are mounted a pair of annular burners 4 and 4', the burners 4 and 4' being secured to the base 2 by conventional brackets, (not shown). The burners 4 and 4' are of conventional construction and are formed from an electrically conductive material. The stove base 2 is also formed from an electrically conductive material and serves as a ground potential between the two burners 4 and 4'. A bracket 6 is mounted on the stove base 2 in any conventional manner, as for example, by screws, soldering, or the like. Structural features of the bracket 6 will be further detailed hereinafter. A piezoelectric ignition assembly 8 is mounted on the bracket 6, the piezoelectric assembly 8 being electrically connected to a first electrode 10 by means of an insulated conductor 12. The electrode 10 is mounted on an electrically insulating post 14 which is secured to the stove base 2 so that the electrode 10 is electrically insulated from the stove base 2. The tip 16 of the electrode 10 is spaced apart from the burner 4 a short distance to define therebetween a spark gap which is disposed in the area of the burner from which fuel issues. The piezoelectric assembly 8 is also connected to a second electrode 18 by means of an insulated electrical conductor 20. The electrode 18 is mounted on an insulating post 22 and the point 24 of the electrode 18 is spaced apart...
from the burner 4 to form a spark gap therebetween in the area from which fuel is emitted from the burner 4.

A fuel manifold 26 is mounted on the bracket 6 and is connected to a fuel conduit 28 which in turn is connected to a source of L. P. fuel, such as a propane tank. A pair of branch fuel conduits 30 and 32 extend from the manifold 26 to the burners 4 and 4' respectively. Fuel regulating assemblies 34 and 36 are associated with the burners 4 and 4' respectively so as to individually control the flame height of the burners. Details of the operation of the fuel regulators 34 and 36 will be set forth in greater detail hereinafter. A slide actuator 38 is slidably carried by the bracket 6 for selectively actuating the ignition assembly 8 in a manner to be set forth in greater detail hereinafter.

Referring now to FIG. 2, the bracket 6 includes an upstanding leg portion 40 and a horizontal foot portion 42, the latter of which is anchored to the stove base 2. A pair of tabs 44 and 46 are struck from the leg portion 40 of the bracket and include aligned apertures 48 and 50 respectively for the reception of the piezoelectric ignition assembly 8. A tab 52 is formed on the bracket 6, the tab 52 having downwardly bent end portions 54 and 56 which contain aligned slots 58 and 60 respectively for receiving the actuating slide 38. The leg portion 40 also contains spaced apart openings 62 and 64 through which pass the fuel regulating assemblies 34 and 36 respectively, and which provide means for securing the manifold 26 to the bracket 6.

Referring now to FIG. 3, details of the actuating slide 38 are shown. The slide 38 includes a tail portion 66 of reduced lateral dimension, which tail portion 66 is slidably received in the aligned tab slots 58 and 60. The slide further includes a laterally enlarged head portion 68 terminating in a downwardly turned nose 70. The enlarged portion 68 and reduced portion 66 meet at opposed shoulders 72 which engage the bent end portion 54 of the bracket tab 52 laterally of the slot 58 so as to define one terminal of the sliding movement of the slide 38. A slot 74 is cut through the slide 38, which slot 74 provides opposed end walls 76 and 78, the purpose of which will be set forth in greater detail hereinafter. The function of the rearward end wall 80 of the slide 38 will also be set forth in greater detail hereinafter.

Referring now to FIG. 4, details of the igniter assembly 8 are shown. The igniter assembly 8 includes a housing 82 of electrically insulating material, such as plastic, or the like, which housing 82 is mounted on the bracket tabs 44 and 46. A piezoelectric crystal 84 is mounted in the housing 82 and a pair of electrical contacts 86 and 88 are disposed in electrical connection with opposite ends of the crystal 84. The insulated conductor wire 12 is electrically connected to the contact 86 and the conductor wire 20 is electrically connected to the contact 88. The crystal 84 is such that when its internal stresses are changed by applying an external force to it, equal and opposite electrical potentials are created at the contacts 86 and 88. The igniter assembly includes a plunger 98 which is movably mounted in the housing 82 and protrudes from one end thereof. The plunger 98 includes an interior portion 100 which is mounted a relatively heavy spring 94. One end of the spring 94 engages the bottom of the well 92, as at 96, and the other end of the spring 94 engages a hammer member 98 as at 100. As shown in FIG. 4, the spring 94 is fully extended and exerts only enough force on the hammer 98 to hold a pin 102, which is secured to the hammer 98, against a restraining shoulder 104 formed on the housing 82. A second relatively light spring 106 is sandwiched between the hammer 98 and the contact 88 and serves to bias the hammer 98 away from the contact 88. A collar 108 having a camming surface 110 is secured to the plunger 90 for movement therewith. It will be noted that the nose 70 of the actuating slide 38 contacts the plunger 90.

The igniter mechanism 8, as shown in FIG. 4, is in its non-sparking position. The ignitor 8 is caused to supply electrical current to the spark gaps adjacent the burners 4 and 4' in the following manner. As viewed in FIG. 4, the actuating slide 38 is caused to move to the right, thus causing the plunger 90 to move to the right and compress the spring 94. Movement of the plunger 90 to the right, in addition to compressing the spring 94, moves the collar 108 and its camming surface 110 to the right and toward the hammer 98 and its pin 102. Rightward movement of the actuator 38, plunger 90 and collar 108 is continued until the camming surface 110 engages the hammer pin 102 and moves the latter circumferentially out of engagement with the restraining shoulder 104 on the casing. At this point substantial energy has been stored in the spring 94 by compression thereof, which stored energy is utilized to drive the hammer 98 to the right until it strikes the contact 88 thereby applying a sharp compressive force of momentary duration to the piezoelectric crystal 84. Rightward movement of the hammer 98 also compresses the spring 106 to store energy therein for use in returning the hammer 98, collar 108, plunger 90 and actuating slide 38 to their original positions once the driving force on the slide is discontinued. The momentary and sharp compression of the piezoelectric crystal 84 causes the latter to impart to the contacts 86 and 88 equal and opposite electrical potentials, a positive potential being imparted to the contact 86 and a negative potential being imparted to the contact 88. In this manner, electrical current flows through the conductor wire 12 to the electrode 10 and jumps, in the form of a spark, across from the electrode tip 16 to the burner 4. This spark will ignite any fuel issuing from the burner 4. The current then flows through the stove base 2 to the burner 4', jumps in the form of a spark, from the burner 4' to the tip 24 of the electrode 18. This spark will ignite any fuel issuing from the burner 4'. The current then flows through the conductor 20 to the negative contact 88, thus completing the circuit. Thus, a single actuation of the ignitor 8 will produce a spark at each burner 4 and 4' and will ignite fuel newly issuing from either of the burners since the electrodes 10 and 18 are hooked up in series with the ignitor 8. It will be noted that the ignitor 8 is constructed and operates generally in accord with the teachings of U. S. Pat. No. 3,449,637 issued June 10, 1969 to Akio Suzuki.

Referring now to FIG. 5, details of the construction of the fuel flow regulator 36 are shown, both of the fuel flow regulators 34 and 36 being similar in construction and mode of operation. The regulator assembly 36 includes a knob 112 which is accessible from the front of the stove and which is mounted on a shaft 114 extending through the base case and bracket 6. The shaft 114 includes a threaded portion 116 threaded into a complimentarily threaded part 118 of a bore 119 in the manifold 26. The bore 119 opens into a throat 121 which in turn opens into a passage 123 intersecting
the main fuel passage 120 in the manifold 26. The forward portion 122 of the shaft 114 is provided with a groove 125 in which is mounted a resilient O ring 124 which seals the bore 119 against leakage of fuel in the direction of the threads 118. The forward portion 122 of the shaft 114 terminates in a conical valve head 128 which is moved longitudinally by rotation of the knob 112 to open and close the fuel passage 123. A second fuel passage 127 opens at one end into the bore 119 and at the other end into the interior of the fuel conduit 32. Thus when the valve head 218 is backed away from the fuel passage 123, fuel is free to pass from the manifold 26 through the passages 123 and 127 and into the fuel conduit 37 to the burner 4'. As shown in FIG. 5, the regulator 36 is in its "off" position so that no fuel can flow to the burner 4'. To turn the burner 4' on, the knob 112 is rotated in a counter-clockwise direction to back the valve head 128 away from the fuel passage 123. A collar 130 is mounted on and keyed to the shaft 114 for rotation therewith, the collar 130 carrying a radially extending finger or pin 132 which finger 132 moves along an arcuate path when the shaft 114 is rotated. It is noted that the finger 132 extends radially outwardly a sufficient distance to be able to contact the end surface 80 of the actuator slide 38 under certain circumstances. It will be noted that, merely for purposes of illustration, the finger 132 has been rotationally offset in FIG. 5 from the position that it actually occupies when the regulator 36 is in the off position, the actual off position of the finger 132 being shown in FIG. 7.

Referring now to FIG. 7, the regulator 36 is shown in its full off position with the position of finger 132 being shown when the regulator 36 is full off, and further with the position of the finger 132 being shown in phantom when the regulator 36 is initially turned on then turned beyond its full on or maximum position to its ignitor actuating position so as to cause the slide 38 to act upon the ignitor 8 and actuate the latter to cause sparks at the burners. The regulator 34 is shown in its ignitor-actuating, or turn-on position wherein the finger 132' has been moved against the end wall 76 of the slide slot 74 to cause the slide nose 70 to move against and depress the ignitor plunger 90. As previously noted, depression of the ignitor plunger 90 results in creation of sparks adjacent each burner on the stove. Thus the slide 38 is shown in FIG. 7 in its actuating position, as distinguished from its normal position, which is shown in FIG. 6. It will be noted that rotation of the control 36 sufficient to move the finger 132 to the position shown in phantom in FIG. 7 will also move the slide 38 to its actuating position. It will further be noted that if the finger 132 is caused to move the slide 38 to its actuating position, such movement will not cause the slide slot 74 to touch the finger 132' should the latter be disposed in any position between the off and maximum positions and within the full range of fuel adjustment positions which can be imparted to the regulator 34. Thus, when a new burner is turned on, resultant movement of the slide 38 will not disturb the preset flame height of a burner which is already on.

Thus, in order to ignite a particular burner, its respective regulator is manually turned from "off" to the maximum or full "on" position to permit fuel to flow to the burner, and then beyond the full "on" position to its igniting position to cause the particular control finger to engage the slide 38 and move the latter toward the ignitor. The actuating movement of the regulator is continued until the ignitor plunger 90 is fully depressed after which a spark will be created at each burner, irrespective of which regulator has been manipulated. The particular regulator is then released permitting the plunger 90 to act upon the slide 38 which in turn acts upon the particular control finger to automatically return the particular regulator to its full "on" position. Subsequent and precise regulation of the flame intensity of the newly ignited burner can then ensue.

It will be readily appreciated that this invention provides a simplified construction for correlating movement of a burner regulator with sparking of a newly turned on burner for fuel ignition. A single current source is sued for a plurality of burners with individual regulators, and a single actuator is used to selectively interconnect "fuel on" movement of each regulator with actuation of the spark igniters. Furthermore, ignition of a newly turned on burner does not disturb the preset flame condition of any other burner which is already on.

Since many changes and variations of the disclosed embodiment of the invention may be made without departing from the inventive concept, it is not intended to limit the invention otherwise than as required by the appended claims.

What is claimed is:

1. An L. P. fuel combustion assembly comprising:
   a. at least first and second burner means for combustion of fuel;
   b. sparking means for creating electrical sparking adjacent each of said burner means to tend to ignite fuel issuing therefrom;
   c. ignition means connected to said sparking means and selectively operable to provide electrical current for said sparking means;
   d. at least first and second regulating means for regulating the amount of fuel fed to said first and second burner means respectively, said regulating means being movable between an off position and an ignition position, and said regulating means further being movable to a maximum position which is between said off position and said ignition position, and wherein a maximum volume of fuel is fed to said burner means; and
   e. means for interconnecting both of said first and second regulating means with said ignition means only when either of said regulating means is moved from said maximum position to said ignition position to provide sparking adjacent both of said first and second burner means whereby said first and second burner means are free of sparking during the full range of burner regulation.

2. The assembly of claim 1, further comprising means for automatically moving each of said regulating means from its ignition position to its maximum position after ignition of fuel issuing from a burner means.

3. The assembly of claim 1, wherein said interconnecting means includes a slide means, and pin members secured to each of said regulating means, said pin members being moved into engagement with said slide means when said regulating means are moved to said maximum position, and said slide means being moved to an actuating position when said regulating means are moved to said ignition position, said slide means, when in said actuating position, being operative to enable
said ignition means to deliver electrical current to said sparking means.

4. An L. P. fuel combustion assembly comprising:
   a. at least first and second burner means for combustion of fuel;
   b. sparking means for creating electrical sparking adjacent each of said burner means to tend to ignite fuel issuing therefrom;
   c. ignition means connected to said sparking means and selectively operable to provide electrical current for said sparking means;
   d. at least first and second regulating means for regulating the amount of fuel to said first and second burner means respectively, said regulating means being movable between an off position and an ignition position with an intervening maximum position whereby movement of said regulating means between said off position and said maximum position results in the full range of flame adjustment at the respective burner means;
   e. slide means adjacent said ignition means and movable to an actuating position wherein said slide means causes said ignition means to provide electrical current for said sparking means, said slide means normally being disposed in a non-actuating position; and
   f. means projecting from each of said regulating means and movable therewith to a position engaging said slide means when said regulating means is moved to said maximum position and said slide means is in said non-actuating position, and said projecting means being operable to move said slide means to said actuating position whereby electrical sparking occurs adjacent each of said burner means, said projecting means further being free of engagement with said slide means during the range of movement of said regulating means from said off position to said maximum position.

5. An L. P. fuel combustion assembly comprising:
   a. a plurality of burner means for combustion of fuel;
   b. sparking means for producing electrical sparking adjacent each of said burner means;
   c. ignition means connected to said sparking means for providing electrical current to said aparkng means;
   d. actuating means adjacent said ignition means and operable when in an actuating position, to enable said ignition means to provide electrical current to said sparking means, said actuating means normally being in a non-actuating position; and
   e. a plurality of regulating means operatively connected to each of said burner means whereby each of said regulating means is operable to regulate fuel flow to a respective one of said burner means, said regulating means being movable between an off position and an ignition position with an intervening maximum position whereby movement of said regulating means between said off position and said maximum position provides a full range of possible burner adjustments, said regulating means including means movable therewith through said positions for engaging said actuating means when any of said regulating means is moved to said maximum position and further operative to move said actuating means to said actuating position when said regulating means is moved to said igniting position, and said means being free of contact with said actuating means during movement of said regulating means between said off position and said maximum position.

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