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3,511,588

BURNER CONSTRUCTION HAVING ELECTRICAL SPARK IGNITION MEANS

Filed Feb. 28, 1968

4 Sheets-Sheet 1

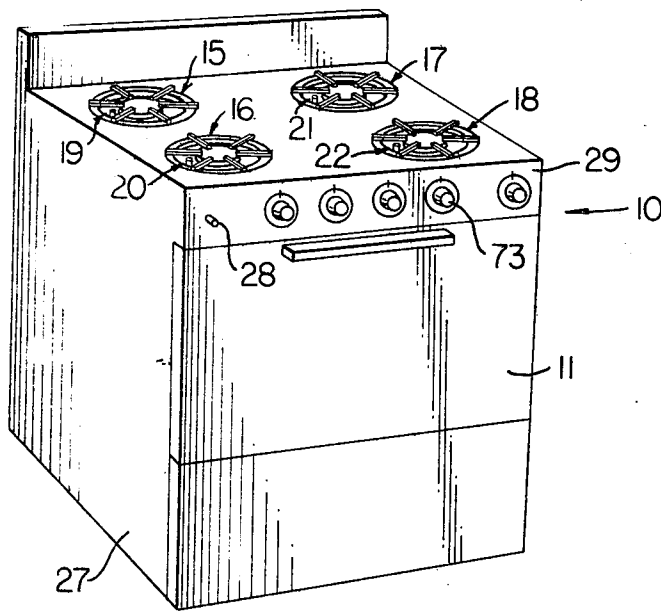


FIG.1

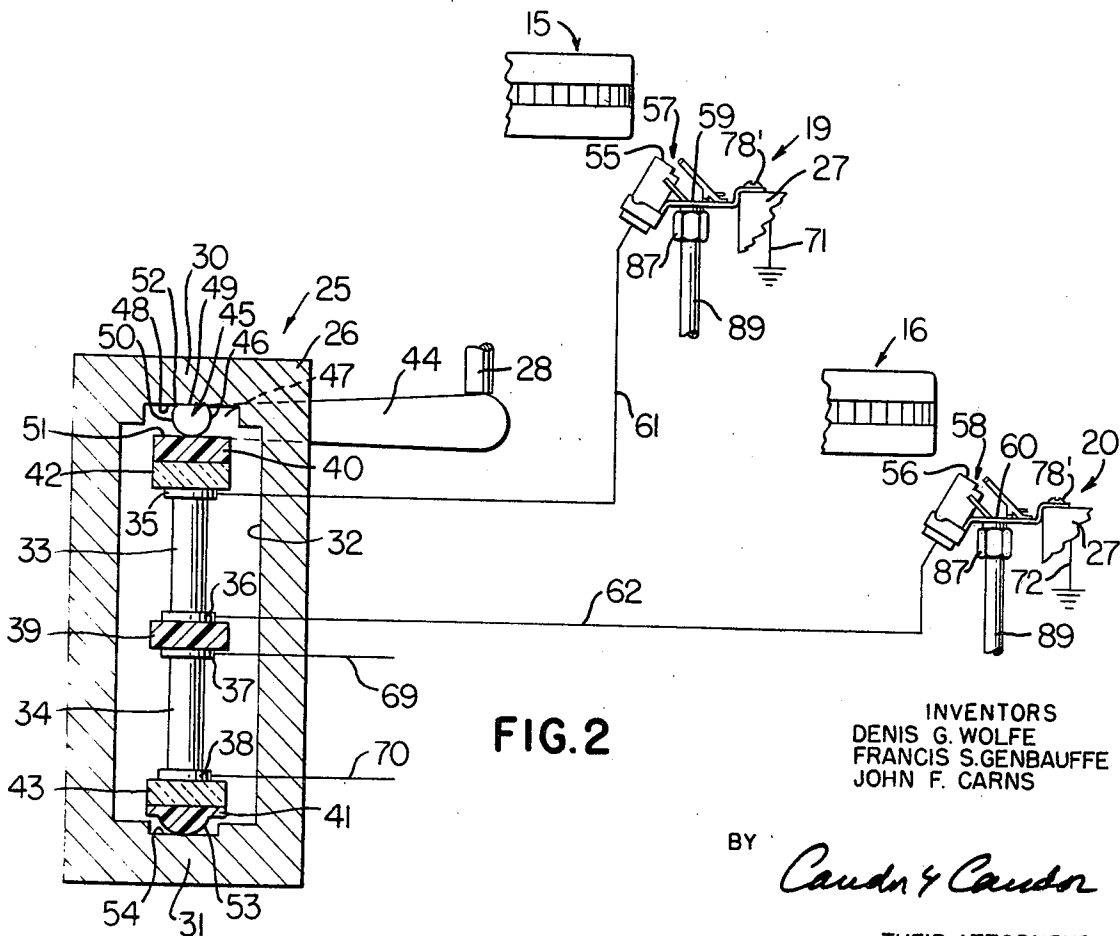


FIG. 2

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4 Sheets-Sheet 2

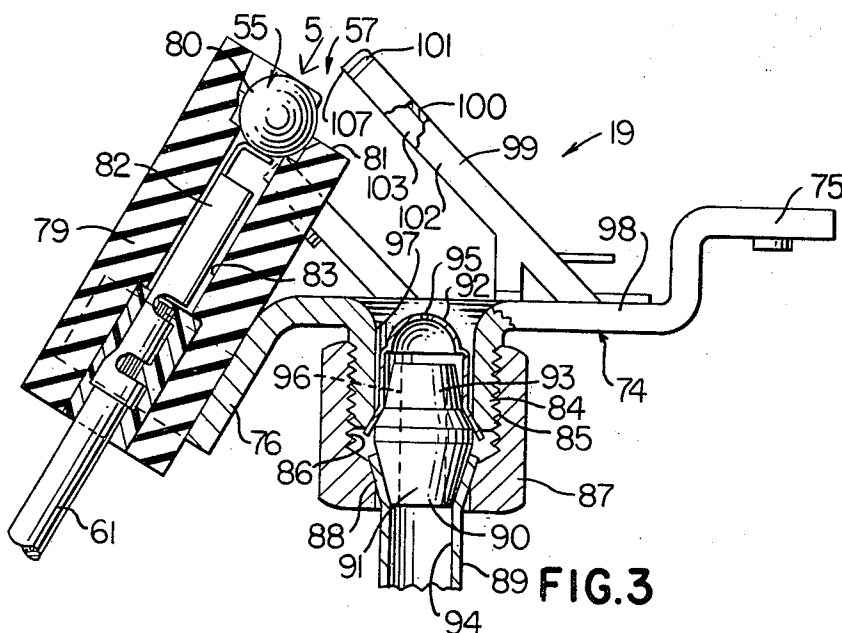


FIG. 3

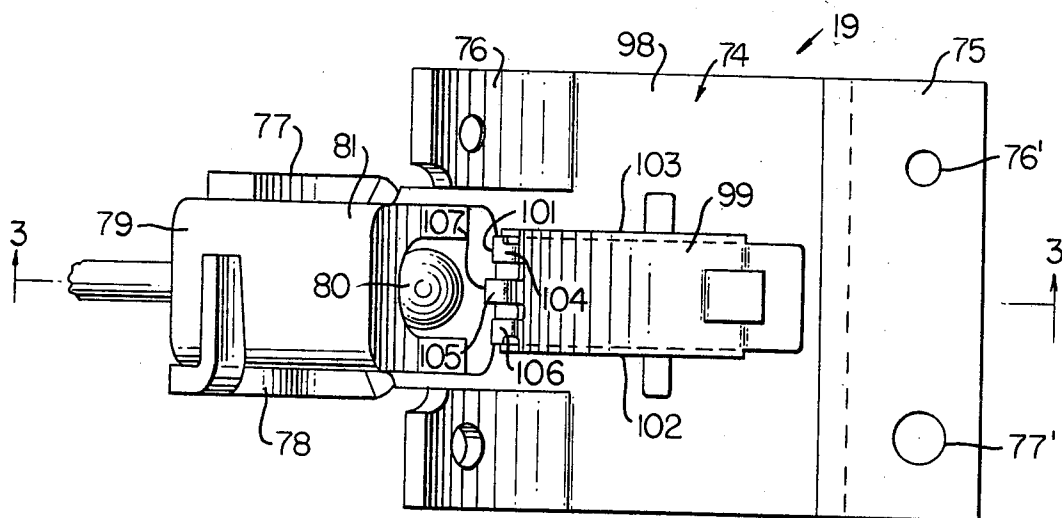


FIG. 4

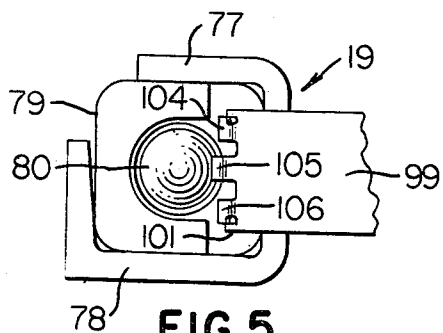


FIG. 5

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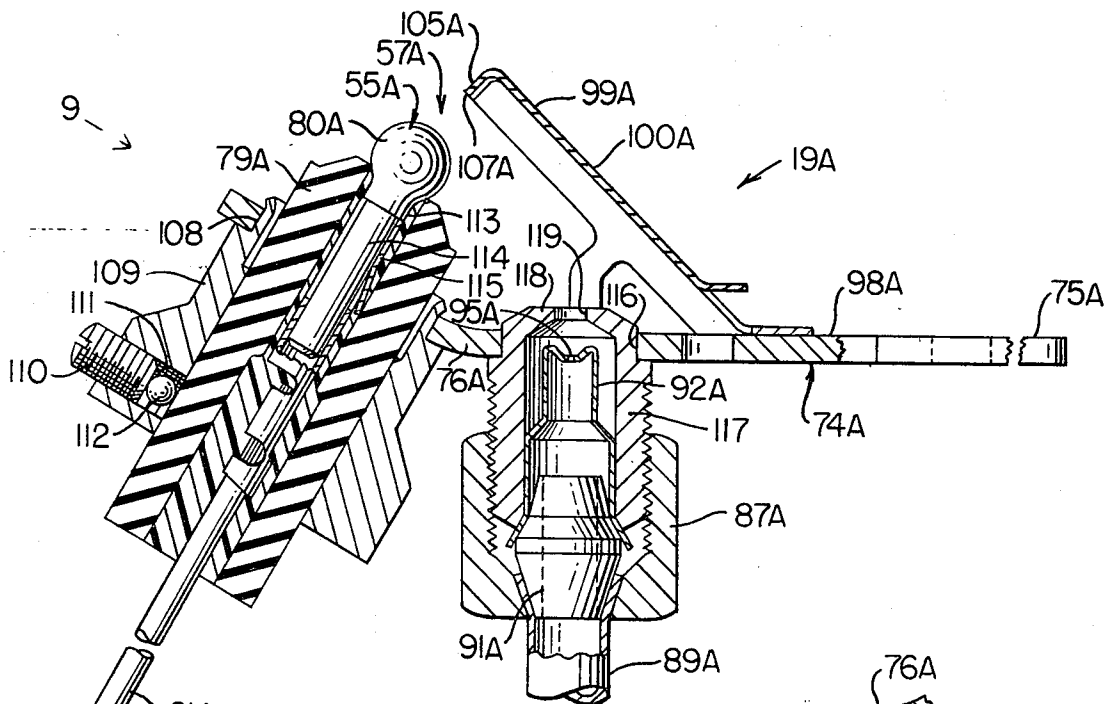


FIG. 6

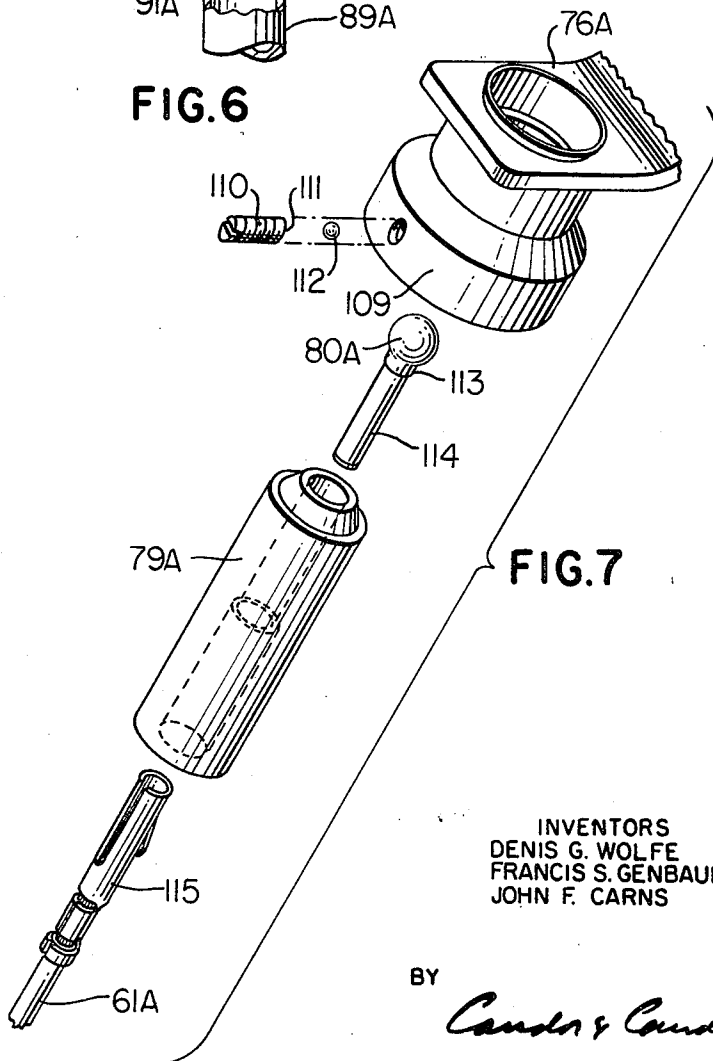


FIG.7

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4 Sheets-Sheet 4

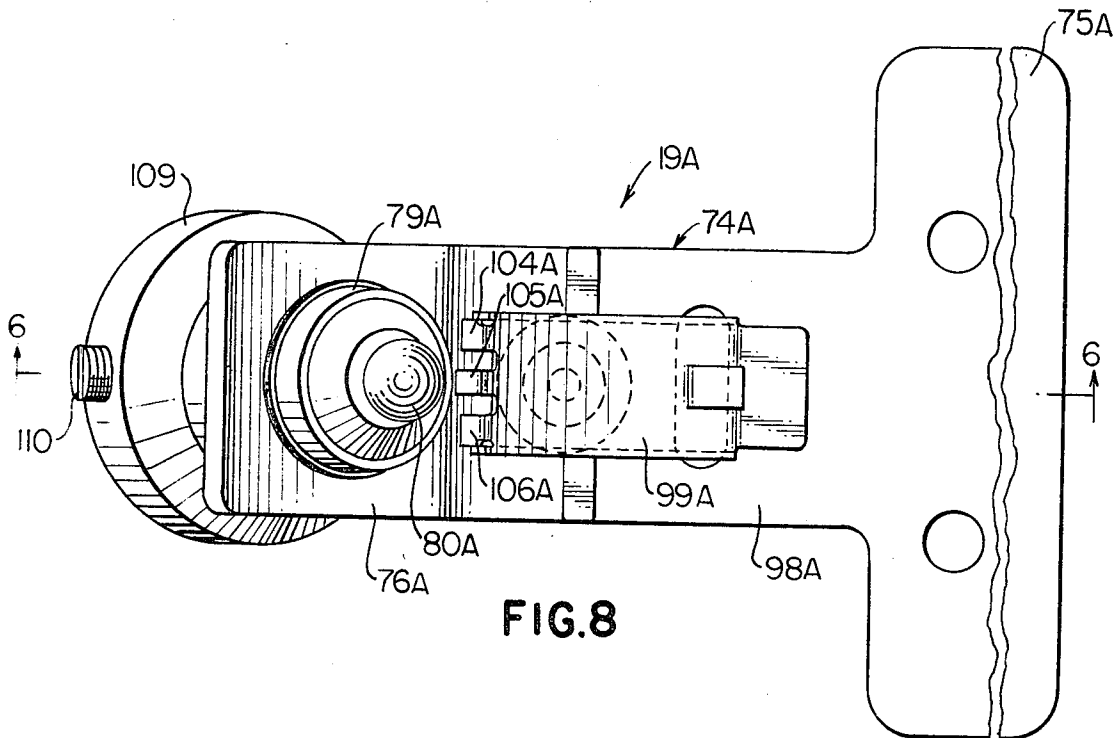


FIG. 8

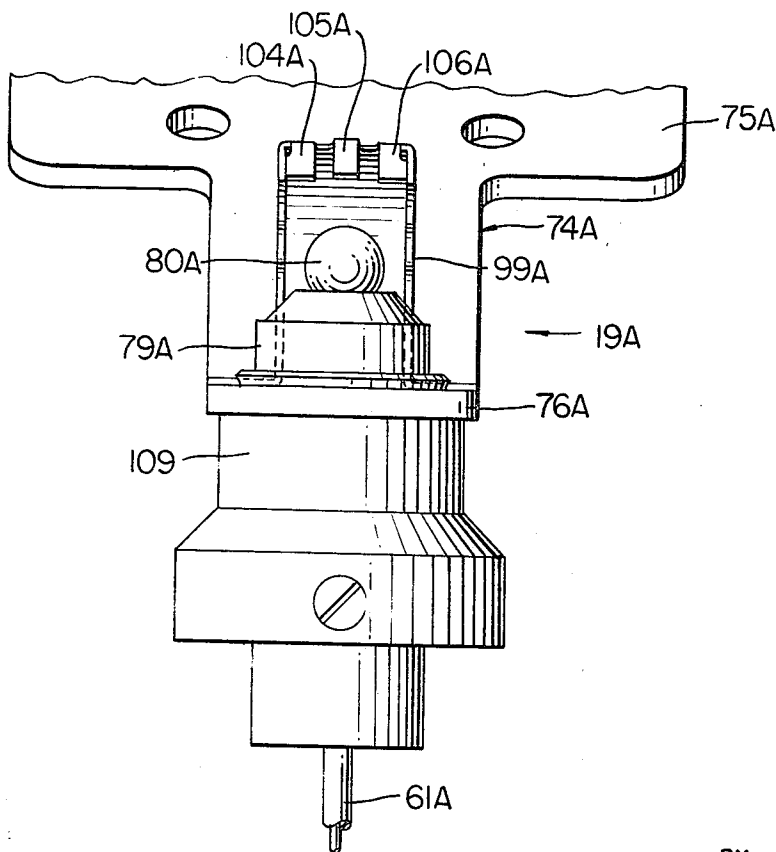


FIG. 9

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BURNER CONSTRUCTION HAVING ELECTRICAL SPARK IGNITION MEANS

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Int. Cl. F23q 3/00

U.S. Cl. 431—264

21 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to ignition means for a pilot burner construction wherein the pilot burner construction has a flame shield disposed adjacent the fuel outlet opening to deflect the flow of fuel toward an electrode that cooperates with the free end of the flame shield to provide a spark gap whereby the altering of stresses in a piezoelectric crystal means will cause sparking between the electrode and the end of the flame shield to ignite the pilot gas fuel.

This invention relates to an improved pilot burner construction having electrical spark ignition means therefor.

It is well known that many cooking apparatus of the fuel burning variety have individual pilot burner means for each main burner thereof whether the main burner is disposed in the oven or on top of the cooking apparatus, the pilot burners being continuously burning pilot burners and when adversely put out because of air current or the like, the same must be re-ignited by the housewife or the like utilizing matches and the like.

However, according to the teachings of the copending patent application, Ser. No. 670,307, filed Sept. 25, 1967, and assigned to the same assignee to whom this application is assigned, an ignition means for such pilot burner means can be provided wherein the housewife or the like, in a simple and effective manner, alters the stresses in piezoelectric crystal means to cause electrical sparking across spark gaps at the pilot burner means to re-ignite the same.

One feature of this invention is to provide an improved pilot burner construction that can be utilized with such piezoelectric spark creating means.

In particular, one embodiment of this invention comprises a pilot burner construction having outlet means for the issuing of pilot fuel that is directed against a flame shield angularly disposed relative to the outlet end of the fuel passage to deflect the issuing fuel toward an electrode that cooperates with the free end of the flame shield in defining a spark gap whereby subsequent electrical sparking between the electrode and the free end of the flame shield will ignite the issuing fuel.

Therefore, it is an object of this invention to provide an improved pilot burner construction having one or more of the novel features set forth above or hereinafter shown or described.

Another object of this invention is to provide improved pilot burner ignition means, the ignition means having one or more of the novel features set forth above or hereinafter shown or described.

Other objects, uses and advantages of this invention are apparent from a reading of this description which proceeds with reference to the accompany drawings forming a part thereof and wherein:

FIG. 1 is a perspective view of a cooking apparatus utilizing the ignition means of this invention.

FIG. 2 is a schematic view illustrating the ignition system for the cooking apparatus of FIG. 1.

FIG. 3 is an enlarged, fragmentary, partial, cross-sectional view illustrating one embodiment of the pilot burner construction of this invention utilized in the system of FIG. 2, FIG. 3 being taken substantially on line 3—3 of FIG. 4.

FIG. 4 is a top view of a pilot burner construction of FIG. 3.

FIG. 5 is a fragmentary, angular top view of the electrode means of the burner construction of FIG. 3 looking substantially in the direction of the arrow 5 in FIG. 3.

FIG. 6 is a view similar to FIG. 3 and illustrates another pilot burner construction of this invention, FIG. 6 being taken substantially on line 6—6 of FIG. 8.

FIG. 7 is an exploded perspective view of one of the electrode means of the pilot burner construction of FIG. 6.

FIG. 8 is a top view of the pilot burner construction of FIG. 6.

FIG. 9 is a top side view of the pilot burner construction of FIG. 6 and is taken at an angle substantially along the arrow 9 of FIG. 6.

While the various features of this invention are herein-after described and illustrated as being particularly adaptable for providing ignition means for a pilot burner means of a cooking apparatus, it is to be understood that the various features of this invention can be utilized singly or in any combination thereof to provide ignition means for other apparatus as desired.

Therefore, this invention is not to be limited to only the embodiment illustrated in the drawings, because the drawings are merely utilized to illustrate one of a wide variety of uses of this invention.

Referring now to FIG. 1, a cooking apparatus is generally indicated by the reference numeral 10 and has a conventional oven chamber provided with a broil burner and a bake burner in the usual manner and therefore are not illustrated. The oven chamber is opened and closed by a conventional door means 11.

The cooking apparatus 10 includes a plurality of top burner means 15, 16, 17 and 19 with only the top burner means 15 and 16 being illustrated schematically in FIG. 2.

Individual pilot burner means are provided for the main burners of the cooking apparatus 10 and the top pilot burners are generally indicated by the reference numerals 19, 20, 21 and 22 for the respective top burners 15, 16, 17 and 18. The pilot burners 19 and 20 are illustrated schematically in FIG. 2 and are so constructed and arranged that the same are adapted to ignite fuel issuing from the respective main top burner means 15 and 16 as long as the respective pilot burners are burning.

However, should one or more of the pilot burners of the cooking apparatus 10 be extinguished for any reason, spark igniting means of this invention is provided for the apparatus 10 and is generally indicated by the reference numeral 25 in FIG. 2 and will now be described.

The spark igniting means 25 comprises a support or frame member 26 suitably mounted to the frame structure 27 of the cooking apparatus 10 so that a push rod or manual actuator 28 of the igniter means 25 will be exposed in any suitable location on the apparatus 10, the embodiment of the igniter means 25 illustrated in FIG. 1 having the push rod means 28 located on the control panel means 29 of the apparatus 10.

The support frame 26 has one or more piezoelectric crystal elements carried therein between the opposed ends 30 and 31 thereof with such crystal means being disposed in a recess or cutout 32 of the support frame 26. In the embodiment of the igniter means 25 illustrated in FIG. 2, two such piezoelectric crystal elements 33 and 34 are being utilized.

The crystal elements 33 and 34 are disposed in longitudinal stacked and aligned relation with the element 33 having electrical terminal means 35 and 36 at the op-

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posed ends thereof and the crystal element 34 having electrical terminal means 37 and 38 at the opposed ends thereof. An electrical insulator 39 is disposed between the terminal means 36 and 37 of the crystal elements 33 and 34 to effectively electrically insulate the elements 33 and 34 from each other while electrical insulating means 40 and 41 respectively electrically insulate the other ends of the crystal elements 33 and 34 from the support frame 26 whereby the crystal elements 33 and 34 are not only electrically insulated from each other, but are also electrically insulated from the support frame 26 and, thus, from the frame means 27 of cooking apparatus 10. If desired, ceramic pressure pads or elements 42 and 43 can be respectively disposed between the insulators 40 and 41 and the respective terminal means 35 and 38 as illustrated.

A rocker arm 44 is pivotally or rotatably carried by the support frame 26 and is adapted to rotate relative thereto about a transversely movable axis of rotation generally indicated by the reference numeral 45, the rocker arm 44 carrying a cam member 46 at the rotatably mounted end 47 thereof to be disposed between the insulator 40 and a flat surface 48 of the support frame 26 at the end 30 thereof to also rotate in unison with the rocker arm 44 about the movable axis 45. The cam member 46 has a flat surface 49 cooperating with the flat surface 48 of the support frame 26 and a true, partial circular surface 50 cooperating with an adjacent flat surface 51 of the insulator 40 whereby when the cam member 46 is disposed in the position illustrated in FIG. 2, the elements 40, 42, 33, 39, 34, 43 and 41 are disposed in stacked relation between the opposed ends 30 and 31 of the support frame 26 and will not alter the stresses in the crystal elements 33 and 34 to generate a potential difference at the respective terminal means 35, 36 and 37, 38 until the cam element 46 is rotated about the axis 45 to either axially squeeze the elements 33 and 34 between the opposed ends thereof or relieve such squeezing action.

In particular, when the push rod 28 of FIGS. 1 and 2 is manually or automatically pushed inwardly relative to the apparatus 10, the cam element 46 will rotate about its axis 45 in a clockwise direction so that the corner 52, formed by the juncture of the flat surface 49 thereof and the circular surface 50 thereof, will bear against the flat surface 48 of the support frame 26 and cause the axis 45 to move downwardly and to the left in FIG. 2 to increase the effective length of the cam member 46 between the surface 48 of the support frame 26 and the surface 51 of the insulator 40 to impose a substantially longitudinal compressive and squeezing action on the elements 33 and 34 between the ends 30 and 31 of the support frame 26 so that the stresses in the crystals 33 and 34 are sufficiently altered to cause the same to create a potential difference at the respective pairs of terminals 35, 36 and 37, 38 to be utilized in a manner hereinafter described. When such compression of squeezing action on the crystal means 33 and 34 are subsequently relieved by the operator manually or automatically releasing the inwardly imposed push force on the push rod 28, the cam member 46 will rock back to the position illustrated in FIG. 2 to effectively decrease the effective cam length of the cam member 46 between the surfaces 48 and 51 to thereby again alter the stresses in the crystal elements 33 and 34 as the same longitudinally expand from their previous squeezed condition to also generate a potential difference at the respective pairs of terminals 35, 36 and 37, 38.

During such rotation of the cam element 46, the stack of elements 40, 42, 33, 39, 34, 43 and 41 tends to rock as a unit to the left as the cam element 46 is rotated in a clockwise direction and tends to rock to the right when the cam element 46 is rotated in a counterclockwise direction back to the position illustrated in FIG. 2 whereby the insulator 41 can be provided with an arcuate surface 53 that bears against a flat surface 54 of the support frame 26 to permit such rocking of the stack of elements

between the opposed ends 30 and 31 of the support frame 26.

A first pair of electrodes 55 and 56 are mounted to the frame means 27 of the apparatus 10 adjacent the respective pilot burners 19 and 20 and in spaced relation from the pilot burners 19 and 20 so as to define spark gaps 57 and 58 adjacent the fuel outlet means 59 and 60 of the pilot burners 19 and 20. The electrodes 55 and 56 are electrically insulated from the frame means 27 of the apparatus 10 and are electrically interconnected to the terminals 35 and 36 by suitable leads 61 and 62.

Similarly, another pair of electrodes can be carried by the apparatus 10 and be disposed in spaced relation from the pilot burners 21 and 22 to define spark gaps adjacent the fuel outlet ends of the respective pilot burner means 21 and 22, such electrodes also being electrically insulated from the frame means 27 of the apparatus 10 and being respectively interconnected to the terminal means 37 and 38 by leads 69 and 70.

However, since each pilot burner 19, 20, 21 and 22 is identical in structure and operation, only the pilot burners 19 and 20 are schematically illustrated in FIG. 2 and only the detailed structure of the pilot burner 19 is illustrated in FIGS. 3-5 as it will be understood that the further description of any one or more pilot burners will also apply to the other pilot burners.

The pilot burner means 19 and 20 are electrically conductive and are, in effect, connected to a ground potential by being electrically interconnected to the frame means 27 of the apparatus 10 and such ground potential of the pilot burners is generally indicated by the reference numerals 71 and 72 in FIG. 2, the frame means 27 of the apparatus 10 being effectively grounded through interconnection thereof to the gas supply lines and the like and also by conventional grounding means.

In this manner, it can be seen that the pilot burner means 19 and 20 respectively provide ground electrodes cooperating with the electrodes 55 and 56 to define the spark gaps 57 and 58.

The operation of the igniting means 25 for the apparatus 10 will now be described.

When the housewife or the like notices that one of the burner means 15, 16, 17 or 18 does not ignite when she turns on one of the main selector knobs 73 on the control panel 29 of the apparatus 10, or when she actually notices that one of the pilot burner means 19, 20, 21 and 22 is not burning, she can merely push inwardly on the push rod 28 to effect rocking of the cam member 46 of the igniter means 25 whereby the stresses in each crystal element 33 and 34 will be altered in the manner previously described so that one potential will be created at the electrode 55 and an equal and opposite potential will be created at the electrode 56. When the differences in potential between the electrodes 55 and 56, and their respective grounded electrodes 19 and 20 reaches a particular magnitude, electrical arcing will be created across the spark gaps 57 and 58 in substantially a simultaneous manner whereby such electrical sparking will ignite the fuel issuing from any unlit pilot burner means 19-22 as the crystal means 34 is also creating sparking at the pilot burners 21 and 22.

Continued inward movement of the push rod 28 to effect a squeezing action on the elements 33 and 34 will produce the above-described sparking one or more times depending upon the length of inward movement of the push rod 28. Also, releasing of the rod 28 will also alter the stresses in the crystals 33 and 34 to effect sparking at the spark gaps 57 and 58 on the return of the push rod 28 to its full out position as illustrated in FIGS. 1 and 2.

While it is believed that merely one actuation of the push rod 28 will effectively light any unlit pilot burner means 19-22, a mere repetitive pushing action of the housewife or the like on the push rod 28 will more than assure that any unlit pilot burner means 19-22 will be

effectively lit by the sparking created by the crystal means 33 and 34.

Therefore, it can be seen that by arranging the crystal means 33 and 34 in the manner previously described, each crystal means 33 or 34 is adapted to effectively ignite two or more pilot burner means so that a relatively inexpensive ignition means can be provided for the apparatus 10.

The particular details of any one of the pilot burner means 19-22 will now be described and reference is now made to FIGS. 3-5 wherein the pilot burner means 19 of this invention is fully illustrated.

As illustrated in FIGS. 3 and 4, the pilot burner construction 19 includes a supporting bracket member 74 having an upwardly offset end 75 provided with opening means 76' and 77' therethrough for mounting the bracket means 74 to the frame structure 27 by suitable fastening means, such as fastening means 78' in FIG. 2.

The bracket member 74 has a downwardly extending and angularly disposed end 76 provided with clip portions 77 and 78 in the configuration illustrated to detachably secure a substantially rectangular, electrically insulating member 79 thereto, the insulator 79 carrying the previously described electrode means 55 which, in the embodiment illustrated in FIG. 3, comprises a spherical ball 80 at the upper end 81 of the insulating member 79 and being electrically interconnected to the lead 61 by suitable terminal means 82 detachably disposed in a passage means 83 passing through the insulating member 79.

The bracket 74 is provided with a downwardly extending tubular part 84 which is externally threaded at 85 to be threadedly interconnected to internal threads 86 of an internally threaded coupling member 87. The coupling member 87 is adapted to stack an outwardly flared end 88 of a pilot fuel source conduit 89 against one frusto-conical end 90 of a coupler 91 while stacking an orifice cup 92 against the other frusto-conical end 93 of the coupler 91 in the manner illustrated in FIG. 3 so that the passage means 94 in the pilot fuel source conduit 89 is fluidly interconnected to the outlet orifice 95 of the orifice cup 92 by a passage means 96 passing through the coupler 91.

The integral tubular part 84 of the bracket means 75 terminates at its upper end to define an opening means 97 passing through the intermediate body part 98 of the bracket 74 whereby the pilot fuel issues directly vertically upwardly out through the orifice 95 of the orifice cup 92.

A flame shield 99 is carried by the bracket 74 and has a flat body portion 100 angularly disposed relative to the bracket 74 so as to be disposed in the path of the fuel issuing vertically upwardly out of the orifice 95 of the orifice cup 92 to direct the same upwardly and to the left toward the free end 101 of the shield 99 which is disposed adjacent the electrode ball 80 for a purpose hereinafter described. The flame shield 99 includes a pair of downwardly extending side tabs 102 and 103 throughout the length of the body portion or wall 100 thereof to confine the issuing fuel between the tangs 102 and 103 so that the fuel will flow upwardly and to the right against the inside surface of the wall 100 to issue from the free end 101 thereof.

As illustrated in FIGS. 4 and 5, the free end 101 of the flame shield 99 is provided with a plurality of downwardly bent teeth-like tangs 104, 105 and 106 with the intermediate tang 105 being more outwardly disposed than the outboard tangs 104 and 106 so that the free end 107 of the tang 105 is the point of the flame shield 99 that is closest to the electrode 80.

In this manner, the sparking that is created at the pilot burner means 19 in the manner previously described by actuation of the igniter 25 occurs between the ball 80 and the tang 105 of the flame shield 99 so that the fuel, being deflected upwardly and to the left by the flame shield 99 to the spark gap 57, will be fully ignited by the

electrical sparking between the tang means 105 and electrode 55.

It has been found that in order to provide proper ignition of issuing pilot burner fuel by electrical sparking, such as sparking that can be created by the igniter means 25 previously described, not only must a proper gas and air mixture be provided at the spark gap 57, but also the velocity of the issuing mixture at the spark gap must be taken into consideration.

Therefore, it is believed that by providing the teeth-like tangs 104-106, angularly disposing the flame shield 99 in the path of the fuel issuing from the orifice means 95, while correlating the same with a proper height from the orifice 95, proper air entrainment will be provided for the issuing fuel and the velocity of the mixture at the spark gap 57 will be reduced sufficiently, in combination with the type of spark provided between the spherical surface 55 and the rectangular end means 107 of the tang 105, for full ignition of the pilot fuel.

Another pilot burner construction of this invention is generally indicated by the reference numeral 19A in FIGS. 6-9 and parts thereof substantially identical to the pilot burner construction 19 previously described are indicated by like reference numerals followed by the reference letter A.

The pilot burner construction 19A has the mounting end means 75A thereof substantially coplanar with the intermediate body portion 98A thereof, whereas the other end means 76A thereof is bent angularly upwardly and has an opening means 108 passing therethrough and receiving a tubular member 109 which, in turn, receives the tubular, electrically insulating member 79A. The tubular member 109 carries a transversely disposed threaded set screw 110 which has its inner end 111 acting on a ball 112 that can be compressed into the insulating tubular member 79A and fix the same in the desired telescopic relation relative to the bracket 74A.

In addition, the electrode 55A of the pilot burner construction 19A comprises substantially a ball end 80A cooperating with the flame shield 99A in the manner previously described except that the ball end 80A has a tubular part 113 telescopically receiving a rod like member 114 that can be telescopically received in a tubular terminal member 115 of the lead means 61A as illustrated.

The intermediate part 98A of the bracket 74A has an opening 116 passing therethrough and receives a tubular member 117 having a closed end wall 118 that projects upwardly beyond the upper surface of the bracket 74A and is provided with an enlarged opening 119 therethrough that is disposed in alignment with the orifice 95A of the orifice cup 92A coupled to the pilot fuel source conduit 89A in the manner previously described by the coupling members 87A and 91A.

Therefore, it can be seen that the pilot burner construction 19A functions in substantially the same manner as the pilot burner construction 19 previously described whereby the flame shield 99A is disposed in the path of the fuel issuing substantially vertically upwardly out of the orifice 95A of the orifice cup 92A to impinge against the inside surface of the flat angularly disposed wall 100A thereof so as to be directed upwardly and to the left to impinge against the teeth-like tangs 104A-106A and be ignited by the electrical sparking at the spark gap 57A defined between the ball electrode end 80A and the free end 107A of the intermediate tang 105A.

Therefore, it can be seen that not only does this invention provide an improved pilot burner construction that can be ignited by electrical sparking means, but also this invention provides an improved ignition means for a cooking apparatus or the like.

While the form of the invention now preferred has been disclosed as required by the statutes, other forms may be used, all coming within the scope of the claims which follow.

What is claimed is:

1. A pilot burner construction comprising only one passage defining means for issuing pilot fuel at one end means thereof, a first electrode disposed adjacent said one end means in the path of said issuing fuel, and a second electrode disposed adjacent and spaced from said first electrode for cooperating therewith to create ignition spark means across the space therebetween for igniting said issuing fuel, said first electrode comprising a flame shield disposed adjacent and spaced from said one end means of said passage defining means substantially completely across the entire flow path of said issuing fuel to deflect substantially the entire amount of said issuing fuel toward said second electrode and through said space between said first and second electrodes.

2. A pilot burner construction as set forth in claim 1 wherein said flame shield has a free end provided with angularly disposed tang means.

3. A pilot burner construction as set forth in claim 2 wherein said second electrode is closer to said tang means than to any other part of said first electrode.

4. A pilot burner construction as set forth in claim 2 wherein said second electrode comprises a ball and is closer to said tang means than to any other part of said first electrode whereby sparking takes place between said ball and said tang means.

5. A pilot burner construction comprising passage defining means for issuing pilot fuel at one end means thereof, a first electrode disposed adjacent said one end means in the path of said issuing fuel, and a second electrode adjacent said first electrode for cooperating therewith to create ignition spark means therebetween for igniting said issuing fuel, said first electrode comprising a flame shield for said issuing fuel, said flame shield having a free end provided with angularly disposed tang means, said tang means comprising a plurality of spaced teeth-like members angularly bent out of the plane of said shield at said free end thereof.

6. A pilot burner construction as set forth in claim 5 wherein at least one medial tooth-like member is disposed closer to said second electrode than the outboard teeth-like members.

7. A pilot burner construction as set forth in claim 1 wherein said passage defining means directs said pilot fuel substantially vertically upwardly and said flame shield is disposed at an angle to the vertical directly over said one end means of said passage defining means.

8. A pilot burner construction as set forth in claim 7 wherein said second electrode is disposed in offset relation relative to said one end means of said passage defining means and is disposed in close spaced relation with the outer free end of said flame shield.

9. In combination, a bracket means, only a single passage defining means carried by said bracket means and having an end means for issuing pilot burner fuel, a first electrode carried by said bracket means and being disposed adjacent said end means in the path of said issuing fuel, and a second electrode carried by said bracket means and being disposed adjacent and spaced from said first electrode for cooperating therewith to create ignition spark means across the space therebetween for igniting said issuing fuel, said first electrode comprising a flame shield disposed adjacent and spaced from said one end means of said passage defining means substantially completely across the entire flow path of said issuing fuel to deflect substantially the entire amount of said issuing fuel toward said second electrode and through said space between said first and second electrodes.

10. A combination as set forth in claim 9 wherein said passage defining means is detachably secured to said bracket means at an opening in said bracket means.

11. A combination as set forth in claim 10 wherein said bracket means has an externally threaded part defining at least part of said opening thereof and wherein said passage defining means has an internally threaded part threaded to said threaded part of said bracket means to detachably secure the same together.

12. A combination as set forth in claim 11 wherein said threaded part of said bracket means is integral therewith.

13. A combination as set forth in claim 11 wherein said threaded part of said bracket means has an end wall provided with an opening passing therethrough for issuing the fuel from said passage defining means whereby said end wall defines said end means of said passage defining means.

14. A combination as set forth in claim 9 wherein said second electrode is detachably secured to said bracket means at an end means of said bracket means.

15. A combination as set forth in claim 14 wherein said end means of said bracket means is angularly disposed relative to the main body portion of said bracket means to angularly dispose said second electrode relative to said end means of said passage defining means.

16. A combination as set forth in claim 14 wherein said bracket means is electrically conductive and said second electrode has an electrical insulator insulating the same from said bracket means.

17. A combination as set forth in claim 9 wherein said flame shield has a flat body portion disposed at an angle over the path of said issuing pilot burner fuel to deflect the same toward a free end of said shield.

18. In combination, a main burner, a pilot burner having only a single outlet for issuing pilot fuel that when ignited will be adapted to ignite fuel issuing from said main burner, said pilot burner having a first electrode and a second electrode spaced from each other to define a spark gap adjacent said outlet, said first electrode being disposed in the path of said issuing pilot fuel to deflect the same toward said second electrode, and means for creating electrical sparking at said spark gap between said electrodes to ignite said issuing pilot fuel, said first electrode comprising a flame shield disposed adjacent and spaced from said outlet of said pilot burner substantially completely across the entire flow path of said issuing fuel to deflect substantially the entire amount of said issuing fuel toward said second electrode and through said spark gap between said first and second electrodes.

19. A combination as set forth in claim 18 wherein said means for creating said sparking comprises piezoelectric crystal means operatively interconnected to said electrodes.

20. A combination as set forth in claim 18 wherein said flame shield has a free end adjacent said second electrode and has tang means directed toward the same.

21. A combination as set forth in claim 20 wherein said second electrode comprises a ball-like member that is disposed close to said tang means.

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