June 4, 1968 C. D. BRANSON 3,386,431

BURNER CONSTRUCTION AND METHOD AND APPARATUS FOR MAKING THE SAME AND THE LIKE

Filed Aug. 9, 1966 4 Sheets-Sheet 1

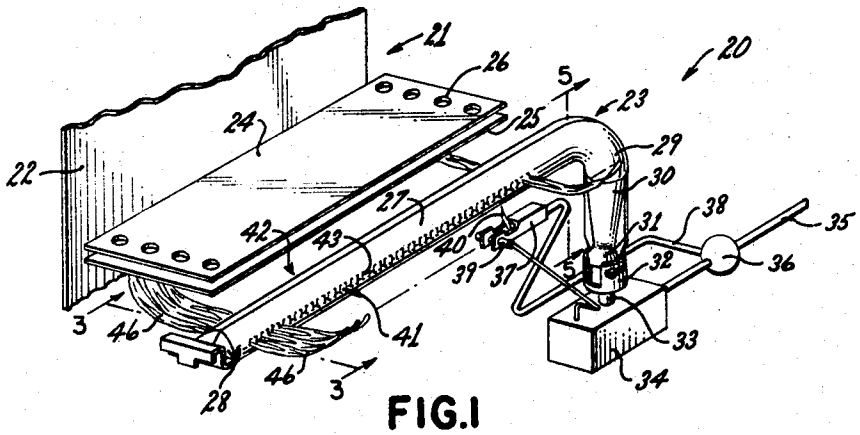


FIG.1

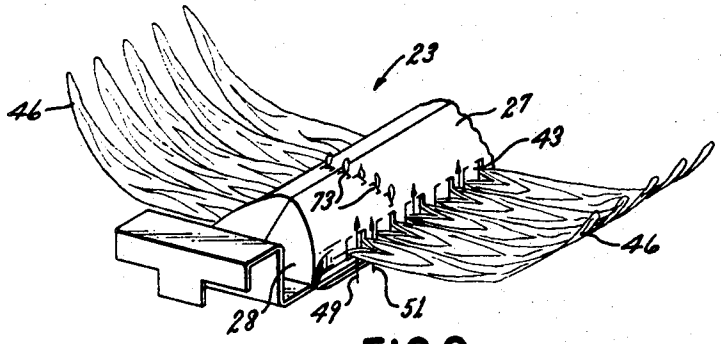


FIG.2

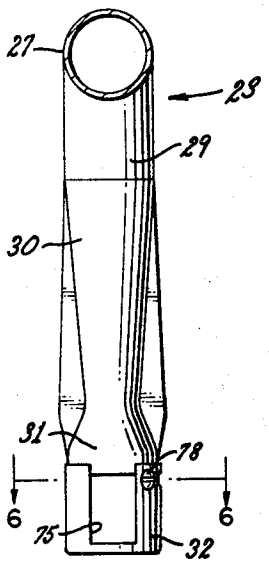


FIG.5

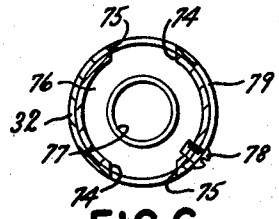


FIG.6

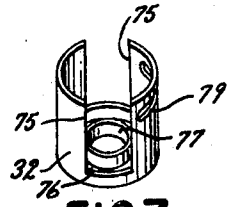


FIG.7

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BURNER CONSTRUCTION AND METHOD AND APPARATUS FOR MAKING THE SAME AND THE LIKE

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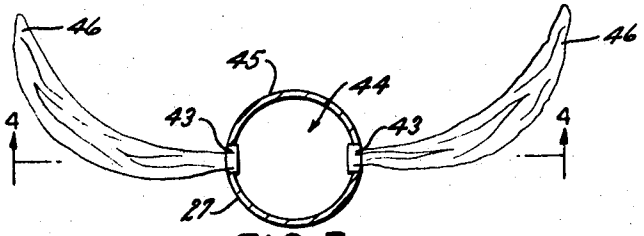


FIG. 3

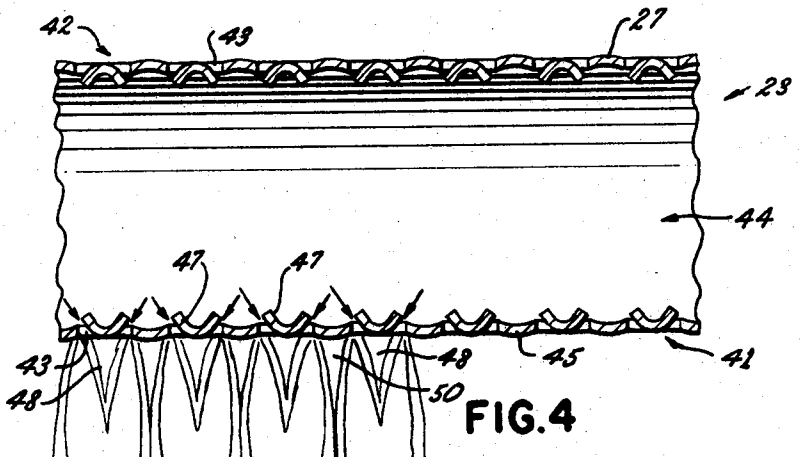
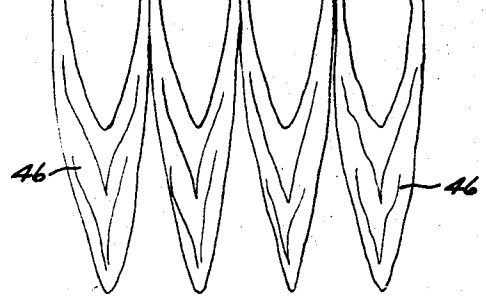


FIG. 4



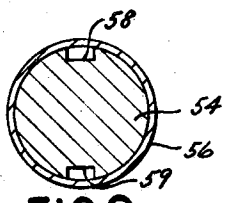


FIG. 9

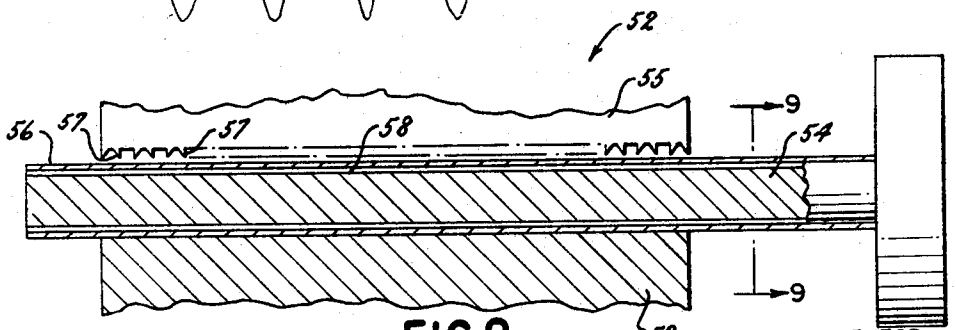


FIG. 8

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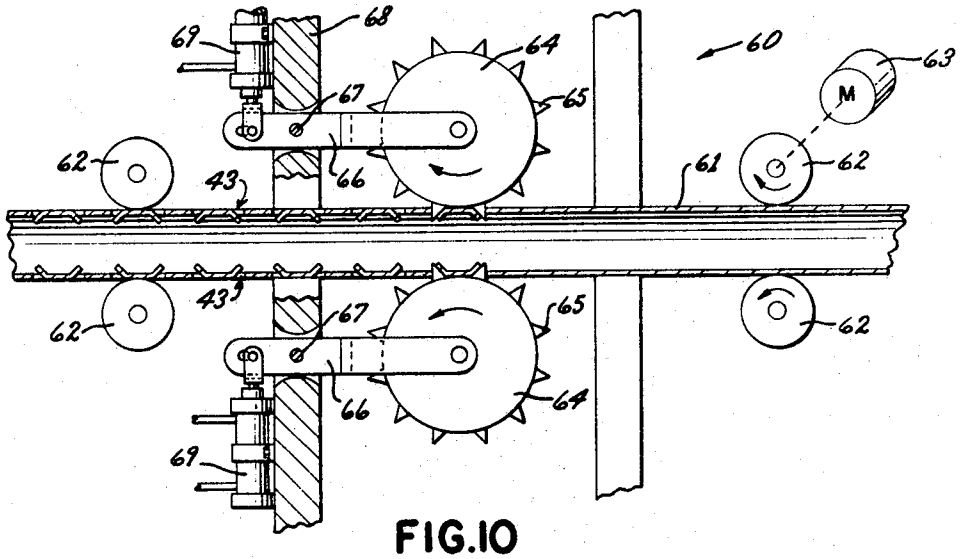


FIG.10

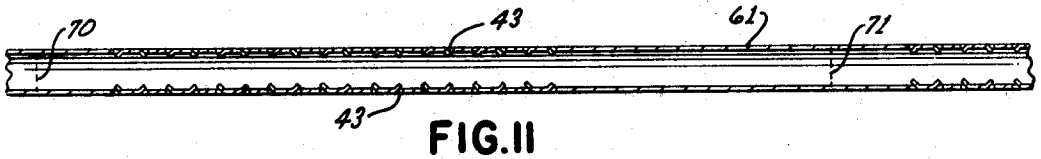


FIG.11

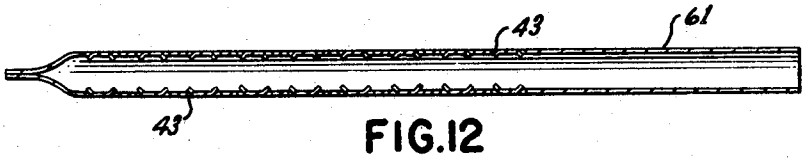


FIG.12

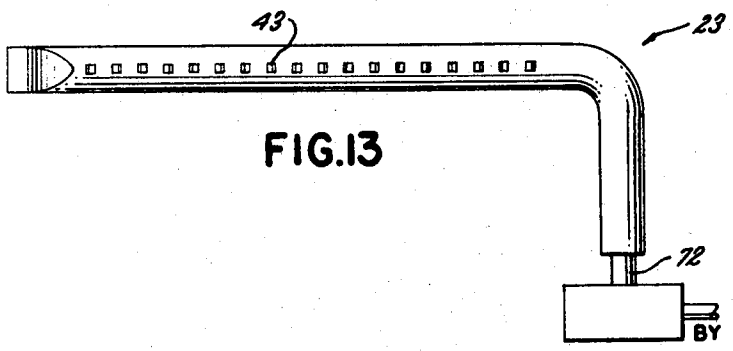


FIG.13

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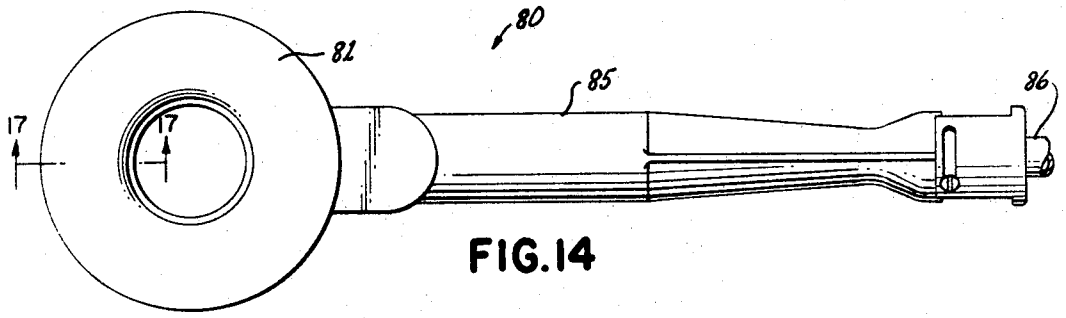


FIG.14

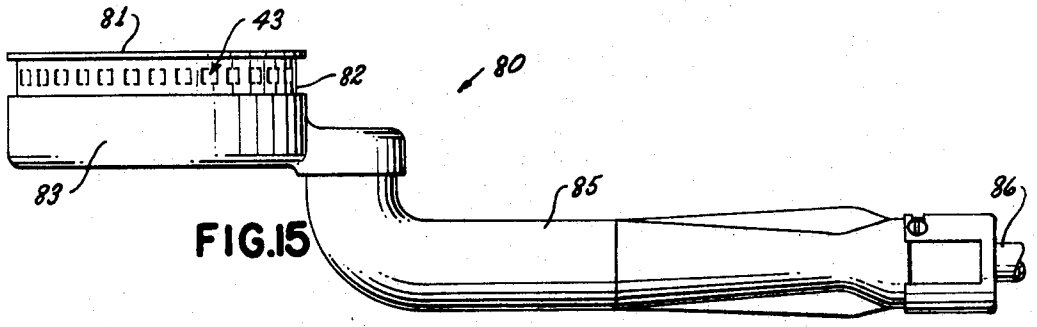


FIG.15

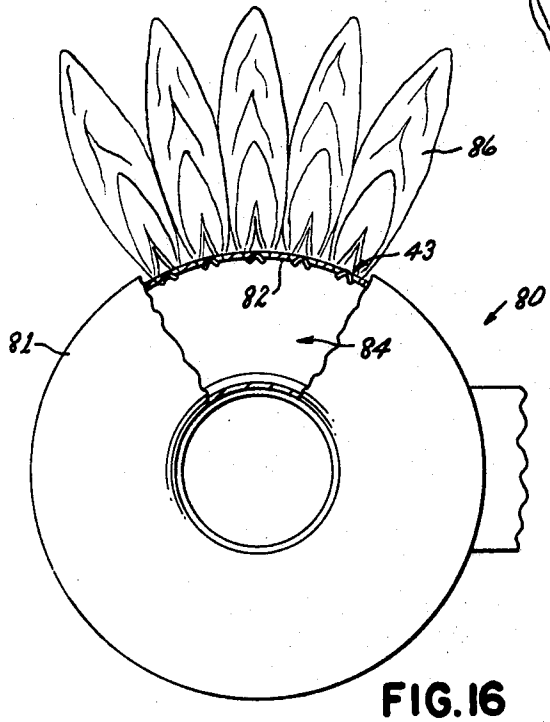


FIG.16

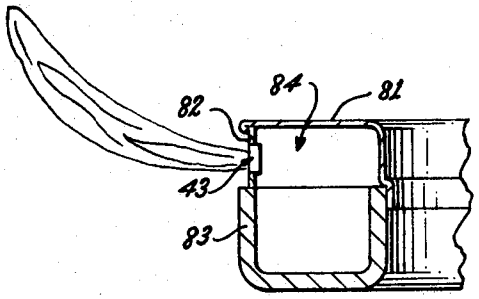


FIG.17

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United States Patent Office 3,386,431 Patented June 4, 1968

3,386,431

BURNER CONSTRUCTION AND METHOD AND APPARATUS FOR MAKING THE SAME AND THE LIKE

Charles David Branson, Greensburg, Pa., assignor to Robertshaw Controls Company, Richmond, Va., a corporation of Delaware

Filed Aug. 9, 1966, Ser. No. 571,316
14 Claims. (Cl. 126—39)

ABSTRACT OF THE DISCLOSURE

This disclosure relates to a burner construction wherein the burner has an interior chamber defined by wall means so that such chamber can receive a flow of fuel and pass out of port means formed in the wall means to be burned for a heating purpose or the like, at least one pair of the port means each having a tab means provided with a free end projecting into the chamber from the interior surface of the wall means and being provided with another end attached to the wall means on the side of its respective port that is disposed adjacent to a like side of the other port that forms the respective pair of ports so that the fuel is adapted to flow from the chamber in two streams respectively out of the pair of ports and impinge against each other to form a substantially common stream that is angularly disposed relative to the wall means.

This invention relates to an improved burner construction for fuel burning apparatus, such as domestic cooking ovens and the like, as well as to improved methods and apparatus for making such burner construction or the like.

In the past, fuel burning apparatus normally included a cast iron main burner construction which is not only relatively expensive to manufacture, but also which is relatively heavy and cumbersome for the intended use thereof.

Further, such prior known cast iron burner construction cannot be utilized for maintaining a temperature in a domestic oven or the like below 275° F. because the porting arrangement thereof required a certain fuel flow therethrough to maintain a minimum flame at the burner construction, such minimum flame fuel flow characteristic not permitting the oven to maintain a temperature below 275° F.

However, according to the teachings of this invention, an improved burner construction is provided which is not only relatively simple and inexpensive to manufacture, but also which will permit a minimum flame characteristic to permit the oven to be maintained at a relatively low warming and non-cooking temperature without subjecting the burner construction to adverse flashback conditions or adverse flame sweep off conditions as in prior known burner constructions.

In particular, the burner construction of this invention is so constructed and arranged that the port means thereof respectively increase the cross-sectional thickness of the burner construction in a manner to hold even a small flame thereto as well as to provide excellent secondary air entrainment in a manner hereinafter described.

Accordingly, it is an object of this invention to provide an improved 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 an improved method of making such a burner construction or the like.

A further object of this invention is to provide an improved apparatus for making such a burner construction or the like.

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:

FIGURE 1 is a fragmentary, top perspective schematic view illustrating an improved apparatus of this invention.

FIGURE 2 is an enlarged, fragmentary, top perspective view at one end of the burner construction of FIGURE 1.

FIGURE 3 is an enlarged cross-sectional view taken on line 3—3 of FIGURE 1.

FIGURE 4 is an enlarged, fragmentary cross-sectional view taken on line 4—4 of FIGURE 3.

FIGURE 5 is an enlarged cross-sectional view of the venturi portion of the burner construction of FIGURE 1, FIGURE 5 being taken substantially on the line 5—5 of FIGURE 1.

FIGURE 6 is a cross-sectional view taken on line 6—6 of FIGURE 5.

FIGURE 7 is a top perspective view of the primary air adjustment member of FIGURE 5.

FIGURE 8 is a fragmentary cross-sectional view of one apparatus of this invention for forming the burner construction of FIGURE 1.

FIGURE 9 is a cross-sectional view taken on line 9—9 of FIGURE 8.

FIGURE 10 is a schematic cross-sectional view illustrating another apparatus of this invention for forming the burner construction of FIGURE 1.

FIGURE 11 is a fragmentary cross-sectional view illustrating one method of forming the burner construction of this invention.

FIGURE 12 is a view similar to FIGURE 11 and illustrates another step in the method of this invention.

FIGURE 13 is a side view illustrating the completed burner construction formed by the apparatus of FIGURE 10.

FIGURE 14 is a top view of another burner construction of this invention, the burner construction of FIGURE 14 being utilized as a top burner construction for a domestic range or the like.

FIGURE 15 is a side view of the burner construction of FIGURE 14.

FIGURE 16 is a top fragmentary partially broken away view of the burner construction of FIGURE 14.

FIGURE 17 is an enlarged, fragmentary, cross-sectional view taken on line 17—17 of FIGURE 14.

While the various features of this invention are hereinafter described and illustrated as providing a burner construction for a cooking apparatus or the like, it is to be understood that the various features of this invention can be utilized singly or in any combination thereof with other types of fuel burning apparatus as desired.

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

Referring now to FIGURE 1, an improved cooking apparatus of this invention is generally indicated by the reference numeral **20** and includes a cooking oven chamber means **21** defined by conventional wall means **22** of the cooking apparatus **20**. The cooking chamber **21** is separated from the improved burner construction **23** of this invention by conventional baffle plates **24** and **25** extending between the wall means **22** but being spaced therefrom and having apertures **26** passing therethrough in a conventional manner so that the heated air produced by the burner construction **23** of this invention can readily circulate into the cooking chamber **21** in the conventional manner.

Generally, the burner construction 23 of this invention includes a burner tube 27 having a closed end 28 for being supported to suitable burner supporting structure on the wall means 22 of the apparatus 20 and another end 29 adapted to be disposed in assembled and telescoping relation with a venturi air fuel mixing member 30 in a manner hereinafter described.

The venturi tube member 30 has a lower end 31 telescopically carrying a primary air adjustment member 32 in a manner hereinafter described, the lower end 31 of the venturi tube member 30 being in fluid communication with an outlet orifice means 33 of a conventional fuel control valve means 34 adapted to have its inlet interconnected to a source 35 of gaseous fuel or the like. The source 35 is adapted to be interconnected to the valve means 34 by conventional selector means 36 manually operated by the housewife or the like, the selector valve means 36 also being adapted to interconnect the source of fuel 35 to a pilot burner means 37 through a conduit means 38. The valve means 34 is so constructed and arranged that the valve means 34 will only interconnect the source of fuel 35 to the venturi tube 30 when a flame sensing bulb 39 senses a flame 40 at the pilot burner 37 so that fuel subsequently issuing from the burner construction 23 will be ignited by the pilot flame 40 in a manner well known in the art.

The particular details of the burner construction 23 will now be described with particular reference being made to FIGURES 2–7.

As illustrated in the drawings, the tubular member 27 of the burner construction 23 has the majority of the length thereof provided with a cylindrical portion having a uniform circular cross section as illustrated in FIGURE 3 and being provided with two longitudinally disposed and oppositely arranged rows 41 and 42 of port means 43 to permit fuel to issue from the internal chamber 44 of the wall means 45 of the burner construction 23 to the exterior thereof and produce the flames 46 in a manner hereinafter set forth.

As illustrated in FIGURE 4, each port meains 43 of each row of ports 41 and 42 in the burner construction 23 of this invention cooperates with an adjacent port means 43 in such a manner that the flow of fuel through the burner construction 23 flows out of the two ports 43 of each pair thereof in two streams in the manner illustrated by arrows in FIGURE 4 to impinge against each other outboard of the wall 45 of the tubular member 27 and form a common stream substantially perpendicular to the cylindrical wall 45 of the burner construction 23 to produce the flame pattern 46 illustrated schematically in FIGURE 4.

Each port means 43 interrupts the cylindrical wall means 45 of the burner construction 23 and includes a carved and inwardly bent tab means 47 angularly disposed relative to the longitudinal axis of the burner construction 23 in such a manner that the tab means 47 not only causes the angular flow of fuel through the respective port means 33 in the manner illustrated by the arrows in FIGURE 4, but also the tab means 47 effectively increases the cross-sectional thickness of the wall means 45 of the burner construction 23 at the port means 43 in such a manner that a relatively small flame can be produced at the port means 43 and be effectively held therein so that an upward draft or flow of air will not wipe such flame from the respective port means 43 and will not cause the small flame at the port means 43 to create an adverse flash-back condition in the burner construction 23. Conversely, the tab means 47 are so constructed and arranged that substantially no blow-off of the flames 46 can be created.

Because each port 43 of each pair thereof causes angular flow of fuel in the manner previously described, it can be seen that a substantially free triangular area 48 is defined between the ports 43 of each pair thereof to draw secondary air upwardly therebetween in the manner illustrated by the arrow 49 in FIGURE 2 for good secondary air entrainment with the fuel flowing from the port means 43. In addition, a substantially free triangular area 50 is created between adjacent pair of ports 43 in the manner illustrated in FIGURE 4 to also cause upward secondary air flow for entrainment in the manner illustrated by the arrow 51 in FIGURE 2 so that by the time the flames 46 substantially merge together in the manner illustrated in FIGURE 4 an improved secondary air entrainment has been provided for effective fuel burning characteristics.

The tab means 47 each has a substantially rectangular configuration and is cut on three sides thereof, the tab means 47 when bent inwardly out of the plane of the wall 45 defining the port means 43.

While the port means 43 in the burner construction 23 of this invention can be formed in any suitable manner, one method and apparatus of this invention for forming the burner construction 23 is illustrated schematically in FIGURES 8 and 9 and will now be described.

As illustrated in FIGURES 8 and 9, the apparatus and method of this invention is generally indicated by the reference numeral 52 and comprises a supporting member 53, a mandrel or arbor means 54, and a die punch means 55 so constructed and arranged that a cylindrical tubular member 56 can be disposed on the arbor 54 in the manner illustrated in FIGURE 8 with the arbor 54 and tubular member 56 being supported on the die part 53 so that the punch member 55 can form the port means 43 in a longitudinal row along substantially the entire length of the tubular member 56.

In particular, the die member 55 has a plurality of aligned teeth-like projections 57 throughout the length thereof which are adapted to cut through the cylindrical member 56 and be received in a longitudinal groove 58 formed in the outer periphery of the arbor 54 so that the tab means 47 can be carved from the tube wall and be formed in the desired angular configuration for the burner construction 23. After the punch 55 has formed one longitudinal row of port means 43 through the tubular member 56, the arbor 54 is indexed 180° to position the tubular member 56 and another longitudinal groove 59 of the arbor 54 adjacent the punch 55 so that the opposed row of port means can be formed in the manner previously described.

After the opposed rows of port means 43 have been punched into the cylindrical member 56 in the manner previously described, the tubular member 56 can have one of its open ends closed to form the supporting end 28 of the burner construction 23 while the other open end thereof is suitably bent to be compatible with the venturi tube means 30 previously described.

Another method and apparatus of this invention is generally indicated by the reference numeral 60 in FIGURE 10 and comprises a method and apparatus wherein the tubular members for forming the burner constructions 23 of this invention can be substantially continuously formed.

In particular, an elongated length 61 of tubular stock can be continuously fed from right to left into the apparatus 60 between guide rollers 62, the right-hand guide rollers 62 being driven by a motor 63 to continuously feed the tubular stock 61 to the left. A pair of cooperating die rollers 64 are provided and have a plurality of punch means 65 throughout the outer periphery thereof which cooperates with the tubular length 61 in such a manner that the projections 65 punch the port means 43 through the tubular length 61 in opposed longitudinal rows as the length 61 is forced therebetween.

However, the die rollers 64 are rotatably carried by arms 66 pivotally mounted at 67 to the stationary frame means 68 so that suitable pneumatic or hydraulic actuators 69 can pivot the arms 66 away from the tubular stock 61 for a purpose now to be described.

As the stock 61 is fed through the apparatus 60 of this invention, the actuators 69 are so controlled that the same

cause the die wheels 64 to cut opposed rows of ports 43 into the tubular length 61 for a substantial distance therethrough and are then pivoted away from the tubular length 61 so that a portion of the length 61 will pass through the apparatus 60 without having port means 43 provided therein.

Thus, it can be seen in FIGURE 11 that the tubular length 61 can be serially cut at 70 and 71 to produce a tubular length having the left-hand end sealed closed in the manner illustrated in FIGURE 12 and have the right-hand end thereof suitably bent to be interconnected to a venturi means 72 in the manner illustrated in FIGURE 13 to provide a burner construction 23 of this invention.

Accordingly, the method and apparatus 60 of this invention can continuously form tubular members for forming burner constructions 23 of this invention by intermittently forming the port means 43 through the wall means of the tubular length 61 in the manner previously described.

However, it is to be understood that regardless of the method and apparatus for forming the burner tubes 27 of this invention, the tubular members 27 each has the port means 43 provided therein in cooperation with bent-inward tab means 47 to produce the novel burning effects previously described.

In order to insure flame propagation between the opposed rows 41 and 42 of the burner construction 23 of this invention, the top half or bottom half of the tubular member 27 can be provided with additional port means 73 in the manner illustrated in FIGURE 2 to effectively interconnect the rows 41 and 42 together.

In particular, it can be seen in FIGURE 1 that when fuel is permitted to flow to the tubular member 27 of the burner construction 23, the pilot flame 40 will ignite the fuel issuing from the row 41 of port means 43 and the ignited row 41 of port means 43 will then ignite the fuel issuing from the port means 43 of the row 42 by the flame propagation across the top of tube 27 caused by the port means 73 effectively interconnecting the rows 41 and 42 together.

One such burner tube 27 that has proved satisfactory comprised steel tubing having an O.D. of approximately 1.000 inch and a wall thickness of approximately 0.035 of an inch. The port means 43 therein each have a height of approximately 0.100 of an inch and a width of approximately 0.100 of an inch while being spaced at its far edge to the far edge of its cooperating port means 43 approximately 0.200 of an inch and having its tab means 47 bent at an angle of approximately 35° relative to the radius of the tube 27. A distance between the adjacent center lines of adjacent pairs of port means 43 in approximately 0.340 of an inch.

While the venturi tube means 30 on the burner construction 23 of this invention can be formed in any suitable manner to permit primary air entrainment in the flow of fuel issuing through the burner tube 27, the venturi tube 30 illustrated in FIGURES 5–7, has its lower end 31 interrupted by a pair of opposed vertically disposed slots 74 adapted to mate with a pair of vertically disposed slots 75 formed in the adjustment member 32 telescopically receiving the lower end 31 of the venturi tube 30. The adjustment member 32 has a bottom wall 76 provided with an aperture means 77 passing centrally therethrough and is adapted to be telescoped over the outlet means 33 of the valve means 34 in a conventional manner.

The adjusting member 32 is adapted to be rotated relative to the venturi tube 30 and is interconnected thereto by a threaded fastening member 78 passing through an elongated slot 79 formed in the adjusting member 32 to limit the degree of rotational movement between the adjustment member 32 and the venturi tube 30.

In this manner, the amount of primary air being drawn into the venturi tube 30 to mix with the fuel flowing therethrough can be controlled by the adjusting member 32 in regard to its relation of opening and closing the slot means 74 in the lower end 31 of the venturi tube 30.

While the burner construction of this invention has been previously described as being utilized in a domestic oven of a cooking apparatus or the like, it is to be understood that the various features of this invention can be utilized for other types of burner constructions.

For example, reference is now made to FIGURES 14–17 wherein the novel features of this invention are utilized to form a top burner construction for a cooking range or the like.

In particular, it can be seen in FIGURES 14–17 that a top burner construction 80 is provided and includes a substantially circular top plate 81 having a depending cylindrical side wall means 82 interconnected thereto and provided with port means 43 of this invention formed in the manner previously described throughout the entire length of the side wall means 82.

The top plate means 81 and side wall means 82 are effectively interconnected to a chamber-defining member 83 to define an annular cavity 84 adapted to be disposed in fluid communication with a venturi tube means 85 to be interconnected to a source of fuel 86 in any suitable manner.

In this manner, fuel flowing to the annular chamber 84 of the top burner construction 80 will issue from the port means 43 in the manner illustrated in FIGURE 16 to produce an annular flame pattern 86, each flame 86 being produced by fuel issuing from the two cooperating ports 43 in the manner previously described for the burner construction 23 so that secondary air entrainment can be provided between adjacent pairs of ports 43 as well as between the port means 43 of each pair thereof.

Accordingly, it can be seen that the unique port means 43 of this invention can be utilized in oven burners, range top burners, and other types of burners to not only effectively increase the cross-sectional thickness thereof to positively hold a flame at the respective port means 43, but also to permit excellent secondary air entrainment for optimum fuel burning characteristics.

Accordingly, it can be seen that this invention not only provides an improved burner construction, but also this invention provides improved methods and apparatus for making the same 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 burner construction having wall means defining chamber means for receiving fuel from a source thereof, said wall means having at least one pair of spaced ports passing therethrough and interconnecting said chamber means with the exterior surface of said wall means, each port including a tab means having a free end projecting into said chamber means beyond the interior surface of said wall means and having another end attached to said wall means on the side of its respective port that is adjacent to the tab means attached side of the other port that forms said pair of ports, said tab means and said ports being so constructed and arranged that fuel is adapted to flow from said chamber means in two streams respectively out of said ports and impinge against each other to form a substantially common stream that is angularly disposed relative to said wall means.

2. A burner construction as set forth in claim 1 wherein said tab means and said ports are so constructed and arranged that said two streams impinge against each other at a point spaced outwardly from said exterior surface of said wall means whereby secondary air will be drawn into the space between said two streams.

3. A burner construction as set forth in claim 1 wherein each tab means is integral with said wall means.

4. A burner construction as set forth in claim 3 wherein

each tab means is bent inwardly out of the plane of said wall means.

5. A burner construction as set forth in claim 4 wherein each tab means is defined by three interconnecting cuts through said wall means.

6. A burner construction as set forth in claim 5 wherein each tab means has a substantially rectangular configuration.

7. A burner construction as set forth in claim 1 wherein said wall means defines a tubular structure having a longitudinal axis.

8. A burner construction as set forth in claim 7 wherein a plurality of said pairs of ports are provided in aligned relation throughout substantially the entire length of said tubular structure in two rows on opposite sides of and parallel to said longitudinal axis.

9. A burner construction as set forth in claim 8 wherein other ports are provided through said wall means between said rows of ports to provide flame propagation means between said rows of ports.

10. A burner construction as set forth in claim 1 wherein said wall means defines an annular part of a top burner or the like, and wherein a plurality of said pairs of ports are provided in aligned continuous relation throughout the length of said annular part.

11. In an apparatus having a cooking chamber and a source of fuel, the improvement comprising a burner construction for heating said cooking chamber and having wall means defining an interior chamber operatively interconnected to said source of fuel, said wall means having at least one pair of spaced ports passing therethrough and interconnecting said interior chamber with the exterior surface of said wall means, each port including a tab means having a free end projecting into said interior chamber means beyond the interior surface of said wall means and having another end attached to said wall means on the side of its respective port that is adjacent to the tab means attached side of the other port that forms said pair of ports, said tab means and said port means being so constructed and arranged that said fuel flows from said interior chamber means in two streams respectively out of said ports and impinge against each other to form a substantially common stream that is angularly disposed relative to said wall means, said fuel streams burning with a flame pattern having its base extending between said ports and defining a substantially triangular air space between said ports to entrain secondary air into said streams.

12. In an apparatus as set forth in claim 11, said cooking chamber being separated from said burner construction by a baffle plate whereby said cooking chamber is utilized for baking purposes and the like.

13. In an apparatus as set forth in claim 11, said burner construction being disposed in the top of said cooking chamber whereby said cooking chamber is utilized for broiling purposes and the like.

14. In an apparatus having a surface means for range top cooking and the like and a source of fuel, the improvement comprising a burner construction for heating a cooking utensil and the like disposed on said surface means and having wall means defining an interior chamber operatively interconnected to said source of fuel, said wall means having at least one pair of spaced ports passing therethrough and interconnecting said interior chamber with the exterior surface of said wall means, each port including a tab means having a free end projecting into said interior chamber means beyond the interior surface of said wall means and having another end attached to said wall means on the side of its respective port that is adjacent to the tab means attached side of the other port that forms said pair of ports, said tab means and said port means being so constructed and arranged that said fuel flows from said interior chamber means in two streams respectively out of said ports and impinge against each other to form a substantially common stream that is angularly disposed relative to said wall means, said fuel streams burning with a flame pattern having its base extending between said ports and defining a substantially triangular air space between said ports to entrain secondary air into said streams.

References Cited

UNITED STATES PATENTS

2,160,764	5/1939	Taylor	126—273
2,728,384	12/1955	Anderson	158—116 X

FREDERICK L. MATTESON, JR., *Primary Examiner.*

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