Dec. 20, 1960 J. T. ALGER 2,965,166

FLAME DEFLECTORS

Filed Nov. 26, 1958

FIG. 1

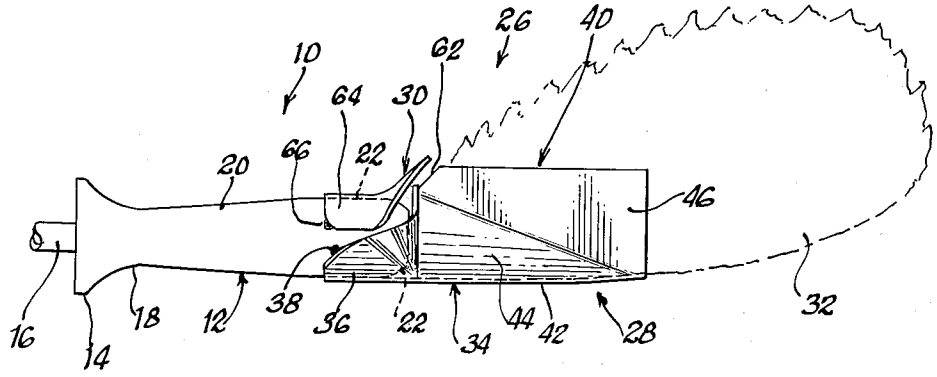


FIG. 2

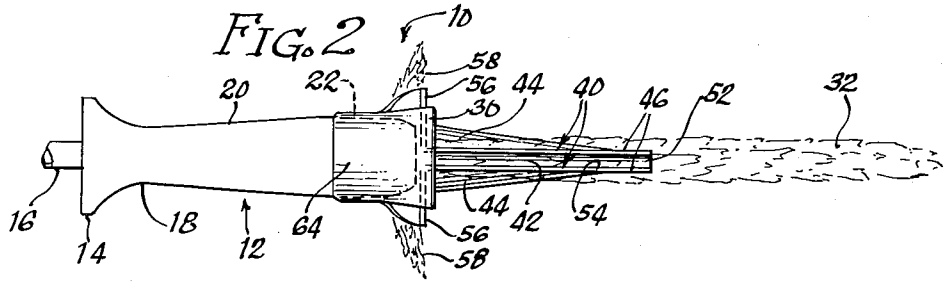


FIG. 3

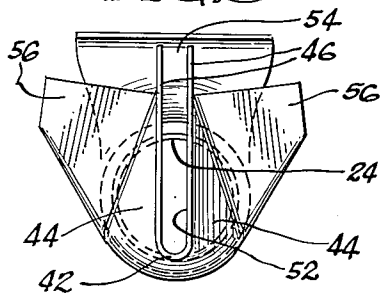


FIG. 4

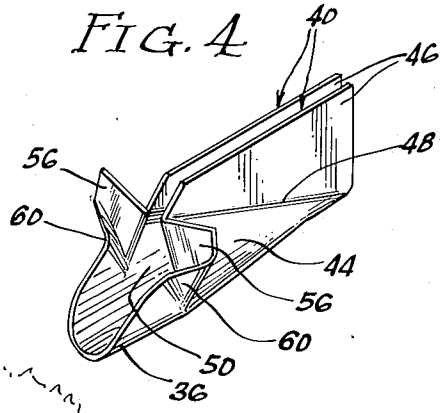
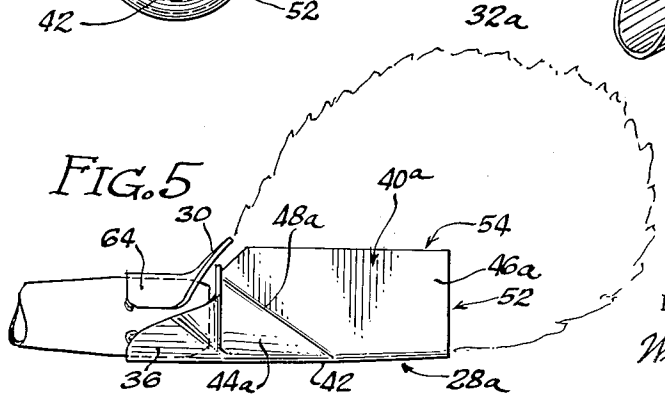


FIG. 5



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2,965,166

FLAME DEFLECTORS

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5 Claims. (Cl. 158—113)

This invention relates to burners for gas or other suitable fuel, and pertains particularly to burners equipped with flame deflectors for producing a flame of a particular size and shape.

One object of the present invention is to provide a new and improved flame deflector arrangement for producing a flare which is elongated and extremely thin.

A further object is to provide a new and improved flame deflector flame arrangement of the foregoing character which is provided with means for stabilizing and protecting the flame against the action of secondary air currents.

Another object is to provide a new and improved flame deflector construction whereby the shape of the flame may be changed by making minor changes in the shape of the flame deflector.

It is another object to provide a new and improved flame deflector having means for producing small retaining flames extending laterally from the base of the main flame, together with means for stabilizing both the retaining flames and the main flame.

In various respects, the present invention may be regarded as an improvement upon the invention disclosed and claimed in the present applicant's co-pending application Serial Number 652,901, filed April 15, 1957, entitled Flame Deflector, now Patent No. 2,877,837.

Further objects and advantages of the present invention will be apparent from the following description, taken with the accompanying drawings, in which:

Fig. 1 is an elevational view of a burner equipped with a flame deflecting arrangement to be described as an illustrative embodiment of the present invention.

Fig. 2 is a plan view of the burner of Fig. 1.

Fig. 3 is an elevational view showing the front end of the burner of Fig. 1.

Fig. 4 is a perspective view showing the main flame deflecting member employed on the burner of Figs. 1–3.

Fig. 5 is a fragmentary elevational view, similar to Fig. 1, but showing a modified construction.

It will be seen that Fig. 1 illustrates a burner **10** which may be employed to burn gas or other suitable fuel. The burner **10** comprises a mixture tube **12** adapted to mix the gas with air so as to form a combustible mixture. At its rear end, the tube **12** has an enlarged open ended portion **14** which is generally bell-shape. Gas is introduced into the tube **12** by means of a nozzle **16** which is directed axially into the bell-shaped portion **14**. In front of the bell-shaped portion **14** the tube **12** has a relatively constricted venturi portion or throat **18**. The passage of the gas along the venturi portion **18** draws air into the rear end of the bell-shaped portion **14**.

The burner tube **12** has a forwardly flaring portion **20** which extends forwardly from the venturi throat **18** and increases gradually in diameter. Near its front end, the tube **12** has a portion **22** which is substantially cylindrical. The extreme front end of the tube **12** is formed with a smoothly curved, inturned flange **22** formed around a somewhat constricted axial discharge port **24**.

The illustrated burner **10** is shown with the axis of the

burner tube **12** extending horizontally. While the horizontal position is preferable, the burner may be employed in other positions for various applications.

In general, the illustrated burner **10** is provided with a flame shaping arrangement **26** comprising a flame deflector **28** and a secondary air deflector **30**. The flame deflector **28** produces a main flame **32** which is generally vertical and extremely thin or flat. The flame **32** slants upwardly and outwardly from the deflector **28**. The air deflector **30** tends to stabilize the base of the flame **32** against the action of currents of secondary air.

As shown, the flame deflector **28** comprises a body **34** made of sheet metal or the like. The body **34** is formed with a cylindrically curved mounting portion or leg **36** for securing the flame deflector **28** to the mixture tube **12**. The mounting leg **36** may be welded or otherwise suitably secured to the lower portion of the burner tube **12**, as indicated by the welds **38**.

It will be seen that the body **34** of the flame deflector **28** is generally channel-shaped. Thus, the body **34** comprises left and right-hand side wall flanges **40**, connected together at their lower edges by a bottom wall **42**. It will be apparent that the flanges **40** and the bottom wall **42** extend generally in a longitudinal direction with respect to the axis of the burner tube **12**. The bottom wall **42** extends outwardly from the front end of the burner tube **12**. As shown in Fig. 2, the illustrated bottom wall **42** has a width which tapers in a forward direction.

The side wall flanges **40** have inner or lower portions **44** which extend upwardly from the bottom wall **42** and converge toward each other. The lower portions **44** merge into generally parallel outer or upper portions **46**. At the junction between the lower and upper portions **44** and **46**, each side wall flange **40** is bent along a line **48** which slopes downwardly toward the outer end of the flame deflector **28**. With this arrangement, the flame deflector **28** has a relatively wide opening **50** at its rear end, adapted to receive the combustible mixture from the discharge portion **24** of the mixture tube **12**. The space between the flanges **40** tapers in a forward direction to a relatively narrow opening or slot **52** at the front of the flanges **40**. A slot **54** of similar width is formed between the upper edges of the flanges **40**.

It will be seen that the side wall flanges **40** are disposed with their rear edges spaced a short distance in front of the mixture tube **12**. The rear edges of the flanges **40** overlap opposite portions of the discharge port **24**. Thus, most of the combustible mixture is intercepted between the flanges **40** and is squeezed upwardly and forwardly to form the thin vertical main flame **32**.

The rear edges of the illustrated side wall flanges **40** are formed with laterally projecting ears **56**, extending generally at right angles to the axis of the burner tube **12**. The ears deflect portions of the mixture laterally, so as to form small laterally extending flames **58** adjacent the base of the main flame **32**. The small lateral flames **58** tend to retain the main flame in its normal position on the flame deflector **28**. Moreover, the lateral deflection of portions of the combustible mixture makes it easier to light the burner with a lighter disposed laterally of the burner. Thus, for example, several of the burners may be disposed in a row, with the burner tubes parallel. A single lighter at either end of the row will be effective to light all of the burners, because each burner will light the adjacent burner.

It will be observed that the height of the side wall flanges **40** is substantially greater than the diameter of the discharge port **24**. Moreover, the height of the flanges **40** is considerably greater than the spacing therebetween. This arrangement produces an extremely thin or flat flame.

Generally triangular web portions **60** are provided to

extend between the cylindrically curved mounting leg **36** and the lower edges of the ears **56**. The web portions **60** are inclined upwardly in opposite lateral directions. Thus, they tend to direct the lateral side flames **58** at upwardly inclined angles. Moreover, the web portions **60** shield the side flames and the base of the main flame **32** from currents of secondary air coming from the sides of the burner tube **12**. Of course, the mounting leg **36** shields the flames from secondary air coming from below the burner tube. Thus, the portions **36** and **60** tend to prevent the flames from operating in a noisy and unstable manner.

The secondary air deflector **30** protects the flames **32** and **58** from currents of secondary air coming along the upper portion of the burner tube **12**. Thus, the deflector **30** slants upwardly and outwardly from the upper portion of the burner tube **12**. It will be seen that the air deflector **30** is spaced from but rather closely adjacent the inner ends of the side wall flanges **40**. At its rear upper corner, each side wall flange **40** has a diagonal or slanting edge **62**. The air deflector **30** slants upwardly beyond the outer end of the burner tube **12** and overlies the edges **62**, in spaced relation thereto. The lower, rear portion of the air deflector **30** is formed into a cylindrically curved mounting leg **64**, which may be welded or otherwise suitably secured to the burner tube **12**, as indicated by the welds **66**.

It will be apparent that the deflector **30** diverts the secondary air upwardly, away from the inner portions of the flanges **40** and the ears **56**. Thus, the deflector **30** prevents the base portions of the flames **32** and **58** from being unduly agitated by the secondary air. The burner is thus enabled to operate in a quiet, stable manner.

It has been found that the illustrated burner operates efficiently, quietly and with a high degree of stability. Moreover, the flame deflector arrangement provides a thin, generally oval shaped flame which is advantageous for many applications. As shown in Fig. 5, the shape of the flame may be varied by modifying the flame deflector to a slight extent. Thus, Fig. 5 illustrates a flame deflector **28***a* which is the same as that shown in Figs. 1–4, except that the relative sizes of the lower and upper portions **44***a* and **46***a* on the side wall flanges **40***a* have been changed. It will be seen that the lower portions **44***a* are smaller and the upper portions **46***a* are larger than the corresponding portions **44** and **46** shown in Fig. 1. Thus, the slanting bend line **48***a*, between the portions **44***a* and **46***a*, has been moved downwardly. The angle between the line **48***a* and the bottom wall **42***a* has been increased. These changes tend to produce a main flame **32***a* which is shorter and higher than the flame shown in Fig. 1. As the angle of the line **48***a* increases, the length of the cavity within the walls **42** and **44***a* decreases. This reduces the supply of gas-air mixture to the end of the flame spreader. The resultant increase in the area of the walls **46***a* establishes additional resistance to the flow of the mixture to the slot **52**, causing the shortening of the flame. Since the supply of gas-air mixture and the size of the slots **52** and **54** have remained constant, the mixture which has been restricted from the slot portion **52** is now forced through the slot portion **54**, causing an increase in the height of the flame.

In addition to promoting quiet, efficient operation, the illustrated flame deflectors minimize the chance that the flame will flash back into the burner tube **12**. Thus, the provision of the flame deflecting arrangements produces burners which will operate in an excellent manner in a wide variety of applications, even under adverse conditions.

Various other modifications, alternative constructions and equivalents may be employed without departing from the true spirit and scope of the invention, as exemplified in the foregoing description and defined in the following claims.

I claim:

1. In a burner, the combination comprising a horizontal mixture tube having an axial discharge port at one end, a flame deflector mounted on said end of said mixture tube and having a body spaced outwardly in front of said port, said body being generally channel-shaped and extending generally longitudinally with respect to the axis of said port, said body having an elongated bottom wall, said body having spaced left and right-hand side wall flanges extending in a generally upward direction from said bottom wall, the height of said side wall flanges being greater than the diameter of said discharge port, the spacing between said side wall flanges being substantially less than the diameter of said discharge port, generally vertical ears formed laterally away from each other in opposite directions from said respective left and right-hand side wall flanges at the inner ends thereof, said ears being near the discharge port but spaced in front thereof, said ears overlapping opposite portions of said port and thereby being in the path of the mixture discharged therefrom to deflect portions of the mixture laterally to form small laterally directed side flames, said flame deflector having a mounting portion extending between said bottom wall and said mixture tube and secured to said mixture tube, said deflector having web portions extending between said mounting portion and the lower edges of said ears, said web portions being sloped upwardly in opposite lateral directions to direct the small side flames upwardly and stabilize said flames, said side wall flanges having lower portions converging upwardly toward each other and generally parallel upper portions for producing a thin long main flame extending upwardly and outwardly from said side wall flanges, said upper and lower portions of each side wall flange being integrally joined along a bend line sloping downwardly in an outward direction, said bottom wall tapering in width in an outward direction to flatten the main flame, and a stabilizing deflector secured to the upper portion of said mixture tube adjacent the outer end thereof and sloping upwardly in an outward direction in spaced relation to the inner ends of said side wall flanges for deflecting secondary air upwardly and laterally and thereby stabilizing the main flame and the small side flames.

2. A flame deflector for use on a generally horizontal burner tube with an axial discharge port, said flame deflector comprising a body adapted to be mounted on the end of the burner tube in front of the port in outwardly spaced relation thereto, said body being generally channel-shaped and having an elongated generally longitudinal bottom wall extending from the port, said bottom wall tapering outwardly in width, said body having spaced generally longitudinal left and right-hand side wall flanges extending in a generally upward direction from said bottom wall, said side wall flanges being greater in height than the spacing therebetween, said side wall flanges having lower portions converging upwardly toward each other and generally parallel upper portions to form a thin outwardly extending upwardly slanting generally vertical main flame, left and right-hand generally vertical ears formed laterally away from each other in opposite directions from said respective left and right-hand side wall flanges at the inner ends thereof to deflect portions of the combustible mixture laterally to form small side flames, a cylindrically curved mounting leg extending rearwardly from said bottom wall and adapted to be secured to the burner tube, and left and right-hand laterally extending upwardly inclined web portions extending between said mounting leg and the lower edges of said ears to stabilize the side flames and direct them at upwardly inclined angles.

3. A flame deflector for use on a burner tube with an axial discharge port, said flame deflector comprising a body adapted to be mounted on the outer end of the burner tube in front of the port and in outwardly spaced

relation thereto, said body being generally channel-shaped and having an elongated generally longitudinal deflector wall adapted to extend outwardly from the port, said body having spaced generally longitudinal left and right-hand side wall flanges extending in one direction from said deflector wall, said side wall flanges being wider in said direction than the spacing therebetween, said side wall flanges having inner portions converging toward each other from said deflector wall and merging into generally parallel outer portions to produce a thin flame extending outwardly and slanting away from said deflector wall, left and right-hand ears formed laterally away from each other in opposite directions from said respective left and right-hand side wall flanges at the inner ends thereof, said ears extending generally transversely with respect to the longitudinal direction of said side wall flanges to form small laterally directed side flames, a mounting portion extending rearwardly from said deflector wall and adapted to be secured to the burner tube, and left and right-hand web portions extending between said mounting portions and said respective left and right-hand ears to stabilize the small laterally directed side flames.

4. A flame deflector for use on a generally horizontal burner tube with an axial discharge port, said flame deflector comprising a body adapted to be mounted on the end of the burner tube in front of the port in outwardly spaced relation thereto, said body being generally channel-shaped and having an elongated generally longitudinal bottom wall with spaced generally longitudinal left and right-hand side wall flanges extending in a generally upward direction from said bottom wall to form a thin vertical main flame, said side wall flanges being greater in height than the spacing therebetween, left and right-hand generally vertical ears formed laterally away from each other in opposite directions from said respective left and right-hand side wall flanges at the inner ends thereof to deflect portions of the combustible mixture laterally to form small side flames, mounting leg extending rearwardly from said bottom wall and adapted to be secured to the burner tube, and left and right-hand laterally extending upwardly inclined web portions extending between said mounting leg and the lower edges of said ears to stabilize the side flames and direct them at upwardly inclined angles, each of said web portions constituting a slanting continuation of substantially the entire lower edge of the corresponding ear.

5. In a burner, the combination comprising a horizontal mixture tube having an axial discharge port at one end, a flame deflector mounted on said end of said mixture tube and having a body spaced outwardly in front of said port, said body being generally channel-shaped and extending generally longitudinally with respect to the axis of said port, said body having an elongated bottom wall, said body having spaced left and right-hand side wall flanges extending in a generally upward direction from said bottom wall, the height of said side wall flanges being greater than the diameter of said discharge port, the spacing between said side wall flanges being substantially less than the diameter of said discharge port, generally vertical ears formed laterally away from each other in opposite directions from said respective left and right-hand side wall flanges at the inner ends thereof, said ears being near the discharge port but spaced in front thereof, said ears overlapping opposite portions of said port and thereby being in the path of the mixture discharged therefrom to deflect portions of the mixture laterally to form small laterally directed side flames, said flame deflector having a mounting portion extending between said bottom wall and said mixture tube and secured to said mixture tube, and a stabilizing deflector secured to the upper portion of said mixture tube adjacent the outer end thereof and sloping upwardly in an outward direction in closely spaced relation to the inner ends of said side wall flanges for deflecting secondary air upwardly and laterally and thereby stabilizing the main flame and the small side flames.

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