Jan. 23, 1951 R. E. YATES ET AL 2,538,953

COMBUSTION CHAMBER FOR FLUID FUEL

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Fig. 1

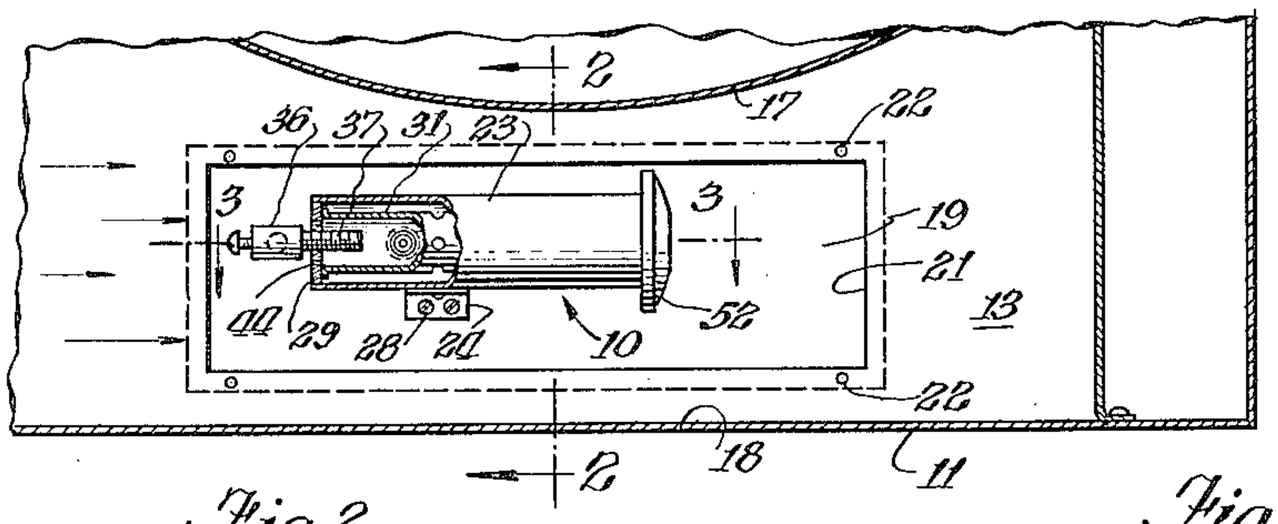


Fig. 2

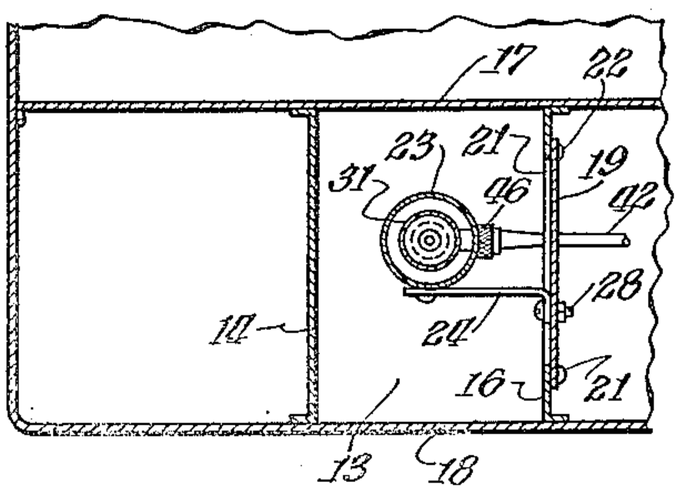
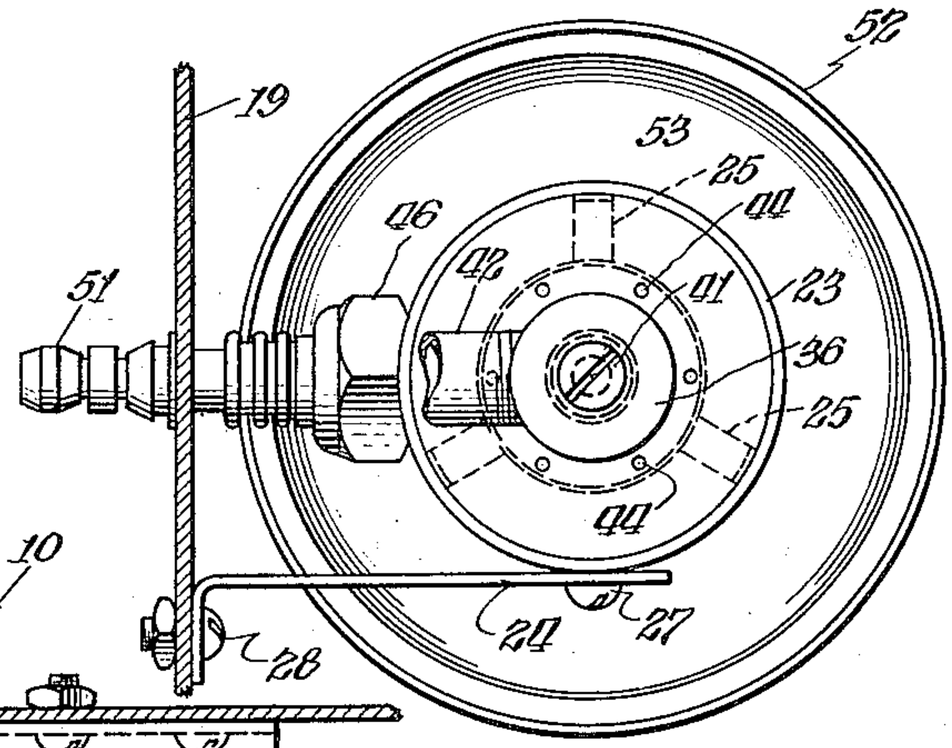
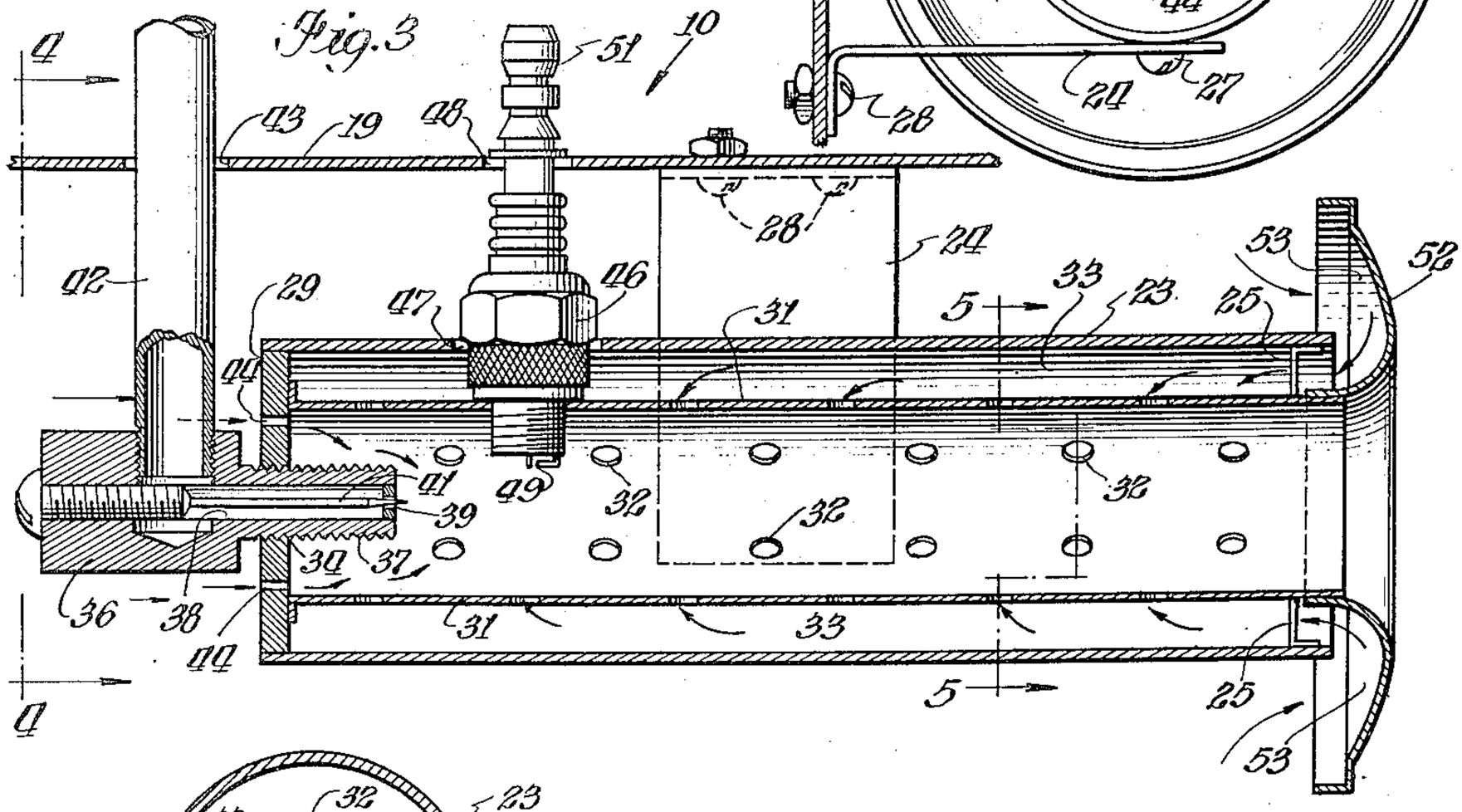


Fig. 3





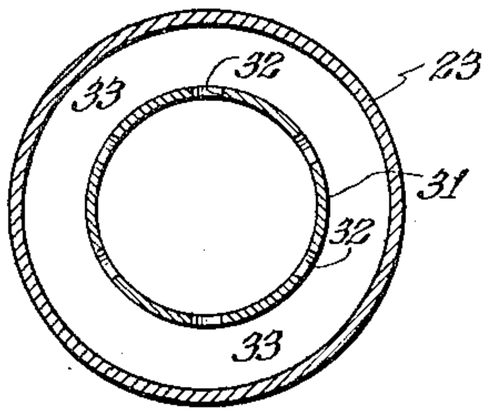


Fig. 5

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COMBUSTION CHAMBER FOR FLUID FUEL

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6 Claims. (Cl. 158—99)

1

This invention relates to gas burners and has particular reference to a gas burner suitable for operation in a rapidly moving current of air.

The usual burner for gaseous fuel is ordinarily not subjected to strong currents of air, and in the usual case the air supply moving past the burner moves at the minimum speed consistent with complete combustion of the fuel. In instances where the burner must operate in a fast moving current of air, in order to heat the air as for drying operations or the like, it is essential that the burner function properly regardless of the intensity of the current of air in which the burner is positioned. As an adjunct to such operation it is essential that the burner be capable of being lighted without the necessity of first slowing the air current past the burner, and likewise if the burner should be extinguished for any reason, that it be able to be relighted without slowing the current of air.

With the foregoing considerations in mind it is a principal object of this invention to make it possible to operate a gas burner safely and efficiently in a rapidly moving current of air. A related object is to enable such a burner to be lighted without first decreasing the speed of the air moving past the burner.

A further object is to enable the burner to be operated in a rapidly moving stream of air, the burner presenting throttling orifices to the air stream to decrease the speed of the air within the burner adjacent the point of discharge of the gaseous fuel into the burner, so that the fuel-air mixture formed may be readily ignited, the flame so formed being then supplied with air through a plurality of openings in the burner tube for complete combustion, such air being supplied to the burner tube by an air control sleeve surrounding the perforated burner tube.

Still another object is to enable such a burner to scoop the air or reverse the direction of flow of the air immediately exteriorly of the air control sleeve and into a cylindrical chamber formed by the air control sleeve and the perforated burner tube, the air so supplied to the cylindrical chamber entering the perforated burner tube and enabling complete combustion of the fuel to take place in the burner tube.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawing which, by way of illustration shows preferred embodiment, and the principle thereof and what we now consider to be the best mode in which we have contemplated ap-

2

plying those principles. Other embodiments of the invention embodying the same or other principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

Fig. 1 is a sectional view through a domestic clothes drier showing the burner according to the present invention partially in vertical section, and partially in elevation;

Fig. 2 is a transverse section through the burner looking in the direction of the arrows 2—2 of Fig. 1 and showing the disposition of the burner in a forced air passageway of the clothes drier;

Fig. 3 is an enlarged horizontal section looking in the direction of the arrows 3—3 of Fig. 1;

Fig. 4 is an end view looking in the direction of the arrows 4—4 of Fig. 3; and

Fig. 5 is a transverse section through the burner on the line 5—5 of Fig. 3 and looking in the direction of the arrows.

Referring now to the drawing, the burner according to the present invention is indicated at 10 and is incorporated in a domestic clothes drier 11. The details of construction of such a clothes drier are shown in our application Serial No. 785,488, filed November 12, 1947. Suffice it to say, however, the burner 10 is mounted in a duct or passageway 13 formed by spaced side walls 14 and 16, drum housing 17, and a bottom panel 18, as shown in Fig. 2. As shown by the arrows indicating a current of air in Fig. 1, the burner 10 is so positioned as to have the current of air flowing rapidly about the burner, and as will appear later, the air for complete combustion is supplied to the burner from such a current of air. The burner is preferably mounted and assembled on a mounting plate 19 which also covers an inspection port or opening 21. As shown, the burner 10 and its mounting plate 19 are held in position to the side wall 16 by means of mounting screws 22.

The burner unit 10 includes an elongated air control sleeve 23 which is supported on a bracket 24 secured to the mounting plate 26, a screw 27 and mounting bolts 28 completing such support. The control sleeve 23 has a rear wall 29 secured thereto, as by welding, and the rear wall 29 has welded thereto an elongated burner tube 31 having perforations 32 uniformly spaced throughout its length. As shown, the air control sleeve 23 and the burner tube 31 are in coaxial relationship so as to define a cylindrical air passage 33. The air control sleeve 23 and the burner

tube 31 are maintained in such coaxial relationship at their forward ends by means of radially extending struts 25 which are welded to the air control sleeve 23 and bear against the perforated burner tube 31, thus providing a substantially unrestricted entrance through which air may enter the cylindrical air passage 33 at the forward end thereof.

The rear wall 29 has a threaded axial opening 34 therein for a gas supply fitting 36 having an elongated threaded nipple 37 thereon which is threaded into the opening 34. The nipple 37 has an elongated passage 38 therein and the discharge end of the nipple 37 is provided with a metering opening 39 which cooperates with an adjustable needle valve 41 to meter the gas supplied to the fitting 36 by a pipe 42 extending through an opening 43 in the plate 19.

The gas discharged into the burner tube 31 is supplied with air which is adapted to sweep past the discharge end of the nipple 37 and to intimately mix with the gas prior to being ignited, the ignited mixture being thereafter supplied with air entering the perforations 32 to achieve complete combustion of the fuel. It is necessary for the gas so supplied to the burner tube to be supplied with adequate air for ignition, but it is also necessary that such air not have too great a velocity which would result in making the fuel-air mixture too lean for ignition and for proper flame propagation. To this end the rear wall 29 is provided with a plurality of metering air inlet orifices 44 which are exposed to the direct impact of the air current in which the burner 10 is positioned. These metering orifices 44 are spaced circumferentially around the nipple 37 to provide uniform distribution and mixture of the air with fuel supplied at the discharge end of the nipple 37.

The fuel-air mixture so formed is then ignited by a spark plug 46 which is threaded into the perforated burner tube 31 and protrudes through openings 47 and 48 formed respectively in the air control sleeve 23 and the mounting plate 19. The spark plug 46 is provided with the conventional electrodes 49 which are so positioned as to ignite the fuel-air mixture just described. The spark plug 46 has a terminal 51 which is connected to a source at high potential, not shown. It will be understood, of course, that the spark plug 46 is energized only when lighting the burner 10, and that after ignition of the fuel-air mixture it is deenergized until the burner 10 is relighted.

The ignited mixture is supplied with air through the perforations 32 so that the fuel is entirely burned. Since the burner 10 is required to operate in a rapidly moving current of air, the air supplied thereto should not disturb the burner flame and yet should be supplied as to obtain maximum heat from the fuel. In order to supply air at the proper velocity to the burner 10 and in order to supply air at the perforations at a positive pressure, and not that merely induced by the progress of the flame through the burner tube 31, the forward end of the burner tube 31 has fastened thereto, as by welding, an annular cup 52 of a larger diameter than the air control sleeve 23. As shown in Fig. 3, the annular cup 52 is of suitable cross-section as to be spaced from the end of the air control sleeve 23 to provide a passageway 53 which is continuous with the cylindrical passage 33.

It will be apparent that the air flowing exteriorly of the air control sleeve 23 and adjacent thereto will be reversed in its direction to enter the cylindrical passage 33 and will then pass through the orifices 32 into the burner tube 31 to complete the combustion of the fuel.

From the foregoing description it will be evident that the present invention enables a gas burner to be utilized in a rapidly moving stream of air such as the air that is forced through a clothes drier or the like, and this is accomplished by a structure which is extremely simple in character.

While we have illustrated and described the preferred embodiments of our invention, it is to be understood that this is capable of variation and modification and we therefore do not wish to be limited to the precise details set forth, but desire to avail ourselves of such changes and alterations as fall within the purview of the following claims.

We claim:

1. In a burner for operation in a rapidly moving current of air to heat such air, an elongated burner tube having spaced inlet perforations distributed therein throughout substantially its entire length, an air control sleeve surrounding said burner tube in spaced relationship so as to define a cylindrical air passage therebetween, a rear wall supporting one end of said burner tube and said air control sleeve in such spaced relationship, an inlet fitting mounted in said rear wall and having a discharge end opening through said wall for discharging fuel longitudinally and in a forward direction into said burner tube, a plurality of throttling orifices in said wall for supplying air at reduced velocity adjacent said discharge opening for mixing with said fuel, and means for maintaining the forward end of said tube and said sleeve in coaxial relationship to provide a substantially unrestricted passage for air entering said cylindrical air passage whereby air from such a moving current of air may pass in a rearward direction into said passage for distribution through said spaced inlet perforations for complete supply of air to the ignited mixture.

2. In a burner for operation in a rapidly moving current of air to heat such air, an elongated burner tube having spaced inlet perforations distributed therein throughout substantially its entire length, an air control sleeve surrounding said burner tube in spaced relationship so as to define a cylindrical air passage therebetween, a rear wall supporting one end of said burner tube and said air control sleeve in such spaced relationship, an inlet fitting mounted in said rear wall and having a discharge end opening through said wall for discharging fuel longitudinally into said burner tube, a plurality of throttling orifices in said wall exposed to direct impact of air for providing air at reduced velocity sweeping past said discharge opening in a forward direction within said burner tube for mixing with said fuel, ignition means extending into said burner tube for igniting the fuel-air mixture, and means for maintaining the forward end of said tube and said sleeve in coaxial relationship to provide a substantially unrestricted passage for air entering said cylindrical air passage whereby air from such a moving current of air may pass in a rearward direction into said passage for distribution through said spaced inlet perforations for complete supply of air to the ignited mixture.

3. In a burner for operation in a rapidly moving current of air to heat such air, an elongated burner tube having spaced inlet perforations distributed therein throughout substantially its entire length, an air control sleeve surrounding said burner tube in spaced relationship so as to de-

fine a cylindrical air passage therebetween, a rear wall supporting one end of said burner tube and said air control sleeve in such spaced relationship, an inlet fitting mounted in said rear wall and having a discharge end opening through said wall for discharging fuel longitudinally into said burner tube, a plurality of throttling orifices in said wall for supplying air moving in a forward direction at reduced velocity within said burner tube and adjacent said discharge opening for mixing with said fuel, ignition means extending into said burner tube for igniting the fuel-air mixture, and means at the other end of said burner tube for reversing the direction of flow of air moving exteriorly of said air control sleeve whereby air from such a moving current of air may be directed in a rearward direction into said spaced inlet perforations for complete supply of air to the ignited mixture.

4. In a burner for operation in a rapidly moving current of air to heat such air, an elongated burner tube having spaced inlet perforations distributed therein throughout substantially its entire length, an air control sleeve surrounding said burner tube in spaced relationship so as to define a cylindrical air passage therebetween, a rear wall supporting one end of said burner tube and said air control sleeve in such spaced relationship, an inlet fitting mounted in said rear wall and having a discharge end opening through said rear wall for discharging fuel longitudinally and in a forward direction into said burner tube, a plurality of throttling orifices in said wall for supplying air moving in a forward direction at reduced velocity within said burner tube and adjacent said discharge opening for mixing with said fuel, ignition means extending into said burner tube for igniting the fuel-air mixture, and an annular shaped cup mounted on the forward end of said elongated burner tube for reversing the flow of air moving exteriorly of said air control sleeve whereby air from such a moving current of air may be directed in a rearward direction into said passage for distribution through said spaced inlet perforations for complete supply of air to the ignited mixture.

5. In a burner for operation in a rapidly moving current of air to heat such air, an elongated burner tube having spaced inlet perforations distributed therein throughout substantially its entire length, an air control sleeve surrounding said burner tube in spaced relationship so as to define a cylindrical air passage therebetween, a rear wall supporting one end of said burner tube and said air control sleeve in such spaced relationship, an inlet fitting mounted in said rear wall and having a discharge end opening through said wall for discharging fuel longitudinally into said burner tube, a plurality of throttling orifices in said wall exposed to direct impact of air for providing

air moving in a forward direction at reduced velocity within said burner tube for sweeping past said discharge opening and for mixing with said fuel, ignition means extending into said burner tube for igniting the fuel-air mixture, means for holding the forward end of said tube and said sleeve in such coaxial relationship and to provide an unrestricted passage for air entering said cylindrical air passage, and means at said forward end of said burner tube for reversing the direction of flow of air flowing exteriorly of said air control sleeve whereby air from such a moving current of air may pass in a rearward direction into said passage for distribution through said spaced inlet perforations for complete supply of air to the ignited mixture.

6. In a burner for operation in a rapidly moving current of air to heat such air, an elongated burner tube having spaced inlet perforations distributed therein throughout substantially its entire length, an air control sleeve surrounding said burner tube in spaced relationship so as to define a cylindrical air passage therebetween, a rear wall supporting one end of said burner tube and said air control sleeve in such spaced relationship, an inlet fitting mounted in said rear wall and having a discharge end opening through said wall for discharging fuel longitudinally into said burner tube, a plurality of throttling orifices in said wall exposed to direct impact of air for providing air moving in a forward direction at reduced velocity within said burner tube for sweeping past said discharge opening and mixing with said fuel, and a plurality of radially extending members for maintaining the forward end of said tube and said sleeve in coaxial relationship, and to provide substantially unrestricted passage for air entering said cylindrical air passage, and an annular shaped cup mounted on the forward end of said elongated burner tube and projecting beyond the said sleeve in a radial sense for reversing the direction of flow of air moving exteriorly of said air control sleeve whereby air from such a moving current of air may pass in a rearward direction into said passage for distribution through said spaced inlet perforations and for complete supply of air to the ignited mixture.

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