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COMBINED ADJUSTABLE ORIFICE AND VALVE

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This invention relates to a combined adjustable orifice and valve device which is adapted to be employed in connection with various types of gas consuming appliances.

The usual air inspirating gas burner is provided with a fixed gas orifice and a closing valve positioned upstream with respect to the orifice, which valve controls and throttles down the gas supply to the burner to meet the consumer’s requirements. A partial closure of the valve reduces the gas pressure on the upstream side of the orifice and diminishes the velocity of the gas emitted through the orifice, thereby decreasing the percentage of primary air inspirated. This generally results in the entrainment of an insufficient amount of primary air necessary to produce complete combustion in the burner, as evidenced by a “yellow flame” condition. Herefore, only about 60 per cent of the air essential for complete combustion has been inspirated as primary air, any additional or secondary air being obtained from the atmosphere surrounding the burner ports. Experience has shown that there are substantial losses due to excessive or otherwise improper secondary aeration resulting in incomplete combustion and oftentimes in the formation of considerable quantities of highly undesirable and extremely dangerous carbon monoxide.

The practice of my instant invention overcomes the difficulties indicated above and at the same time eliminates the necessity for a separate gas control valve on each burner. As will be more fully set forth hereinafter, my invention contemplates the use of a resilient distortable orifice member which is composed of a synthetic rubber-like substance having a central bore therethrough for the passage of gas. This orifice member is associated with an air inspirating venturi and is provided with means for varying the size of the bore from fully open to completely closed position. It will be readily apparent from an inspection of the drawing and the detailed description that the orifice member is capable of an infinite range of adjustments and that it further serves as a valve to control the admission of gas to the burner properly. The amount of gas admitted to the burner is directly dependent on the size of the bore in the orifice member at any particular time. Regardless of the size of the bore, however, I am able with my device to maintain a substantially constant pressure drop across the orifice. Practically all the air required for complete combustion is inspirated as primary air and there is no need for any secondary aeration to operate the burner in a successful and efficient manner.

The orifice member may be made of any resilient and readily distortable substance. While natural rubber compounds may be employed in some instances, I find that these compounds tend to become vulcanized when left under compression for appreciable periods of time. Furthermore, natural rubbers will expand to such an extent when in contact with certain fuel gases including propane, butane, and mixtures thereof, that the bore or orifice soon becomes completely closed even though no adjustment on the orifice member is made in the interim.

On the other hand, various synthetic rubber compositions, such as Neoprene are entirely satisfactory for use in my present invention. These synthetic rubbers will not vulcanize in the presence of propane or similar gases; they do not become distorted or enlarged when in contact with these gases; nor do they apparently lose any of their properties of resiliency or distortability from continuous normal use in my device.

It is the primary object of this invention to provide a combined adjustable orifice and valve device which will emit gas at a constant pressure drop and thereby maintain the primary air inspirating efficiency of a gas consuming appliance at a high and substantially uniform level under various normal operating conditions. Another object of this invention is to provide a device of the character indicated wherein an adjustable orifice also serves as a closing valve.

My invention has for a further object the provision of a combined adjustable orifice and valve device which is adaptable for use with gas consuming appliances and which is simple and compact in design, and inexpensive to manufacture and maintain.

These and additional objects and advantages will be readily apparent to those skilled in the art by reference to the following description and annexed drawing which respectively describe and illustrate a preferred embodiment of this invention, and wherein:

Figure 1 is a central longitudinal vertical view of the device, partly in cross section, and;

Figure 2 is a transverse cross section view taken along line 2-2 in Figure 1.

Referring to the drawing and more particularly to Figure 1, I have denoted therein a conduit composed of a section of piping 10, an L-connector 11, and a tube 12. The conduit is
employed to transmit a fuel gas, such as propane, butane, or mixtures thereof under a predetermined pressure from a suitable source of supply (not shown). The tube 12 is formed at its forward end with an inwardly extending annular shoulder 13 containing a central opening 14. A cap 15 having a duct 16 is slidably mounted on the end of tube 12 and is externally threaded at 17 to receive a rotating adjusting sleeve 18 which is internally threaded at 19. Adjusting sleeve 18 is also internally threaded at 20 to engage with a corresponding threaded portion on tube 12. It will be observed that adjusting sleeve 18 is differentially threaded at 19 and 20 to control the longitudinal movement of cap 15 and sleeve 18 along tube 12. A key or pin 21 projects into a slot 22 in the cap member to prevent the cap from turning when the adjusting sleeve is being rotated.

It is to be clearly understood that the present invention is not limited to the illustrated differential threaded arrangement on the adjusting sleeve for the purpose of moving cap 15. Instead, threads may be provided only on the forward or cap end of the sleeve with the opposite end free to rotate or from a suitable source arranged as to prevent axial movement of the sleeve while it is being rotated. The peripheral surface of sleeve 18 is preferably knurled to permit the operator to obtain a firm grip thereon. It is obvious that rotating sleeve 18 may be remotely operated by a chain drive, a flexible cable drive, a worm drive, or by any other suitable actuating means commonly known to persons skilled in the art.

A resilient distortable member 23, which is preferably composed of a gas resistant synthetic rubber compound, is disposed in cap 15 intermediate the forward end of the cap and shoulder 13. Member 23 is provided with an orifice or passage 24 which places opening 14, and therefore the interior of tube 12, in communication with duct 16. It is recommended that member 23 be cemented to shoulder 13 in order to overcome the possibility of the gas leaking therebetween.

An air inspirating unit which includes a venturi having a throat portion 25 and a flared portion 26 is provided with an inwardly extending flange 27, at the center of which is an opening 28 to receive the forward end of cap 15. Flange 27 has a pair of curved air admission ports 29 and is equipped with a shutter 30 having a pair of ports 31 which correspond in size and relative position to ports 29. Shutter 30 is maintained against flange 27 by a screw 32 which projects through and beyond a shutter adjustment slot 33. The interior of the forward portion 34 of the venturi constitutes a pre-mix chamber wherein gas and air admitted through duct 16 and slots 25, respectively, are thoroughly agitated and mixed before being emitted through burner ports 35.

In the practice and operation of my present invention, adjusting sleeve 18 is actuated to slide cap 15 to the left or to the right along tube 12, depending upon the direction of rotation of the sleeve. The drawing illustrates the relative position of the various parts when adjusting sleeve 18 has been rotated so as to draw cap 15 toward the left, thereby compressing resilient member 23 and reducing the size of orifice or passage 24. As a consequence, the quantity of gas passing through the conduit, orifice 24, and thence into the air inspirating unit has been correspondingly reduced, but there is a constant pressure drop across the distortable member, regardless of the size of the orifice. Adjusting sleeve 18 may be rotated to further restrict the size of opening 24 or permit resilient member 23 to expand and enlarge orifice 24 in order to meet the consumers' gas requirements. It is evident that a sufficient movement of cap 15 toward the left will distort member 23 to such an extent that orifice 24 will be pinched off or completely closed, distortable member 23 serving at such times as a closing valve.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of my invention as defined by the appended claims.

I claim:
1. A combined adjustable orifice and valve for use with an air inspirating unit in a gas consuming system comprising a conduit, a cap slidably mounted on one end of the conduit, a duct in the cap, a resilient distortable member intermediate the capped end of the conduit and the cap duct, a passage through the distortable member communicating with the conduit and the duct, and means cooperating with the cap for moving the same to deform the distortable member, thereby varying the size of the passage from full open position to closed position.
2. A combined adjustable orifice and valve for use with an air inspirating unit in a gas consuming system comprising a conduit, a cap slidably mounted on one end of the conduit, a duct in the cap, a resilient distortable member in the cap, a passage through the distortable member communicating with the conduit and the duct, and means cooperating with the cap for moving the same in a longitudinal direction to deform the distortable member, thereby varying the size of the passage from full open position to closed position.

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