

[54] **FLARE**

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[57] **ABSTRACT**

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[58] **Field of Search**..... 431/89, 202, 284; 239/424,
239/505, 570, DIG. 7

A flarestack burner tip has a Coanda body placed across the outlet of a high pressure gas line to form an annular slot from which the gas emerges and flows over the Coanda surface. The feed line is a pipe consisting of fixed and moveable parts, the moveable part partially enclosing the fixed part so as to form an annular space. A vertical bellows fits into the space, the upper end of the bellows being attached to the moveable portion of the pipe. Springs acting in series with the bellows may also be attached between the fixed and moveable pipe portions.

[56] **References Cited**

UNITED STATES PATENTS

3,833,337 9/1974 Desty et al..... 431/284

6 Claims, 2 Drawing Figures

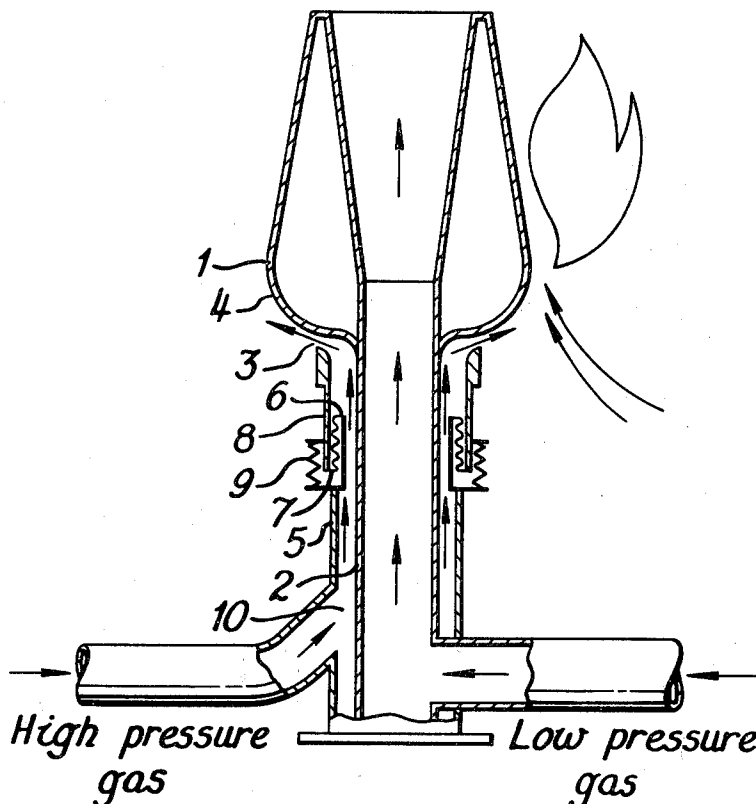
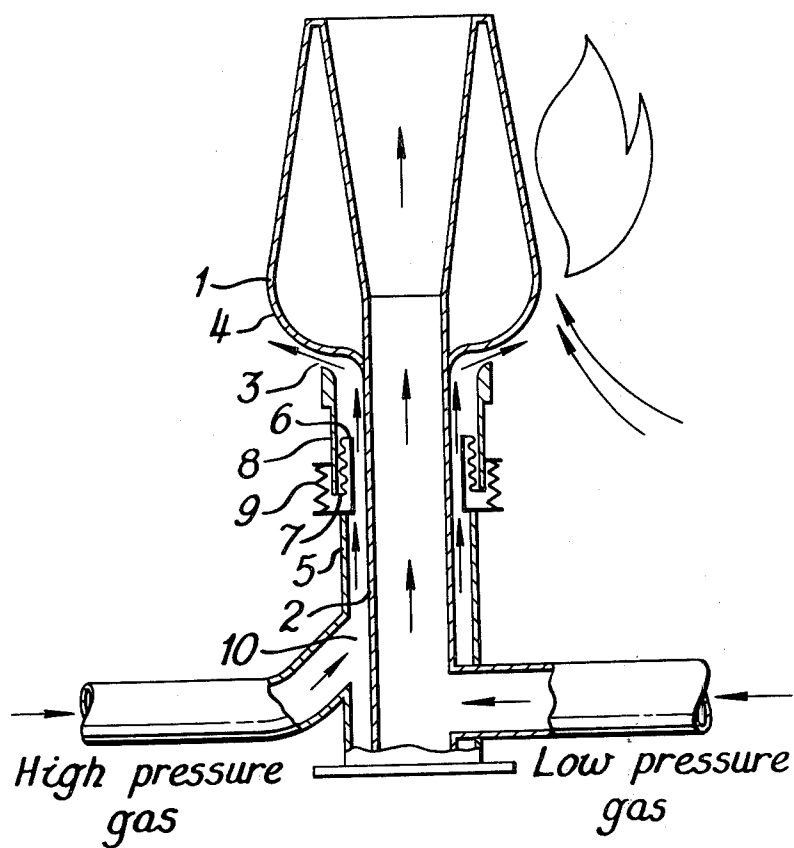
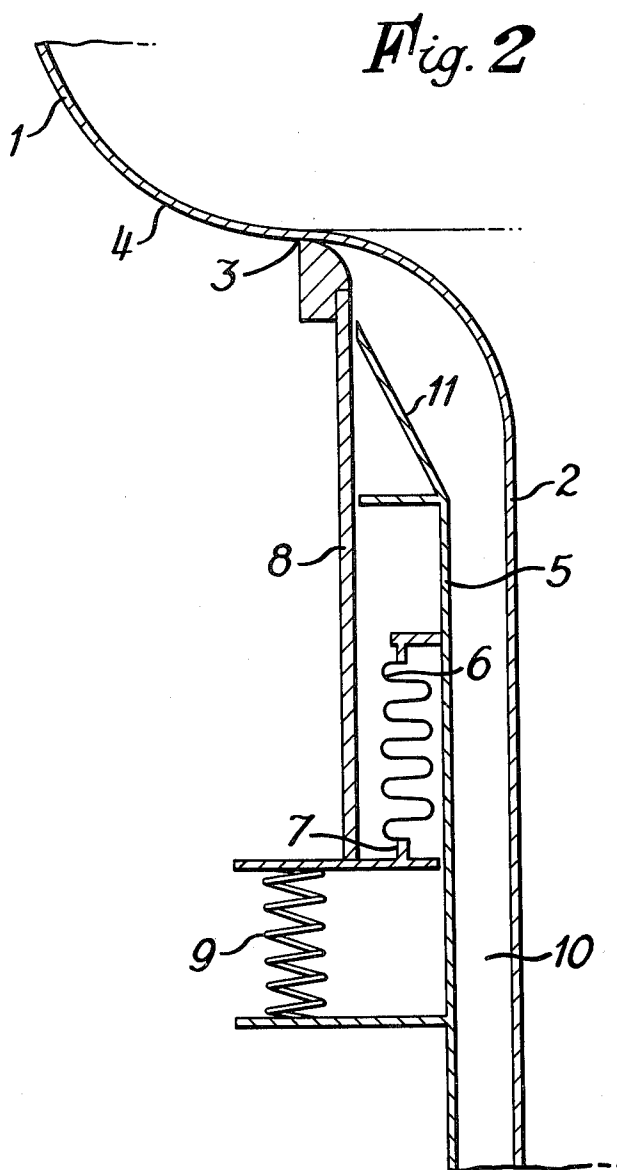


Fig. 1



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FLARE

This invention relates to a flare for disposing of waste combustible gas, and in particular it relates to the disposal of waste petroleum gas.

U.S. Pat. No. 3,833,337 discloses a flarestack burner tip comprising a feed line for a high pressure gas and a Coanda body positioned across the outlet of the high pressure gas line, the curved director surface of the Coanda body initiating flow of gas and air along the surface of the Coanda body, there being a self-adjusting slot between the Coanda surface and the high pressure gas line. The self-adjusting slot may be actuated by a bellows assembly. A new form of bellows assembly has now been devised which has the effect of improving the fatigue life of the bellows and which gives relatively better external protection to the bellows.

By self adjusting slot we mean a slot which adjusts itself automatically to the flow rate of high pressure gas so that the pressure of the high pressure gas remains approximately constant on emerging from the slot.

Thus according to the invention, there is provided a flarestack burner tip comprising a feed line for a high pressure gas and a Coanda body positioned across the outlet of the high pressure gas so as to form a slot, the external wall of the feed line having a moveable portion adjacent to the Coanda body and a fixed portion, the moveable portion being substantially co-axial with and overlapping at least a part of the fixed portion so as to form a space there between, there being a bellows fitted in said space, the end of the bellows farthest from the Coanda body being attached to the moveable portion and the end of the bellows nearest to the Coanda body being attached to the fixed portion of the feed line.

Thus the flarestack burner tip has a bellows, the external surface of which responds to the high pressure gas supply and the internal surface of which is open to the surrounding atmosphere. The bellows has some protection from say external mechanical damage by virtue of being enclosed between the fixed and moveable portion of pipe. Further as the bellows is externally pressurised the bellows has a reduced tendency to "squirm" or distort thus improving fatigue life of the bellows. When the bellows is in a no-load condition it is desirable that the slot is open.

The moveable portion of the feed line preferably partially encloses the fixed portion of the feed line to form the space. With the usual circular pipe feed lines the said space between the moveable and fixed pipe portions will be annular.

The Coanda body has a curved director surface which, in use, is capable of entraining surrounding air into the high pressure fuel gas stream.

The high pressure gas may be a fuel gas or it may be steam.

Preferably it emerges from the feed line at a pressure in the range 70 to 300 kN/m².

If the high pressure gas is fuel gas then preferably the Coanda body includes an internal passage adapted to supply fuel gas at a low pressure into the flow of high pressure gas and air.

If the high pressure gas is steam then the Coanda body must contain such a passageway.

Preferably the moveable portion of the high pressure fuel gas feed line is attached to the fixed portion by

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means of a spring or springs substantially parallel to the feed line and acting in series with the bellows.

Preferably, when the moveable portion of the feed line encloses the fixed portion, the fixed portion of the feed line has a deflector plate inclined towards the slot so as to improve the flow of high pressure fuel gas towards the slot.

The flarestack burner tip is capable of being used for both vertical and horizontal firing. Horizontal firing may be carried out in a trench so as to reduce undesirable luminosity.

The invention is illustrated with reference to FIGS. 1 and 2 of the accompanying drawings.

FIG. 1 shows a vertical cross-section of the flarestack burner tip incorporating a bellows device according to the invention.

FIG. 2 shows the bellows device of the tip in which a deflector plate is incorporated.

The flarestack tip comprises a Coanda body 1 and a line 2 for the supply of high pressure fuel gas. When gas is flowing, a slot 3 opens up between the body 1 and the line 2.

The body 1 has a director surface comprising a deflector portion 4 which turns the direction of the high pressure gas from horizontal to vertical and leads to a tapered portion which transmits the flow from the deflector portion 4 to the top of the body 1.

The shape of the deflector portion 4 is most conveniently specified as the surface of revolution formed by the rotation of a quadrant of a circle about the longitudinal axis of the Coanda body, the curved section of the quadrant being tangential to the slot. The distance between the axis of rotation and the centre of the quadrant is equal to the radius of the quadrant.

As the high pressure fuel gas flows round the deflector portion 4 its direction of flow is changed from (initially) horizontal to vertical. This induces a low pressure zone in the surrounding air and hence it induces movement of air as well as fuel towards the top of the body 1. This phenomenon is known as the Coanda effect.

The bellows-spring arrangement which governs the opening of the slot is attached to a surround member 5 which encloses the line 2. The upper end 6 of the bellows is attached rigidly to member 5 whilst the lower end 7 is attached to a further surround member 8. This further member 8 is attached at one end to a spring 9, the opposite end of the spring 9 being fixed to the surround member 5. The upper part of the member 8 in conjunction with the deflector portion 4 forms the slot 3.

During operation of the flare, high pressure fuel gas passes along the annular passageway 10 and emerges through the slot 3 and hence over the director surface 4. A deflector plate 11 attached to surround member 5 may be incorporated to improve the flow characteristics of the high pressure fuel gas towards the slot 3 i.e. reduced turbulence is obtained downstream from the bellows 6. The slot width increases as the pressure of the high pressure gas increases due to the sliding movement of member 8 over the surface of member 5. This increase in width is however restrained by the combination of bellows and spring action. The external surface of the bellows 6 is pressurised to that of the high pressure gas whilst the internal surface is at atmospheric pressure. It should be noted that the bellows 6 are in a "no-load" condition when the slot 3 is open.

We claim:

1. A flarestack burner tip comprising a feed line for a high pressure gas and a Coanda body positioned across the outlet of the high pressure gas so as to form a slot, the external wall of the feed line having a moveable portion adjacent to the Coanda body and a fixed portion, the moveable portion being substantially coaxial with and overlapping at least a part of the fixed portion so as to form a space there-between; there being a bellows fitted in said space, the end of the bellows farthest from the Coanda body being attached to the moveable portion and the end of the bellows nearest to the Coanda body being attached to the fixed portion of the feed line.

2. A flarestack burner tip according to claim 1 in which the moveable portion of the feed line is exterior to the fixed portion.

3. A flarestack burner tip according to claim 1 in which the Coanda body has an internal passageway

adapted to supply low pressure fuel gas to the burner tip.

4. A flarestack burner tip according to any of claim 1 in which the moveable portion of the feed line is attached to the fixed portion by means of a spring or springs acting in series with the bellows.

5. A flarestack burner tip according to any of claim 2 in which the fixed portion of the feed line has an internal deflector plate inclined towards the slot, the plate being adapted to improve the flow of a high pressure gas towards the slot.

6. A flarestack burner tip according to claim 5 in which the shape of the deflector portion of the Coanda body is the surface of revolution formed by the rotation of a quadrant of a circle about the longitudinal axis of the Coanda body, the curved section of the quadrant being tangential to the slot.

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