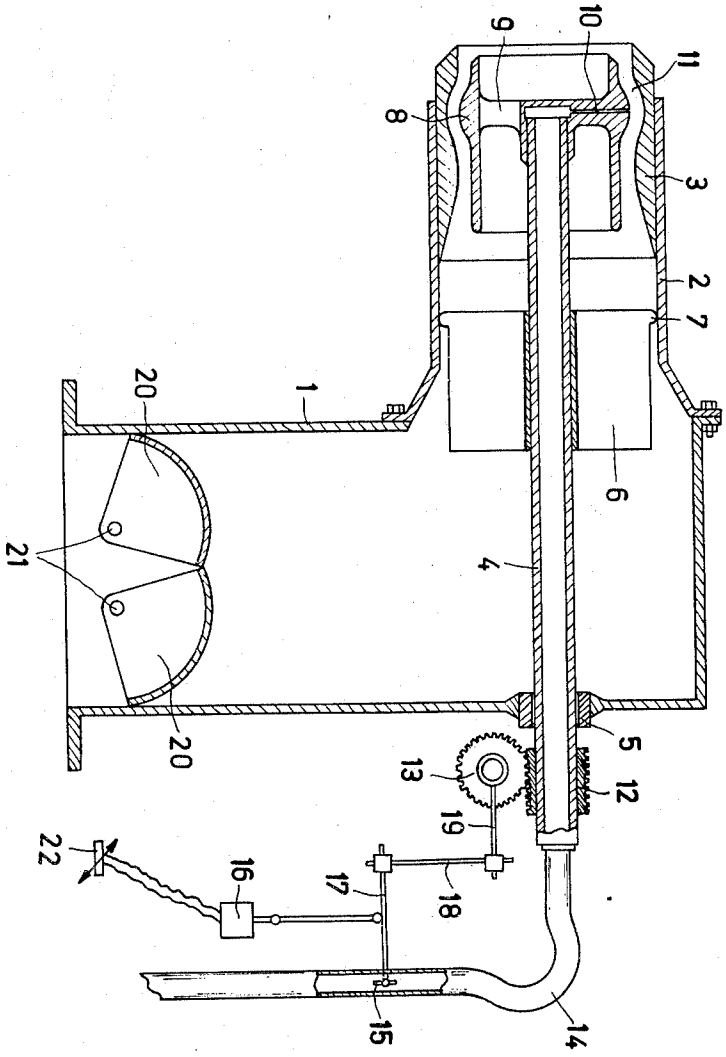
Dec. 23, 1969 G. SBORLINO 3,485,452

MINERAL OIL BURNER

Filed Sept. 19, 1967



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United States Patent Office

3,485,452

Patented Dec. 23, 1969

3,485,452

MINERAL OIL BURNER

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Filed Sept. 19, 1967, Ser. No. 668,892
Claims priority, application Italy, Sept. 24, 1966, 22,809/66, Patent 781,692
Int. Cl. B05b 7/12
U.S. Cl. 239—417 1 Claim

ABSTRACT OF THE DISCLOSURE

A burner for liquid fuel having a central jet of auxiliary air surrounded by an atomizing air jet issuing from a gap between an outer noncylindrical stationary pipe and an inner noncylindrical tubular body, in which gap the fuel is injected, the switch of said gap being adjustable by moving the said tubular body axially.

This invention relates to a burner for liquid fuels, more particularly mineral oil, of the kind in which the atomization of oil is obtained by a jet of low pressure air.

Burners of the kind referred to above are employed, for example, for heating large rotary-drum dryers within which the inert substances intended to make up the bitumen mixes for road surfacing are dried. In these burners the air blown under a low pressure is generally divided into two concentric jets, one of which is intended to atomize the oil as sprayed by specially provided nozzles, whereas the other jet supplies the secondary air which is necessary to ensure a proper formation of the flame. In a few burners, the atomization is brought about a central air jet surrounded by a jet of secondary air. Such an arrangement, however, has the defect that the flame shows a tendency towards expansion so as to find in the surrounding annularly shaped jet the air which is necessary for combustion, it being usually preferred, in the above recalled applications, that the flame is mainly developed lengthwise and is so maintained away from the drum walls, to prevent damages thereto. The inventive burner is of the kind in which the atomization of fuel oil takes place by virtue of a jet having an annular cross-sectional shape, within which the central jet of secondary air is located. In such burners, the flame tends to be concentrated about said central jet without being radially scattered.

A principal object of the present invention is to provide, in a burner of the kind last referred to, a satisfactory rate of flow for the atomizing air jet with a rate of flow of fuel oil which can be varied within a reasonably wide range, all this without significantly varying the rate of flow of secondary air.

This object could be acheived by varying the pressure of the air which feeds the atomization jet.

The last mentioned solution, however, would lead to shortcomings of a twofold nature; in the first place, it would require two feed mains with air at different pressures, the constructional intricacy involved being apparent and, in the second place, a variation of the rate of flow of the atomizing air would be thus obtained concurrently with and because of a variation in the speed of the atomizing air jet, so that a satisfactory atomization could not be obtained irrespective of the rate of flow.

A particular object of the present invention is to provide a burner operable at low pressures with a central jet of secondary air surrounded by an atomizing air jet, in which the rate of flow of the atomizing jet can be varied to suit a variable rate of flow for the fuel oil, still without varying the speed of the atomizing air and without varying the rate of flow of the central jet of secondary air.

To achieve this object the inventive burner comprises a pipe whose front end is open and which is fed from the rear by a source of pressurized air and containing in its front end a tubular piece leaving a gap between itself and the tube, said tubular piece being connected to a duct fed with pressurized oil which opens into said gap through a plurality of openings, and is characterized in that the inner surface of the front end of said tube and the outer surface of said tubular piece have a variable cross-sectional area, means being further provided for varying the mutual position between the front end of said tube and said tubular piece in an axial direction.

This feature, and other additional ones, along with the advantages afforded thereby, will be more clearly understood from the ensuing disclosure of an exemplary embodiment as illustrated in the accompanying drawing which is a diagrammatical lengthwise section thereof.

The burner shown in the drawing comprises a baseplate **1**, internally hollowed out, which is extended into a tubular portion **2** containing the members for dividing and delivering the primary air and for delivering the oil.

These members comprise a tubular piece **3** inserted into the end of the part **2**, whose inner surface has a circular cross-section of variable diameter, as shown in the drawing: more detailedly, starting from the interior of the body **1**, said cross-sectional area is gradually decreased, to be then increased and decreased once again, it being terminated by a short substantially cylindrical portion which is confined by a sharp outlet edge.

Within the body **1** is axially and slidably supported a tube **4** by means of the bush **5** and a few fins **6** whose projecting portions **7** slide on the inner surface of the portion **2**.

One end of the tube **4** is within the tubular piece **3**: on said end is mounted also a piece **8**, also of tubular shape, connected to the tube **4** by spokes **9** in which thin ducts **10** are formed, which communicate with the end of the tube **4** and open out of the piece **8**, where the latter has its highest diameter, in the gap **11** between the pieces **8** and **3**.

The shape of the outer surface of the piece **8** is not cylindrical, but it has cross-sectional areas whose diameters vary, roughly with the same trend with which the cross-sectional area of the cavity of the piece **3** varies. As a consequence, the thickness of the gap **11** is roughly constant when the piece **8** is in the position shown in the drawing, whereas it can be throttled, to a larger or lesser extent, by axially displacing the piece **8**.

The other end of the tube **4** which comes out of the body **1** through the bush **5** carries a sleeve **12** which is externally splined and which meshes with a gear **13**: thus the latter, by being rotated, can cause the tube **4** to be axially shifted. To this end of the tube **4** is connected a hose **14** connected to a source of pressurized oil via a valve **15**. This valve is opened more or less by any conventional control, diagrammatically shown at **16** in the drawing. This valve is controlled by a lever **17** connected through a rod **18** to a lever **19** fixed to said gear **13**.

The body **1** has a lower aperture which can be totally or partially closed in an adjustable way by a conventional valve which is depicted in the drawing by two symmetrical vanes **20** pivoted at **21**. This opening is fed by air at a comparatively low pressure, that is, in the order of one meter of column of water, by a blower which has been omitted from the drawing for the sake of clarity.

The burner as described above operates as follows.

Mineral oil, fed through the valve **15** via the tube **14** to the tube **4**, comes out in the form of tiny jets from the ducts **10** into the gap **11**. Concurrently, air blown into the body **1**, guided by the fins **6**, enters the piece **3** and is divided into two streams: one stream enters the

piece **8** and passing through the openings or spaces between the spokes **9** comes out in the form of a central jet from the piece **3**, whereas the other stream enters the gap **11** and comes out also from the piece **3** in the form of a tubular jet which wraps the central jet aforesaid. This latter portion of air fulfils the task of atomizing the mineral oil issuing from the ducts **10**.

When the tube **4**, and concurrently therewith the piece **8**, are axially displaced, the cross-sectional area of the gap **11** is more or less throttled in the vicinity of the outlet of the ducts **10**. Inasmuch as the pressure of the air which is fed to the gap **11**, assuming that the valve **20** is at stand-still, is always virtually constant and equals the pressure fed into the interior of the body **8**, the result is that, by shifting the tube **4** axially by rotating the gear **13**, the rate of flow of the atomizing air, which is just the air flowing through the gap **11**, can be varied without varying the feeding pressure and thus maintain its outflow speed, and also its atomizing efficiency, virtually unaltered.

It is also possible to cause said variation of the rate of flow of atomizing air to be in a preselected relationship with the rate of flow of the fuel oil fed by the valve **15** by properly adjusting the gear ratio obtained with the linkage **17**, **18**, **19** which bounds the tube **4** axially, and thus the piece **8** relative to the piece **3**, to the position of the regulator **16** which controls the valve **15**.

It is thus possible to adopt the optimum ratio of oil to atomizing air through a wide range of rates of flow of fuel oil. The central jet of secondary air which flows in the interior of the piece **8**, conversely, is kept at a substantially constant rate of flow and speed, and thus also its shape remains virtually the same irrespective of the variations of the jet of surrounding air which contains atomized fuel.

The adjustment of the rate of flow of oil and atomizing air can, if desired, be servoed to certain factors which are inherent in the combustion run, for example by a thermometric member such as diagrammatically shown at **22**.

It is understood that the exemplary embodiment shown herein can be variously modified: for example the position of the tube **4** and of the piece **8** could be maintained unvaried and the piece **3** could be made axially displaceable within the part **2**.

I claim:

1. A burner for liquid fuels comprising a tube with an inner surface having a cross-section which is variable along the axis of said tube, a tubular piece within said tube and coaxial therewith, with an outer surface having a cross section which is variable along said axis, a gap between said tubular piece and said tube, a conduit for the fuel within said tubular piece terminating into a plurality of perforations on the region of greatest cross-section of the outer surface of said tubular piece, means for conveying compressed air to one end of said tube, whereby said air passes through said tubular piece and through said gap, and means for displacing said tubular piece axially with respect to said tube.

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U.S. Cl. X.R.

239—417.3

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PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,485,452 Dated December 23, 1969

Inventor(s) Gino SBORLINO

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading to the printed specification column 1 line 3 for "Ioro & Parisini" read -- Loro & Parisini S.p.A. --.

SIGNED AND
SEALED
JUL 7 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
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WILLIAM E. SCHUYLER, JR.
Commissioner of Patents