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(54) **OIL BURNER FOR COMBUSTION OF UNEASY COMBUSTIBLE STUFF**

(57) Oil burner for combustion of uneasy combustible stuff consisting of a fuel inlet (5), which continues into a inner tube (2), in which the fuel flows, further it consists of an outer tube (3) for air or steam, whereas at the end of the outer tube (3) a jet nut (6) is screwed on with one of its ends, which is provided on the opposite end with a stopper (16) and with a tapered chamfer (15), further on the inner tube (2) an atomizer (9) with its one end is mounted and its second end is leaning against a stopper (16) and it is also provided with tapered chamfer (21) which continues into the tapered chamfer (15) on the nut

(6), whereas the atomizer (9) has an inlet mixing chamber (10) which is terminated by an outlet nozzle (11) and behind this outlet nozzle (11), in the direction of fuel flow, there is a jet part (12) of the atomizer (9), which has an outlet hollow (17), whereas on the beginning of the mixing chamfer (10), a pair of tangential nozzles (20) in up to 80 rows is arranged, whereas the jet part (12) of the atomizer (9) tapers towards the outlet nozzle (11) and an inclined wall (22) is created, where four nozzles (19) drilled perpendicularly through this wall (22), which are distributed regularly on its circumference.

Fig.2

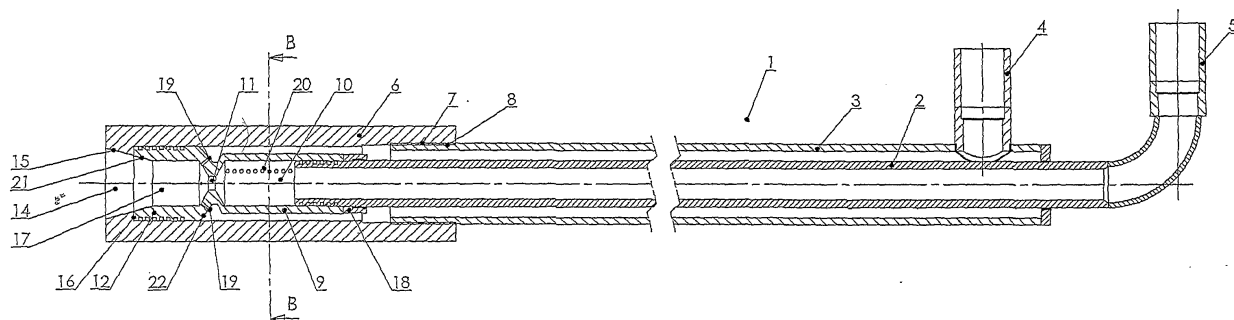
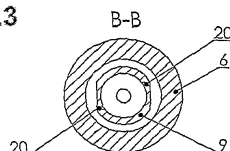


Fig.3



Description

Technical background

[0001] Invention relates to combustion of materials with difficult combustion characteristics.

State of the art

[0002] Liquid fuels are essentially waste products rising from vegetable and livestock production containing materials with small particles, which are at present combustible in conventional burners only with difficulty. Before burning of fuel it is necessary to atomize the fuel, because atomization of fuel increases energy usage of fuel. However, the problem is especially in impossibility of usage of such fuel because of impassability of the small particular in the stuffs through atomizer outlet jets. Due to this choking of jets is occurring and the whole burner can be easy out of function.

[0003] For atomization of fuel, variety of jet shapes are designed. From document US 3,168,131 fuel jet which is ended with extending tapered outlet is known, around which the air is guided. In document US 2,758,880 is fuel jet compressed into the shape of a flat elongated opening. In document US 2,659,427 is the jet circular in principle, but the inner circle is created by blades on the periphery and from inside is regulation cone movably arranged and which is on the circumference provided with embossments which fit against the blades, and according to the adjustment a shaped circular outlet opening is formed.

[0004] The aim of the invention is to introduce a jet for fuel atomization with a new design, which would enable to atomize liquid fluid with low fuel efficiency and its better combustion.

Summary of the invention

[0005] The above mentioned drawbacks are eliminated with oil burner for combustion of uneasy combustible stuff according the invention defined with the features in the independent claim 1.

Description of drawings

[0006] The invention will be described by use of drawings in which Fig.1 is a view of the burner, Fig.2 is a longitudinal cross-section of the burner from Fig.1 along the line A-A, and Fig.3 is a sectional view of atomizer along the line B-B from Fig.2.

Preferred embodiments of the invention

[0007] In Fig.1 is a view of the burner from above. It is evident, that the burner consists of a fuel inlet 5, which continues into an inner tube 2 in which the fuel flows. Further, it consists of an outer tube 3 for air or steam and at the end of the burner there is a nut 6 of an atomizer 9.

[0008] The whole construction of the burner 1 can be seen in sectional view in Fig.2. Again, it can be seen the fuel inlet 5, which continues into the inner tube 2, where the fuel flows, around it there is the outer tube 3 arranged.

The air/steam inlet 4 comes into outer tube 3. At its end the outer tube 3 is provided with an external thread 8. The nut 6 of the atomizer 9 is screwed on with its internal thread 7 on the external thread 8. The nut 6 then covers the atomizer 9. This atomizer 9 is mounted on the end of the inner tube 2 via its mixing chamber 10. The mixing chamber 10 is ended by an outlet nozzle 11 and in front of this outlet nozzle 11, there is a jet part 12 of the atomizer 9. This part has an outlet hollow 17 and this outlet hollow 17 comes at the end into a tapered chamfer 21. This is followed up with a tapered chamfer 15 at the end of the nut 6. In order to follow up chamfers 15 and 21 smoothly, the nut 6 is provided with the a stopper 16.

[0009] It is necessary to ensure an effervescent effect in the outflowing fuel. Therefore, the mixing chamber 10 of the atomizer 9 is provided with two tangential nozzles 20, through which the air enters into the fuel flow and there the mixture is created. The purpose of this air input by tangential nozzles 20, number of them can be e.g. 80, is to bubble through the oil in the tube 2.

[0010] The arrangement of these tangential nozzles 20 is evident from Fig. 3, where there is the sectional view of the mixing chamber 10 of the atomizer 9 along the line B-B from Fig.2. The cross-section is led across the atomizer just through these tangential nozzles 20. The nozzles with effervescent flow are situated so, that the tangential flow inside of the mixing chamber 10 is created. Such arrangement results in rotational whirl on the outlet, which is moving in the same direction and with the same rotation as the combustion air and another consequence is, that this rotation is cleaning the mixing chamber 10 and also the outlet nozzle 11.

[0011] Jet part 12 of the atomizer 9 tapers towards the outlet nozzle 11 and an inclined wall 22 is created on it, and four nozzles 19 are drilled perpendicularly on the wall of the chamfer 22, regularly distributed on the circumference of the inclined wall 22, and through these nozzles 19 the air is supplied into the narrowed flow of the fuel and the air exiting from the outlet nozzle 11. These inclined nozzles 19 supply the energy to the atomized flow of droplets and form the flow.

[0012] It is evident, that the jet part 12 and the mixing chamber 10 of atomizer 9 have different outer diameters. The jet part 12 is mounted on the internal diameter of the nut 6. Between the jet part 12 and the external diameter of the nut 6, there is a labyrinth sealing. By screwing on of the nut 6, the nut 6 is bearing on the front of the jet part 12 with its stopper 16. Simultaneously the atomizer 9 is bearing, with its opposite front than it bears on the nut 6, on an annular stopper 18, which is provided on the inner tube 2.

Industrial applicability

[0013] The novel construction of the burner enables to burn the suspension of liquid fuel and materials with small particles of size up to 2 mm. Atomization of liquid fuel is secured using atomization medium, which can be either pressed air or pressed superheated steam. The pressure of atomization medium can be up to the level of 800 kPa,g, the pressure of liquid fuel is on the level of 700 kPa,g. The jet consists of Y-shaped *mouth* and effervescent part. The jet is intended for atomization of liquid fuel which contains either small foreign particles, which it is not standardly included in fuel, or small particals in stuffs created by technological transformation of fuel (coking, polymeration etc.).

[0014] The novel construction of atomization jet enables to burn the suspensions of liquid fuel, which contain a portion of particular materials, either foreign particles or materials, which arise from the production of the fuel. From commercial point of view, recently there is a demand for usage of oils, which were separated in chemical plants or in waste-treatment plants. These oils contain small particles and therefore they are not suitable for common oil burners. Another area of utility is in usage of new type of atomizer for burning of alternative fluids. First of all, the problems are with bio-oils, where there is a danger of polymerization and pyrolysis oil, which in most cases contains small particles (ash contents, remains of original material). During tests of new type of atomizer it was verified that in this way it is possible to burn both alternative fuels and polluted oils.

clined wall (22), which are distributed regularly on its circumference.

2. Oil burner according to the claim 1, **characterised in that** on the inner tube (2) an annular stopper (18) for the opposite front of the atomizer (9), than that bears on the nut (6) is provided.

Claims

1. Oil burner for combustion of uneasy combustible stuff consisting of a fuel inlet (5), which continues into a inner tube (2), in which the fuel flows, further it consists of an outer tube (3) for air or steam, **characterised in that** at the end of the outer tube (3) a jet nut (6) is screwed on with one of its ends, jet nut (6) is provided on the opposite end with a stopper (16) and with a tapered chamfer (15), further, on the inner tube (2) an atomizer (9) with its one end is mounted and its second end is leaning against the stopper (16) and it is also provided with a tapered chamfer (21) which continues into the tapered chamfer (15) on the nut (6), whereas the atomizer (9) has an inlet mixing chamber (10) which is terminated by an outlet nozzle (11) and in front of this outlet nozzle (11), in the direction of fuel flow, there is a jet part (12) of the atomizer (9), which has an outlet hollow (17), whereas on the beginning of the mixing chamber (10) a pair of tangential nozzles (20), in up to 80 rows, is arranged, whereas the jet part (12) of the atomizer (9) tapers towards the outlet nozzle (11) and an inclined wall (22) is created, where four nozzles (19) are drilled perpendicularly through this in-

Fig.1

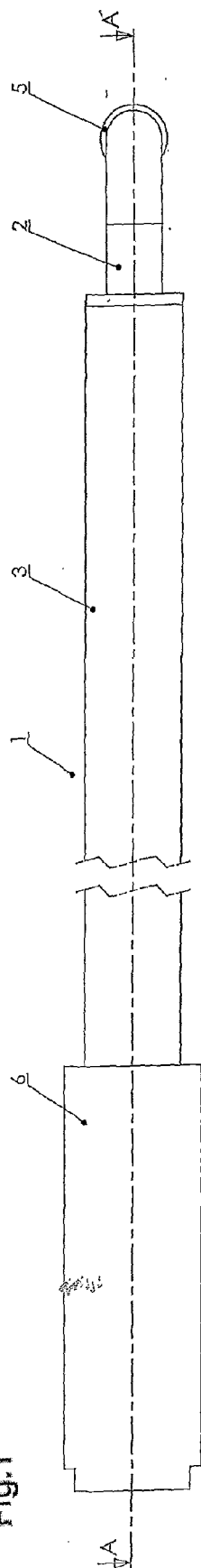


Fig.2

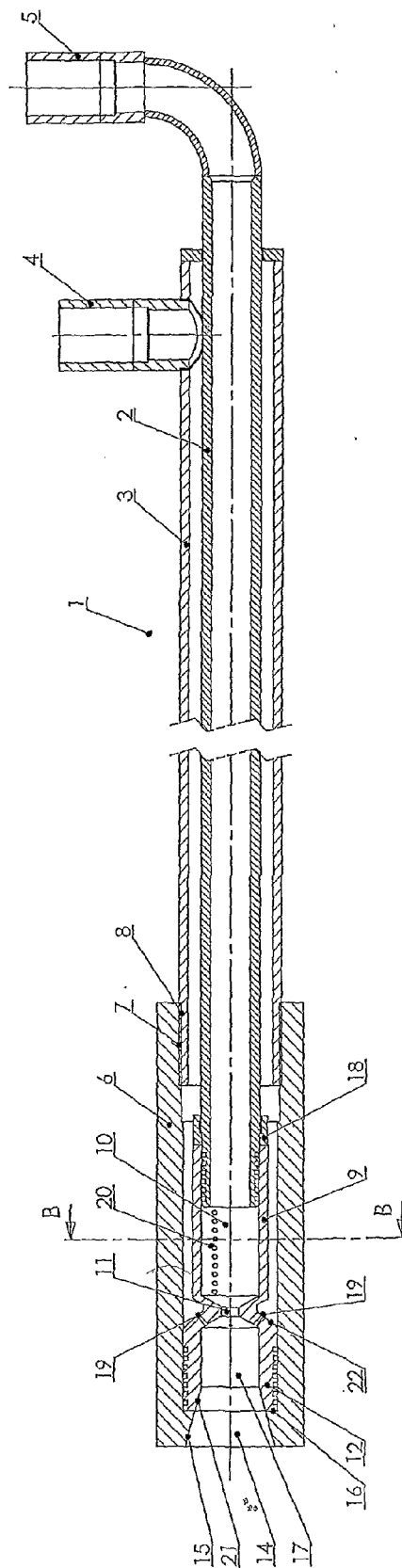
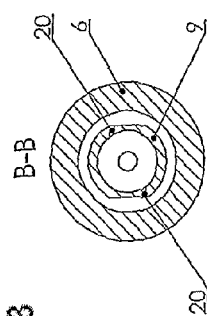


Fig.3





EUROPEAN SEARCH REPORT

 Application Number
 EP 16 16 8601

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 3 897 007 A (ROY JOSEPH G) 29 July 1975 (1975-07-29) * column 2, line 15 - line 68; figures 1-3 *	1	INV. F23D11/10
A	DE 101 33 058 A1 (MESSER GRIESHEIM GMBH [DE]) 23 January 2003 (2003-01-23) * paragraph [0021] - paragraph [0026]; figure *	1	
A	CN 101 435 576 A (UNIV BEIJING [CN]) 20 May 2009 (2009-05-20) * page 6, line 15 - line 19; figure 1 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			F23D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 January 2017	Examiner Theis, Gilbert
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 EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 16 8601

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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16-01-2017

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REFERENCES CITED IN THE DESCRIPTION

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- US 2659427 A [0003]