



(11)

EP 1 731 835 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.12.2006 Bulletin 2006/50

(51) Int Cl.:
F23D 11/44 (2006.01)

(21) Application number: **06425339.6**

(22) Date of filing: **19.05.2006**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI
SK TR**
Designated Extension States:
AL BA HR MK YU

• **BIDOLLI, Massimo**
00155 Rome (IT)

(72) Inventors:
• **BIDOLLI, Luca**
00155 Rome (IT)
• **BIDOLLI, Massimo**
00155 Rome (IT)

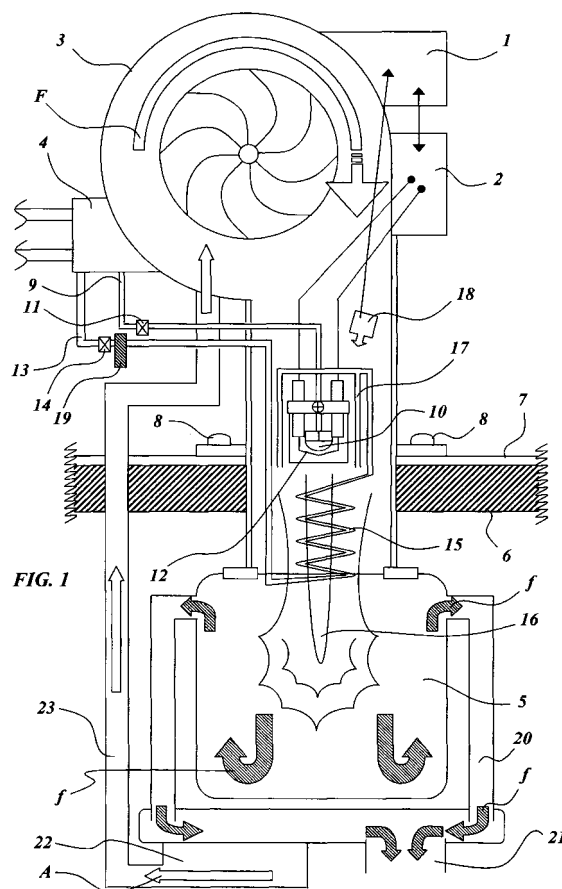
(30) Priority: **25.05.2005 IT RM20050260**

(71) Applicants:
• **BIDOLLI, Luca**
00155 Rome (IT)

(74) Representative: **Perrotta, Luciana**
c/o D. Perrotta & C. S.a.s.,
Via Antonio Dionisi, 61
00151 Roma (IT)

(54) Device for burning gasified liquid fuels

(57) A device for burning gasified liquid fuels includes a central control unit (1), an electric transformer (2), an air pump (3), a fuel pump (4). A first piping (9) terminating in a first nozzle (10) for ejecting the fuel in an atomized liquid state is connected to the supply pump (4). The ejected fuel is ignited by an electrode (12). In addition to such a first burner stage which develops a priming flame in an ignition zone (16), there is a second burner stage formed of a second piping (13) connected to the fuel supply pump (4) for supplying the fuel in a steady state. The second piping (13) has a gasification tract (15), formed as a pipe coil, which passes in the ignition zone (16). The second piping (13) terminates in a passageway (17) for distributing the fuel in the aeriform state in the ignition zone (16).



Description

[0001] The present invention relates to a device for burning gasified liquid fuels. The device is intended to be utilized in both heating boilers and internal combustion engines and in turbine aeronautical motors too, or generally in all those applications in which one has the combustion of a liquid fuel.

[0002] By gasification the generation is meant of aeriform substances by transformation of solid and liquid fuels. The interest is addressed in the present invention to liquid fuels, the gasification of which brings noteworthy advantages which can be summarized in a complete combustion, given the enormous reaction surface the molecular dispersion ensures between the fuel and the comburant, in a better control of the quantity of air necessary for the combustion, in a long flame, in the possibility of interrupting and restarting the combustion at will, in the possibility of concentrating the flames in a restricted space and in the possibility of the recovery of the heat by the preheating of the fuel.

[0003] This invention aims at creating a particular burner arrangement that allows an optimum gasification of a liquid fuel while this one is delivered into a combustion chamber.

[0004] Therefore, according to this invention a device is provided for burning gasified liquid fuels, which includes a central control unit, an electric transformer, a centrifugal pump for supplying air as a comburant, a pump for supplying a liquid state fuel, and, moreover, in communication with a combustion chamber:

a first burner stage, having a first piping and a first nozzle for ejecting the fuel in an atomized liquid state, the first piping being connected to the pump for supplying the fuel and endowed with a first solenoid valve for supplying the priming fuel, the ejected fuel being ignited by an electrode excited by the electric transformer under the control of the central control unit, the first burner stage developing a priming flame in a ignition zone of the combustion chamber;
a second burner stage, having a second piping connected to the pump for supplying the fuel and endowed with a second solenoid valve for the steady-state supply of the fuel, the second piping having a gasification tract passing in said ignition zone such as to allow the transformation of the fuel, which passes inside it, from the liquid state to the aeriform state and terminating in a distribution passageway to be distributed in the aeriform state in said ignition zone, to form a combustion flame caused by said priming flame of the first burner, which is cut out after the ignition of the second burner stage.

[0005] This invention is described to an indicative and not limiting object in an embodiment thereof, referring to the annexed drawing, wherein:

Figure 1 is a schematic, partially cutaway view, of a device for burning gasified liquid fuels according to this invention.

[0006] Referring to the drawing, one has marked a central control unit by 1, and electric transformer by 2, a centrifugal pump for supplying air as a comburant by 3, a pump for supplying liquid state fuel by 4. Centrifugal pump 3 operates to supply air in the direction of arrow F. Such components are assembled in a structure not described and illustrated in detail, but within the skill of the man of the art. Such a structure is applied in a manner which is passing in the interior of a combustion chamber 5, to the wall of which in a refractory material 6 and metal sheet 7 it is fixed by bolts schematized at 8. As schematized, the combustion chamber is surrounded by a hollow space or fumes box 20 for the exhaustion of fumes through a port 21, which also operates, in a rear part thereof, as a heat exchanger for an upper part of a chamber 22 for drawing heated air, indicated by arrow A, for the combustion. Chamber 22 for drawing air is connected through a piping 23 to centrifugal pump 3 for supplying air.

[0007] A first piping 9 terminating in a first nozzle 10 for ejecting atomized liquid state fuel is connected to supply pump 4. First piping 9 is endowed with a first solenoid valve 11 for supplying fuel. First piping 9 is endowed with a first solenoid valve 11 for the supply of the fuel. The ejected fuel, by virtue of the fine crumbling of the droplets, is ignited by an electrode 12, which, connected to the electric transformer 2, is excited under the control of central control unit 1. A first burner stage is so realized, which develops a priming flame in an ignition zone 16 of combustion chamber 5. A second burner stage is formed of a second piping 13 connected with pump 4 for supplying the fuel and endowed with a second solenoid valve 14 for supplying the fuel at a steady state. Second piping 13 has a gasification tract 15, formed as a pipe coil, which passes in the ignition zone 16 of combustion chamber 5. As ignition zone 16 is heated by the priming flame, in gasification tract 15 of second piping 13, one has the transformation of the fuel, which passes inside it, from the liquid state to the aeriform state. Second piping 13 terminates in a distribution passage 17, preferably cylindrical, to be distributed in an aeriform state in ignition zone 16. A combustion chamber is formed therein, caused by the priming flame of the first burner. Thereafter, the priming flame is cut out controlled by central control unit 1. A photoelectric cell 18 for controlling the flame is connected with central control unit 1. As soon as photoelectric cell 18 sees the flame in a steady state, it sends a signal of consent to regular operation to central control unit 1. These interactions are schematically indicated by arrows without reference numbers. The burner in its steady state continues the regular operation, till photoelectric cell 18 sees the flame burning. The flame in the steady state frees fumes schematically indicated by lines with arrows in succession, marked with f.

[0008] It is clear that gasification tract 15 is to be real-

ized in a material fit for withstanding the temperatures of the flame in the steady state of the second stage of the burner, which it is subjected to when the priming flame is cut out and only continues the combustion of the fuel coming out of the passageway for the distribution of the fuel in aeriform phase.

[0009] Suitably, a governor 19 of flow of fuel to burner 17 is envisaged in the second piping. Governor 19 of the flow of fuel, which serves to adjust the flame at the steady state, can be realized under the form of a calibrated-hole plate, interposed in the fuel flow.

[0010] As regards the supply of air, centrifugal pump 3 for supplying air as a comburant draws air for combustion in an upper part of chamber 22 for drawing air. In this way, the supply air is heated at the expense of the exhaust fumes. So, the temperature can even be increased of the combustion chamber, achieving an optimum combustion, substantially devoid of unburnt particles. The environmental pollution is also reduced in such a way.

[0011] It should be apparent that the gasification tract could be externally endowed with other means for heating the fuel which passes inside it, such as for instance an electric resistance, which cooperates to the gasification of the fuel under the control of the central control unit.

[0012] The device according to the present invention can be applied to normal boilers which burn liquid fuels, but also to the combustion in other fields, such as turbine aeronautical motors and internal combustion motors.

[0013] Though not being part of the present invention, the fact is to be taken into account that in combustion motors having traditional carburetion, the position of the chamber having float and metering rod is to be modified to reduce the excessive inflow of liquid fuel. After the chamber having float and metering rod, positioned downstream of the pump for supplying the fuel, the pipe coil is foreseen of the device according to this invention, coiled around one of the pipes for exhausting fumes. In this way the liquid fuel is allowed to pass to the aeriform state and to arrive in this state into the combustion chamber of the motor. It is apparent that in this way the environmental pollution is lowered, whilst the fuel consumption is reduced.

Claims

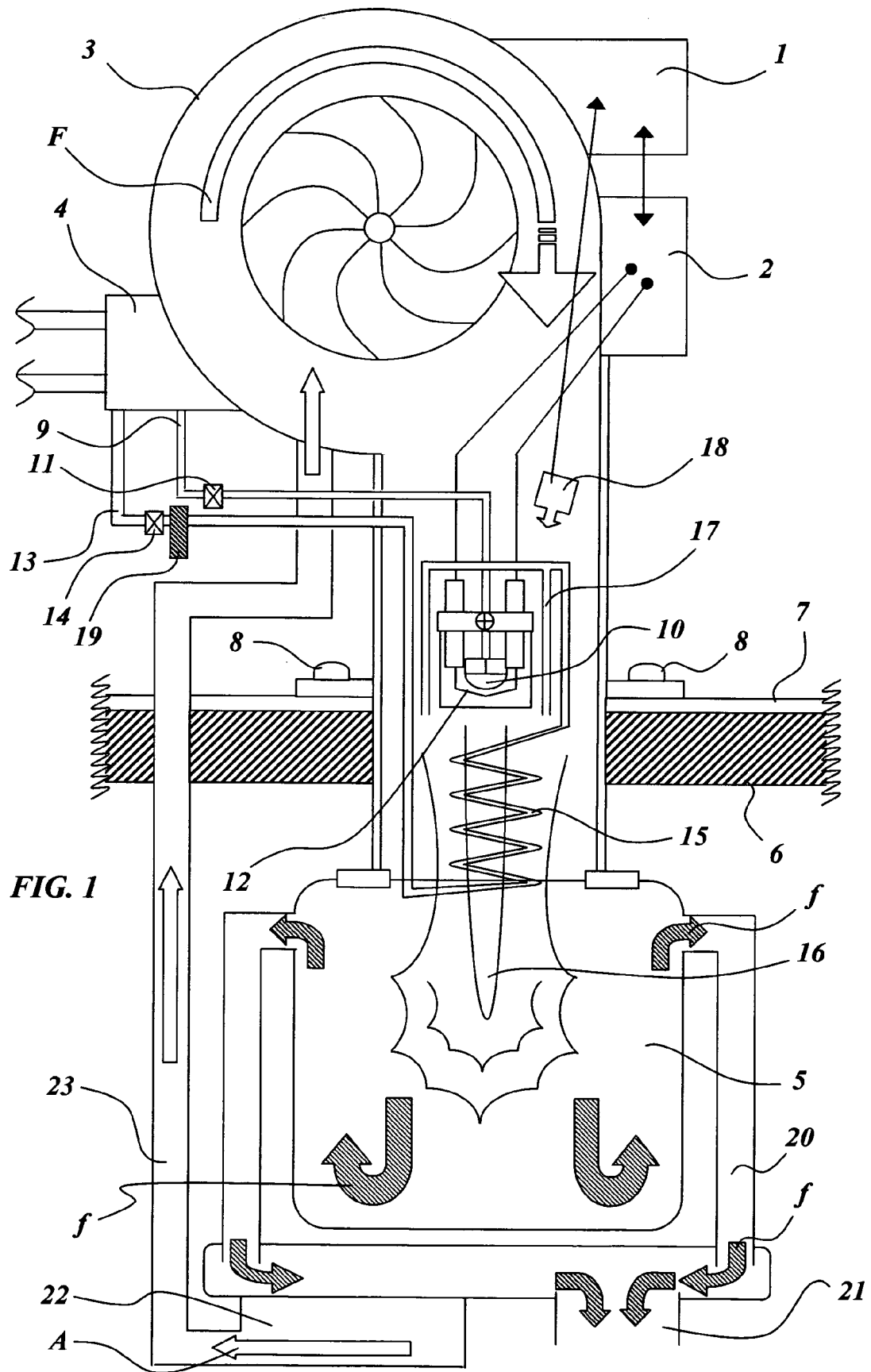
1. Device for burning gasified liquid fuels, which includes a central control unit (1), an electric transformer (2), a centrifugal pump (3) for supplying air as a comburant, a pump (4) for supplying a liquid state fuel, and, moreover, in communication with a combustion chamber (5):

a first burner stage, having a first piping (9) and a first nozzle (10) for ejecting the fuel in an atomized liquid state, the first piping (9) being connected to the pump (4) for supplying the fuel and

endowed with a first solenoid valve (11) for supplying the priming fuel, the ejected fuel being ignited by an electrode (12) excited by the electric transformer under the control of the central control unit (1), the first burner stage developing a priming flame in a ignition zone (16) of the combustion chamber (5);

a second burner stage, having a second piping (13) connected to the pump (4) for supplying the fuel and endowed with a second solenoid valve (14) for the steady-state supply of the fuel, the second piping (13) having a gasification tract (15) passing in said ignition zone (16) such as to allow the transformation of the fuel, which passes inside it, from the liquid state to the aeriform state and terminating in a distribution passageway (17) to be distributed in the aeriform state in said ignition zone (16), to form a combustion flame caused by said priming flame of the first burner, which is cut out after the ignition of the second burner stage.

2. Device according to Claim 1, **characterized in that** said gasification tract (15) is formed as a pipe coil.
3. Device according to Claim 1, **characterized in that** it also includes a photoelectric cell (18) for controlling the flame, connected to said central control unit (1).
4. Device according to Claim 1, **characterized in that** it also includes a governor (19) of the flow of the fuel on said second piping (13).
5. Device according to Claim 4, **characterized in that** said governor (19) of the flow of fuel is a calibrated-hole plate interposed to the flow of fuel.
6. Device according to Claim 1, **characterized in that** said centrifugal pump (3) for supplying air as a comburant draws air for the combustion in an upper part of a drawing chamber (22) in heat exchange with the rear part of a fumes box (20).
7. Device according to Claim 1, **characterized in that** said gasification tract is externally endowed with an electric resistance, which under the control of the central control unit cooperates in the gasification of the fuel.





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5339

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 413 214 A2 (KAERCHER GMBH & CO ALFRED [DE]) 20 February 1991 (1991-02-20)	1,2	INV. F23D11/44
Y	* column 3, line 27 - line 42 * * column 5, line 34 - line 57 * * figures 1,2 *	4-7	
Y	----- US 5 474 442 A (GERTSMANN JOSEPH [US] ET AL) 12 December 1995 (1995-12-12) * column 3, line 36 - column 4, line 12 * * figure 1 *	4,5	
Y	----- US 5 002 481 A (FOERSTER SIEGFRIED [DE]) 26 March 1991 (1991-03-26) * column 3, line 62 - column 4, line 2 * * column 4, line 38 - line 42 * * figure *	6,7	
A	----- US 4 332 547 A (MACDONALD JR JAMES D) 1 June 1982 (1982-06-01) * figure 1 *	1-7	
A	----- DE 24 53 539 A1 (LURZ ANTON) 13 May 1976 (1976-05-13) * page 7, paragraph 2 - page 8, paragraph 1 * * figure 1 *	1-7	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 7 November 2006	Examiner Coquau, Stéphane
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

1
EPO FORM 1503 03.82 (P04C01)

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

EP 06 42 5339

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

07-11-2006

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0413214	A2	20-02-1991	DE 3927159 A1	21-02-1991
US 5474442	A	12-12-1995	NONE	
US 5002481	A	26-03-1991	NONE	
US 4332547	A	01-06-1982	NONE	
DE 2453539	A1	13-05-1976	NONE	