(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
10 April 2003 (10.04.2003)

PCT

(10) International Publication Number
WO 03/029640 A1

(51) International Patent Classification[7]: F02M 25/00, F02D 19/12

(21) International Application Number: PCT/KZ02/00009

(22) International Filing Date: 9 July 2002 (09.07.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2001/1246.1 3 October 2001 (03.10.2001) KZ

(71) Applicants and
(72) Inventors: **BOLOTOV, Albert Vasilievich** [KZ/KZ]; 10 b-22 Abaya pr., Almaty, 480013 (KZ). **NOGAI, Victor Klimentievich** [KZ/KZ]; ul. 15a-1 O.Koshevogo, Talgar, 483310 (KZ).

(74) Common Representative: **BOLOTOV, Albert Vasilievich**; 10 b-22 Abaya pr., Almaty, 480013 (KZ).

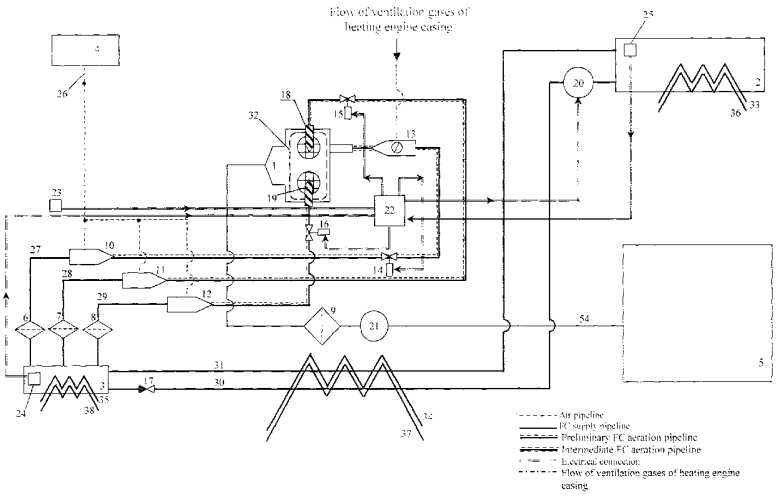
(81) Designated States *(national)*: AE, AT, AU, BA, BB, BG, BR, CA, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KP, KR, LK, LR, LS, MA, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, SD, SE, SG, SI, SK, SL, TR, TT, TZ, UG, US, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) **Title:** SYSTEM FOR ADMIXING AN ADDITIVE TO THE CARBURETOR OF AN INTERNAL COMBUSTION ENGINE



(57) **Abstract:** The invention relates to devices for preparation of fuel intended for feed of internal combustion carburetor engines (ICE). The technical result of the invention is producing of foamed fuel composition (FC), simplification of the system facilities for its preparation, control over the quality and quantity of the consumed FC, depending on the ICE operation mode. It is achieved by the fact that the fuel additive (FA) is supplied to the carburetor chambers (1) through individual pipelines, (27, 28, 29) being switched on successively (14, 15, 16) in response to signals from the temperature sensor (23) of the ICE cooling system. At the same time FA is subject to multi-step aeration by the air (10, 11, 12) and casing gases (13), and is mixed in the carburetor with fuel including hydrocarbon fuel. The produced FC is finally aerated in the foam forming netting (32) while being introduced to the ICE collector, and forms a foamed charge of the ICE combustion chambers.

WO 03/029640 A1

SYSTEM FOR ADMIXING AN ADDITIVE TO THE CARBURETOR OF AN INTERNAL COMBUSTION ENGINE

The invention relates to devices for preparation of fuel intended for feed of internal combustion carburetor engines (ICE).

There has been known fuel system for ICE (Inventors Certificate SU No. 1353918, cl. F 02 M 25/14, 1987), comprising a feed line of anti-knock fuel additive (FA), and devices for its mixing with hydrocarbon fuel, in which the whole system for preparation of a fuel composition (FC) is complicated, and the use of the produced composition does not exclude the fuel equipment failure because water as a part of FC is in a free state.

There has been known fuel system for ICE taken as a prototype (RU patent No. 2030620, cl. F 02 M 25/10, 1995), comprising a fuel tank, fuel lines, fuel pump, carburetor, filters, shut-off cocks, where a system of devices is included, providing control over fuel supply to the carburetor, depending on the engine operation, comprising fuel level sensors and membrane sensor of the gas mixture pressure. Such a system provides large economical efficiency of ICE, but its sensors are complex and not reliable enough in operation. Besides, like in the analogue, in the produced fuel the water is in a free state, that promotes its coagulation and causes failures of fuel equipment, in particular, carburetors. The fuel power efficiency is in a direct dependence on the petrol octane number.

The objective of the invention is the development of a reliable system for preparation of a fuel composition (FC) providing the increase of FC power efficiency, ICE fuel economical efficiency, reduction of toxicity and exhaust opacity, by simplifying the system design.

The technical result of the invention is producing of foamed fuel composition, simplification of the system facilities providing their high efficiency, and control over the quality and quantity of the consumed FC, depending on the ICE operation mode.

It is achieved by the fact that the system for FC preparation for the carburetor ICE is supplied with an exhaust pipe, the system of caseing ventilation and cooling system having temperature sensor, comprising a fuel tank, fuel lines, fuel pump, carburetor with a float chamber, shut-off cocks and a system of FA preparation, comprising a service tank with a filler neck and FA supply branch pipe, FA pump, FA pipe lines and air (pipe) lines, the system of FA preparation also includes a distribution tank connected with the FA pump, being fed from the service tank, FA supply control unit, electrically connected with the temperature sensor, cooling fluid, three pipe lines connecting the distribution tank with the idle running system, carburetor diffusion cell chambers, valves being controlled by the control unit, and aerators connected to the air (pipe) lines, one of the pipe lines being connected to a meter-aerator set in the pipeline of the ICE casing ventilation system, the other two pipe lines being connected with injectors – nozzles, placed in the carburetor diffusion cell chambers, and a foam forming netting being set between

the carburetor and the ICE collector. At the same time thedistribution tank can be furnished with a FA level sensor in a kinematics way connected with the FA pump, the aerator can be made in the form of Venturi tube with a nozzle set in the FA supply line, connected with the air (line) pipe through a jet for FA aeration, the jet diameter can be D_j = 0.1÷3.0 mm, and the length $L_j = (0.1÷2)D_j$. Besides, the meter-aerator can be made like a branch pipe having a damper and nozzle – connecting pipe of FC supply, set perpendicular to the longitudinal axis of the branch pipe, the damper being like a threaded plug with a check-nut and semi-spherical tip, the radius thereof being equal to the radius of the branch pipe hole, set in the branch pipe wall for the controlled lap of the branch pipe and directing the gas flow to the nozzle-connecting pipe, and the distance between the longitudinal axes of the damper and nozzle - branch pipe being 0.5÷20 mm, injector-nozzle can be arranged like a connecting pipe with a concentrically placed piped tip, having an axis calibrated orifice with the diameter of 0.1÷2.0 mm, and at least, one orifice in the wall, where the piped tip can be arranged conjointly with the connecting pipe, or apart from it, the foam forming netting can be arranged as, at least, one semi-sphere with the total open flow area of S_a = (0.1÷8.0 m)S_{is}, where S_i – sectional area of the ICE collector inlet, where it has a coating of metal compounds, nickel and platinum-palladium alloy. For achieving a technical result, the pipelines connecting service and distribution tanks can be polymeric, made, for example, of polyethylene, or metallic with amortization areas, where the pipeline is spiral. FA

system can be furnished with heating devices for heating FA in the pipelines, in the service and/or distribution tank, where heating devices can be electrical and function from the cooling system agent, or exhaust gases.

Besides, in the FA service tank the tank neck is supplied with filler pipe, where the outlet of the filler pipe and inlet of the FA reverse feed branch pipe, and also FA feed pipe orifice in the distribution tank are placed by the bottom of the tanks.

Establishing of three pipelines for FA supply from the distribution tank to the carburetor, equipped with control valves, operating in response to a signal from the temperature sensor of the ICE cooling system allows to control the FA supply, and consequently the FC compound, depending on the operation mode and the degree of ICE warmness, that facilitates the start-up of the cold engine, and in the warmed up engine it decreases the share of hydrocarbon fraction in the fuel composition, i.e. shifting the ICE to a more economical mode of operation.

Equipping the FA pipelines with aerators, meter-aerator and injectors-nozzles provides two-stepped aeration of the fuel addition when it is being prepared, and the availability of the foam-forming netting – FC aeration in the carburetor, and when it is being introduced into the combustion chambers of ICE cylinders. As a result there occurs a foam-like FC structure, uniform and homogeneous, with an increased number of inflammation sources and their uniform distribution over the whole

FC charge, where the water contained in FC is not in a free state, but like a film, that prevents its coagulation. Therefore power efficiency of fuel increases, detonation stops even when using a low-octane petrol, failures of fuel equipment are liquidated, more complete FC combustion is provided, that causes the decrease of ICE harmful exhausts. And the replacing of petrol for a cheap fuel additive in FC makes it a cheap fuel.

Devices for FA aeration are simple in their design, mixing of FC components occurs in the carburetor and in its outlet, i.e. it does not require special equipment, therefore the whole system of FC preparation is distinguished for its simplicity.

The main point of the invention is explained by drawings, where Figure 1 gives a general scheme of FC preparation for the ICE carburetor, Figure 2 shows FA carburetor, Figure 3 – FA meter-aerator, Figure 4 – foam forming netting, Figure 5 – injector-nozzle, Figure 6 – scheme of setting FA heaters, Figure 7 – scheme of connecting FA service and distribution tanks.

The system of FC preparation for the carburetor ICE has the following design.

FA is supplied to carburetor 1 (Figure 1) from the service tank2 through the distribution tank 3, and hydrocarbon fuel (petrol) – from the service fuel tank 5. Besides, the fuel supply system includes a fuel pump 21, filter 9, the system of FA preparation, besides tanks 2 and 3, includes pump 20, pipelines 27, 28, 29 with filters 6, 7, 8, aerators 10, 11, 12, control valves 14, 15, 16, being operated from control unit 22, connected

with temperature sensor 23 of the cooling fluid. The first pipeline 27 is also connected with meter – aerator 13, after passing thereof FA enters carburetor 1. And the second 28 and third 29 pipelines are ended with injectors-nozzles, being introduced into the carburetor diffuser chambers. Aerators 10, 11, 12are connected with air (pipe) line 26 supplying air from the air cleaner 4. FA service tank 2 and distribution tank 3 are supplied with FA level sensors 25 and 24 and connected by a pipeline of the FA emergency effluent 31. A foam forming netting 32 is placed at the carburetor outlet 1. For FA heating the system comprises heating devices. In the service tank an electric heater 33 is placed and/or a heater working from exhaust gases or heated cooling fluid 36, in the distribution tank – respectively – heaters 35 and 38, and for heating the pipelines – 30 and 31 heaters 34 and 37 are used.

Each of the aerators 10, 11, 12 is prepared in the form of Venturi tube, with a conic nozzle, placed in the line of FA supply (Figure 2). At the nozzle throat a jet is made, which is coming from the line of air supply and providing air inflow to the FA flow. Optimal dimensions of the jet are established experimentally and its diameter is $D_j = 0.1 \div 3.0$ mm, and the length - $L_j = (0.1 \div 2.0) \cdot D_j$.

Meter – aerator 13 is made like a branch pipe, being placed in the line of the ICE case ventilation (Figure 3). Perpendicular to the branch pipe axis orifice with the diameter D_c in its walls are fastened a cylindrical threaded plug 44 with a check-nut and spherical tip having radius $R_3 = 0.5\ D_c$, and a connecting pipe 43 for the supply of

preliminarily aerated FA. The threaded plug plays the role of a adjusting valve for closing the branch pipe channel. In the connecting pipe 43 there is a jet coming out to the branch pipe channel below the throttle valve 44 with stream of gas flows. Thus, the controlled hole of the branch pipe channel takes a crescent form and is located in such a way, that the flow coming out from it is directed to the outlet orifice of the connecting pipe nozzle 43, that increases the efficiency of FA suction to gas flows and their mixing. The distances between the axes of the connecting pipe nozzle 43 and the valve can be 0.5 ÷ 20 mm.

Each of the injectors-nozzles 18 and 19 consists of two parts: connecting pipe 45, through which there comes a flow of preliminarily aerated FA, and piped tip-nozzle 46 with a through pivotal calibrated orifice (Figure 5), which is placed in the wall of the carburetor diffusion cell chamber. In the tip wall 46 there is one ore several orifices, for example, in the form of saw cuts, through which air is sucked to the FA flow, additionally aerating it. The tip – nozzle 46 can be made conjointly with the connecting pipe 45, or apart from it with a releasable connection. The use of the injector – nozzle of such a design provides improvement of mixing FA with FC hydrocarbon fraction and preliminary FC aeration.

Final FC aeration takes place upon its passing through the foam forming netting under FC charge supply to the combustion chambers of the working ICE cylinders. The foam forming netting 32 is made in the form of one or several hemispheres (Figure 4) out of metal with coating

out of metal compounds, nickel and platinum-palladium alloy, which is a catalyst while interacting with FC mixture passing through the netting. The amount of netting meshes comes to $S_n = (1.8 \div 8.0)\, S_{in}$, S_{in} - sectional area of the ICE collector inlet orifice.

In order to eliminate the aftereffects of the system vibration when a car moving, the pipelines 30 and 31, connecting the tanks 2 and 3, are made with damping areas where the pipeline has a form of a cushioning spiral (Figure 6), or the above pipelines can be made out of polymer, for example, polyethylene.

In order to eliminate the low temperature influence on the FA state, in FA tanks 2 and 3 and on pipelines 30 and 31 heaters 33, 34, 35, 36, 37, 38 are placed (Figure 6). Here, there have been used the known electric heaters 33, 34, 35 or heaters 36, 37 using the heat of exhaust gases coming through the pipeline of branch 47 from the exhaust pipe 49 through the valve "winter-summer" 8, or heaters 38 using heat of the warmed cooling agent of the ICE cooling system – fluid or air coming through pipeline 50.

The FA service tank 2 has a filler tube 52, placed in the throat 51 (Figure 7). It also comprises a branch pipe of FA supply to pump 20 and pipeline 30, supplied with check-valve 17, and branch pipe of FA entry from distribution tank 3 through the pipeline of emergency discharge 31. In order to avoid FA foaming in tank 2, the hole of tube 52 and branch pipes are located close to the tank bottom.

The system for FC preparation operates as follows.

Preliminarily distribution tank 3 is filled with FA from service tank 2 by means of pump 20 through pipeline 30.

As the start-up of the engine and its idle running operation, valve 14 opens, and by discharge produced by ICE, FA starts coming from distribution tank 3 through intake filter 6 in pipeline 27 to aerator 10, where it is preliminarily aerated by air coming to aerators from air cleaner 4 in air pipe line 26. After that the preliminarily aerated FA enters the meter-aerator 13, where it homogenizes with engine case ventilation gases, is subject to intermediate aeration, and then it is supplied to carburetor 1, being mixed with combustible mixture, including hydrocarbon fuel, entering from tank 5, atomized in the first chamber of the carburetor under the throttle valve, and the produced fuel composition (FC) is finally aerated at the moment of foaming in foam forming netting 32, before being introduced into ICE cylinders.

Once the engine has been heated up to the operating temperature, from temperature sensor of the cooling system 23, to the control unit there enter signals 22, resulted in the opening of valves 15, 16; under average loads of ICE operation the valve of the first carburetor chamber opens and FA under the effect of discharge enters intake filter 7, pipeline 28, preliminarily aerated in aerator 11, intermediately aerated by atomization with injector-nozzle 18 in the diffusion cell of the first chamber and is mixed with combustible mixture, forming FC, is finally aerated at the moment of foaming on netting 32, before being supplied to ICE cylinders. In this FC there increases the contents of FA, as its

amount is summed up, that is supplied in pipelines 27 and 28, and the amount of hydrocarbon fuel decreases – respectively.

Under high loads of ICE operation the valve of the second carburetor chamber opens, and FA under the effect of discharge enters intake filter 8, pipeline 29, valve 16, preliminarily aerated in aerator 12, intermediately aerated by atomization with injector-nozzle 19 in the diffusion cell of the first carburetor chamber, is mixed with combustible mixture and finally forms FC with more contents of FA that aerates at the moment of foaming on netting 18, before being supplied to ICE cylinders.

At the negative temperature of the environment heaters 33, 34, 35, 36, 37, 38 are switched on for heating tanks and FA pipelines.

Under the failure of the system elements and overfilling of the distribution tank the system of emergency discharge operates and FA returns to service tank 2 through pipeline 31.

CLAIMS

1. Systems for preparation of fuel composition for a carburetor internal combustion engine (ICE) having an exhaust pipe, case ventilation system and cooling system with temperature sensor, comprising a fuel tank, fuel pipes, fuel pump, carburetor with float chamber, filters, shutoff cocks and system for preparation of fuel additive (FA), comprising service tank with filler throat and FA supply branch pipe, FA pump, FA pipelines and air (pipe) lines, **wherein** the system of FA preparation includes a distribution tank connected with the FA pump being fed from the service tank, FA supply control unit, electrically connected with the temperature sensor in the engine cooling system, pipelines connecting the service tank with the diffusion cell chambers of the carburetor, each of them being supplied with a filter, a valve being controlled from the control unit, and aerator connected with the air (pipe) line, where one of the pipelines is connected with a meter-aerator installed in the pipeline of the ICE case ventilation system, other pipelines are connected with injectors – nozzles placed in the carburetor diffusion cell chambers, and between the carburetor and ICE collector a foam forming netting is installed.

2. The system as set forth in claim 1, **wherein** the service tank is provided with FA level sensor electrically connected with FA pump.

3. The system as set forth in claim 1, **wherein** the aerator of the FA preparation system is made in the form of Venturi tube, in which a nozzle is placed in the FA supply line, and for the air suction from the air (pipe)

line, at least one jet is made being installed in the nozzle throat and having the diameter $D_j = 0.1 \div 3.0$ mm, and the length $L_j = (0.1 \div 2)\ D_j$.

4. The system as set forth in claim 1, **wherein** the meter – aerator of the FA preparation system is made in the form of a branch pipe having a throttle valve and FA supply jet-connecting pipe installed perpendicular to the branch pipe longitudinal axis, where the valve has a form of a threaded plug with a check-nut and hemispherical tip, radius thereof being equal to the radius of the branch pipe hole, $R_v = 0.5D_{c\text{-}n}$ installed in the branch pipe wall for the controlled lap of the branch pipe hole and directing the gas flow to the jet-connecting pipe, and the distance between the longitudinal axis of the valve and jet-connecting pipe is 0.5 $\div$ 20 mm.

5. The system as set forth in claim 1, **wherein** the injector – nozzle of the FA preparation system is made in the form of a connecting pipe with a concentrically located piped tip having an axis calibrated orifice with diameter 0.1 $\div$ 2.0 mm and, at least, one hole in the wall.

6. The system as set forth in claim 5, **wherein** the piped tip is made conjointly with the connecting pipe.

7. The system as set forth in claim 5, **wherein** the piped tip is made as a separate element connectable with the connecting pipe.

8. The system as set forth in claim 1, **wherein** the foam forming netting of the FA preparation system is made as, at least, one hemisphere with the total open flow area $S_a = (1.0 \div 8.0\ m)\ S_{is}$, where S_i – sectional area of the ICE collector inlet, where it has a coating of metal compounds.

9. The system as set forth in claim 1, **wherein** the pipelines connecting the FA service and distribution tanks are made metallic or polymeric, for example, out of polyethylene.

10. The system as set forth in claim 1, **wherein** the pipelines connecting the FA service and distribution tanks are made of metal and have damping areas with a spiral location of the pipeline.

11. The system as set forth in claim 1, **wherein** the system of FA preparation is equipped with devices for heating FA in the pipelines, in the service and/or distribution tank.

12. The system as set forth in claim 11 **wherein** the heating devices are made as heat exchangers connected with the ICE exhaust pipe.

13. The system as set forth in claim 11 **wherein** the heating devices are made as heat exchangers connected with the ICE cooling system.

14. The system as set forth in claims 11, 12 or 13 **wherein** the heating devices are equipped with electroheating elements.

15. The system as set forth in claim 1 **wherein** in the FA service tank the tank neck is equiped with filler tube, where the outlet port of the filler tube and the inlet port of the FA reverse feed branch pipe, and also the port of FA feed in the distribution tank are located by the bottom of the tanks.

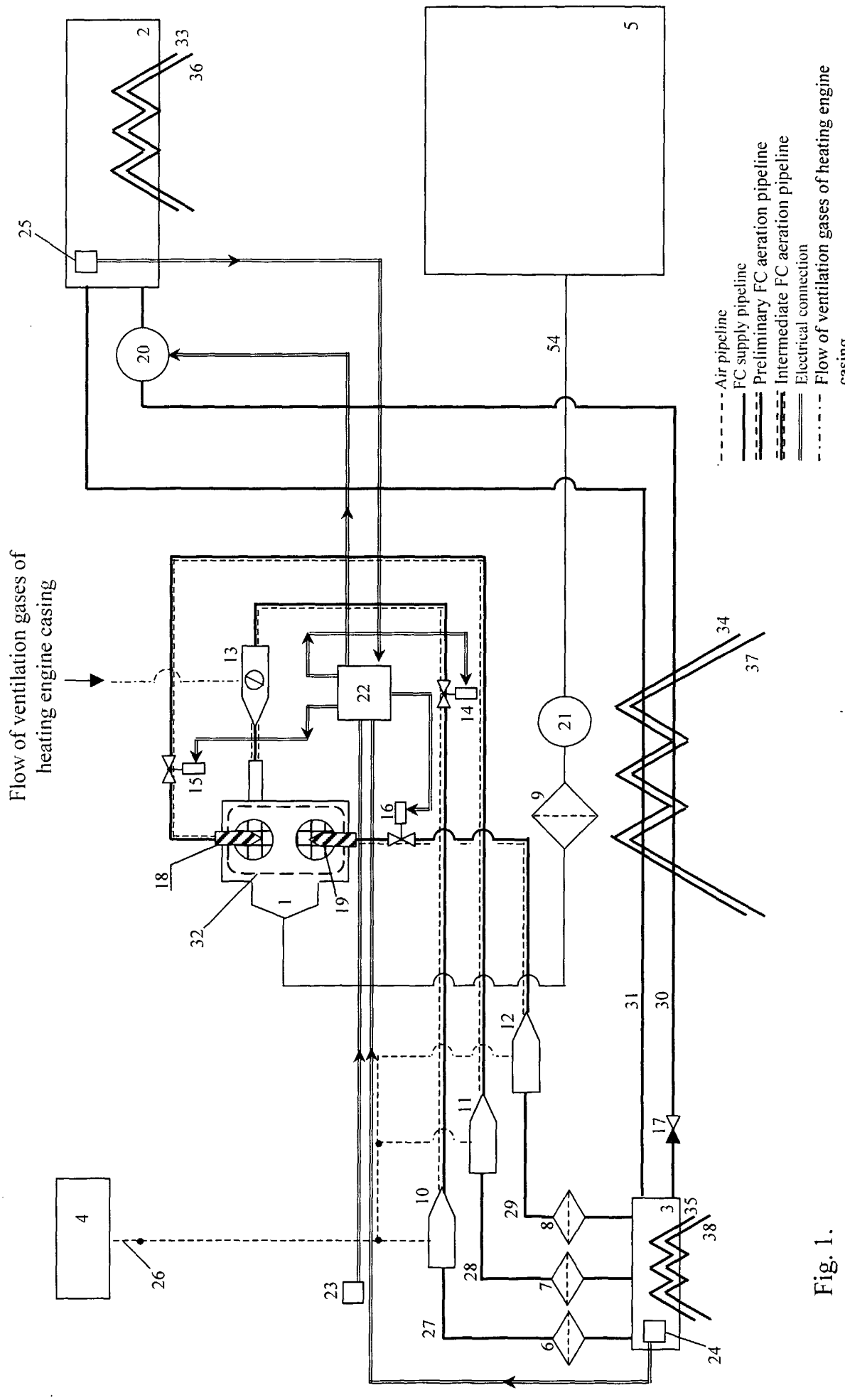

Flow of ventilation gases of heating engine casing
Air pipeline
FC supply pipeline
Preliminary FC aeration pipeline
Intermediate FC aeration pipeline
Electrical connection
Flow of ventilation gases of heating engine casing
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
54

Fig. 1.

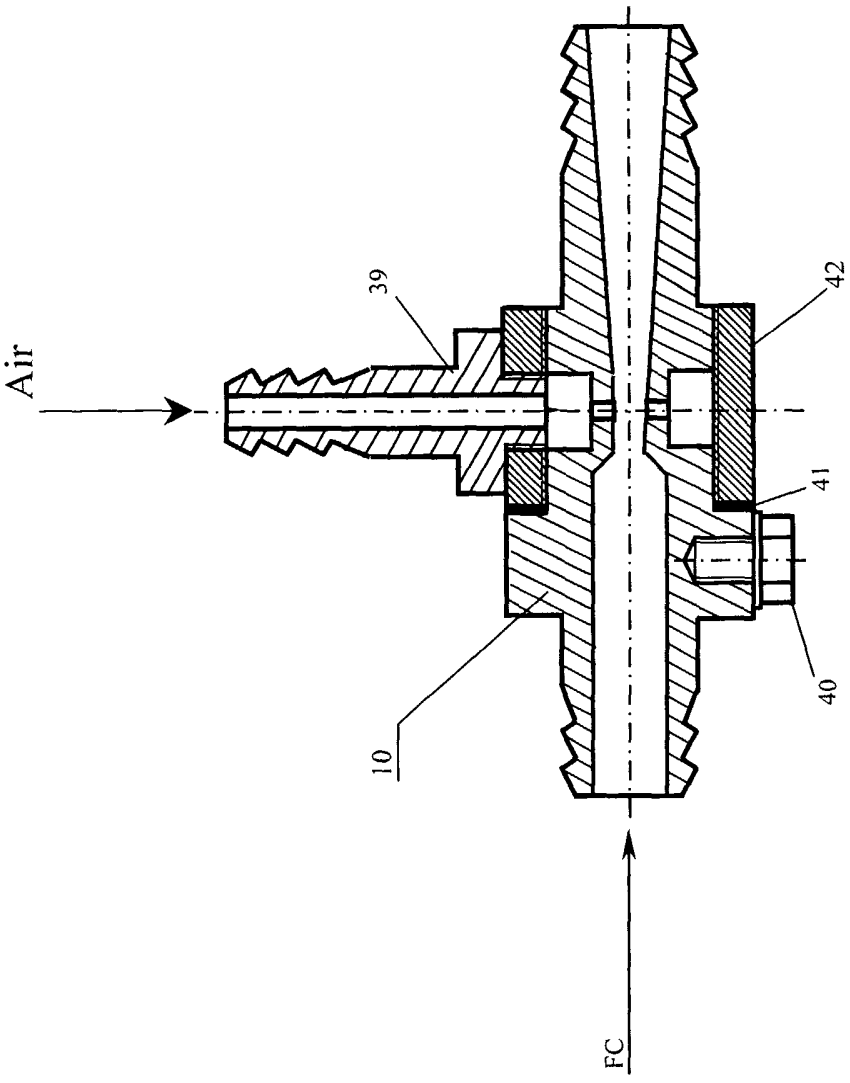


Fig. 2.

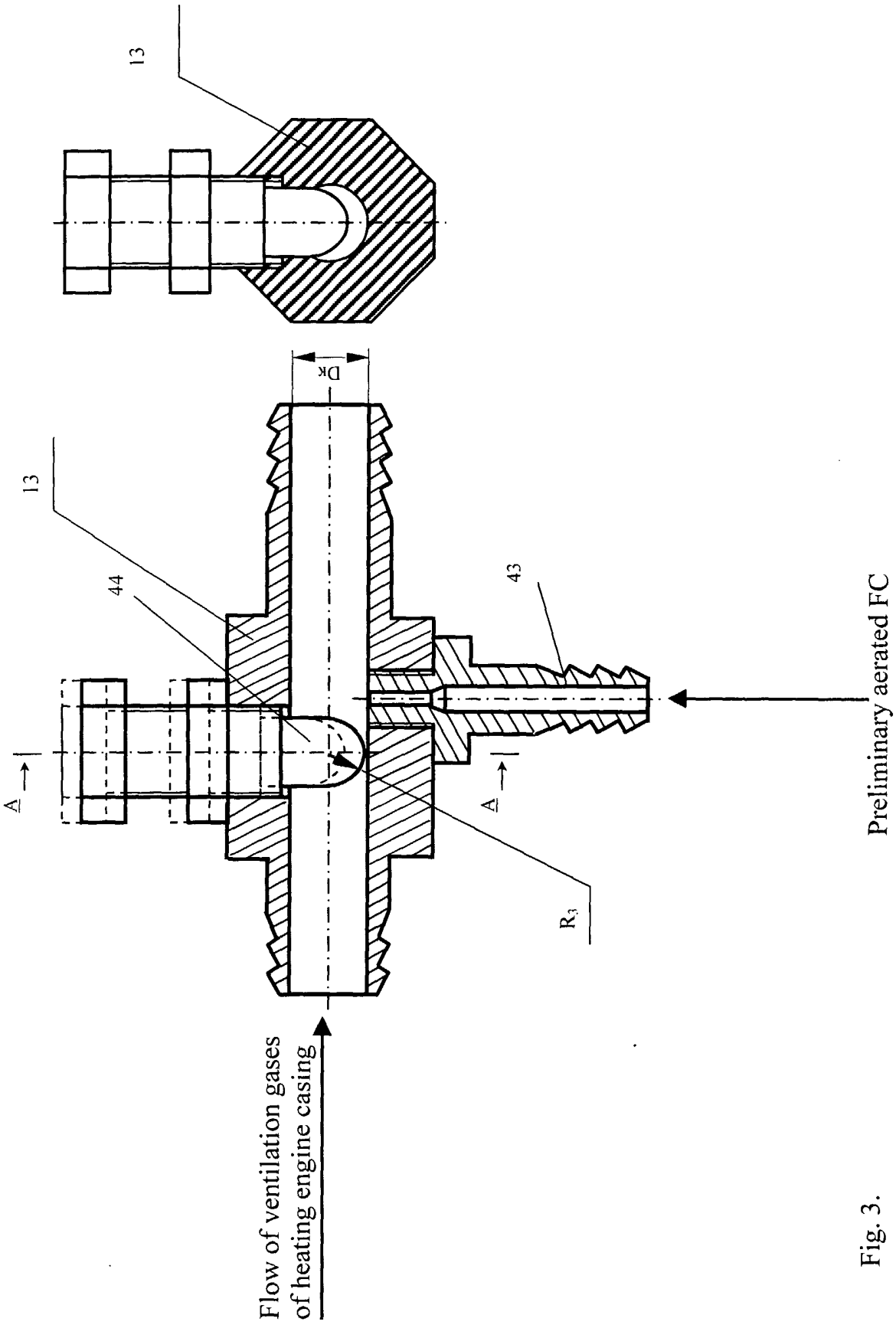

13
13
44
43
A
A
Dк
R3
Flow of ventilation gases of heating engine casing
Preliminary aerated FC

Fig. 3.

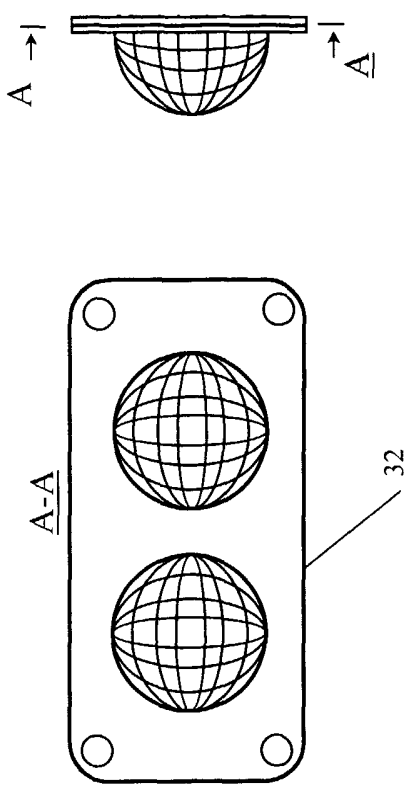


Fig. 4.

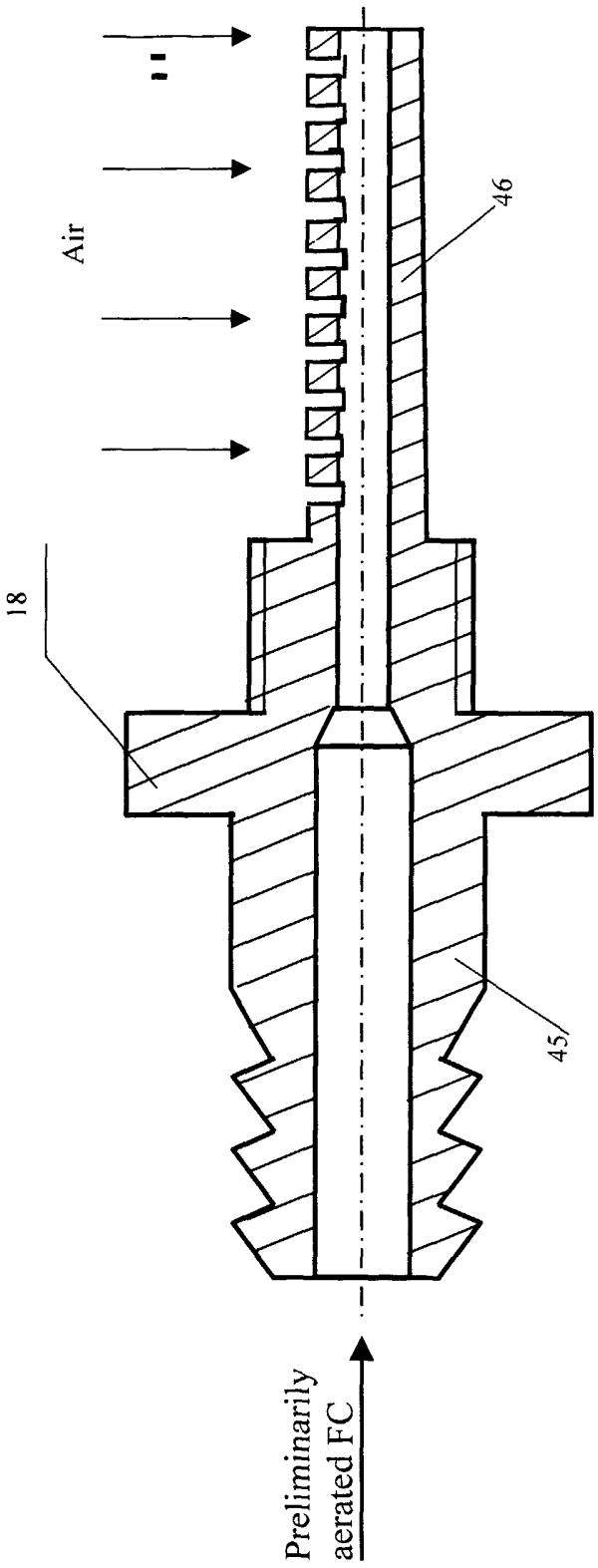


Fig. 5.

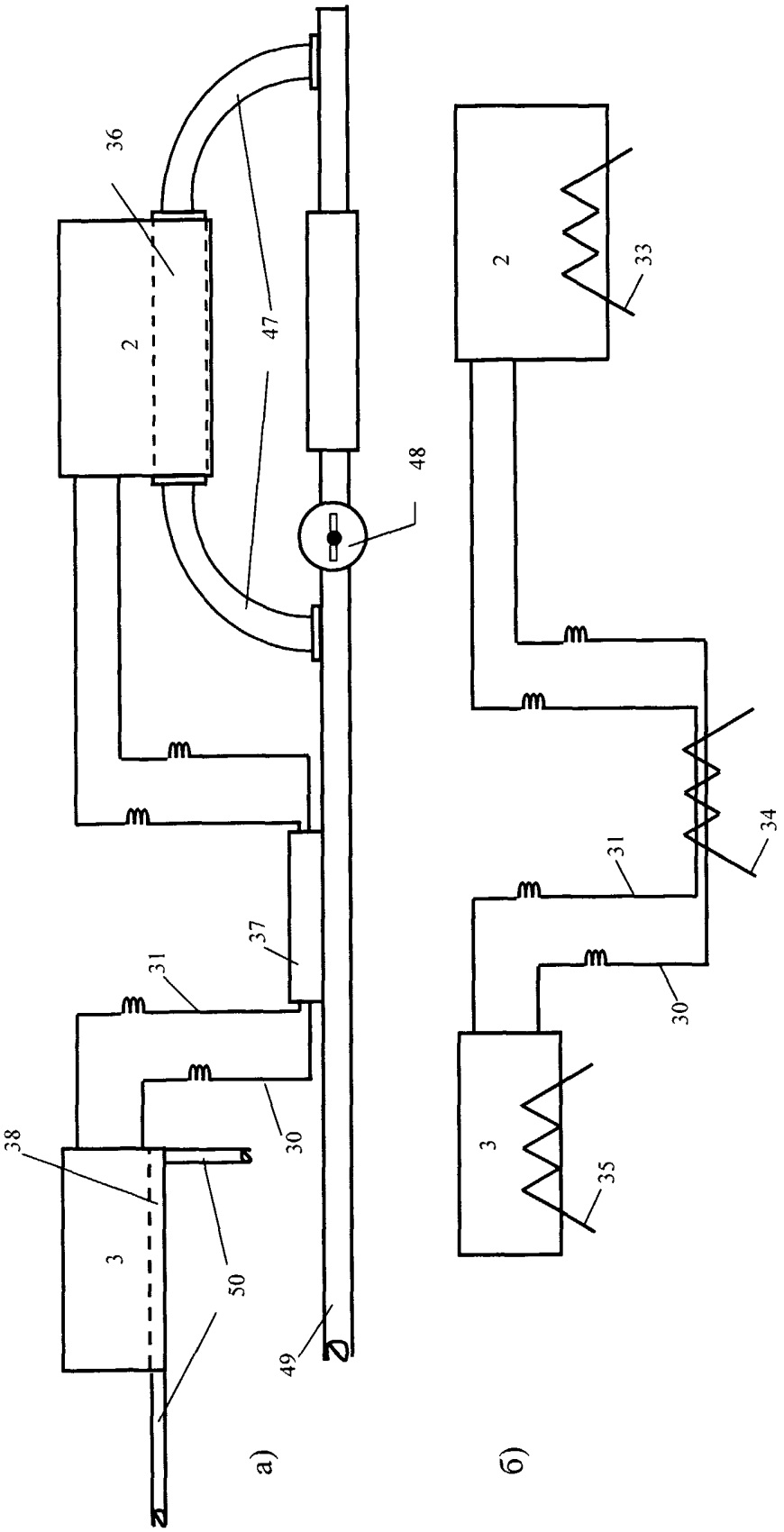


Fig. 6.

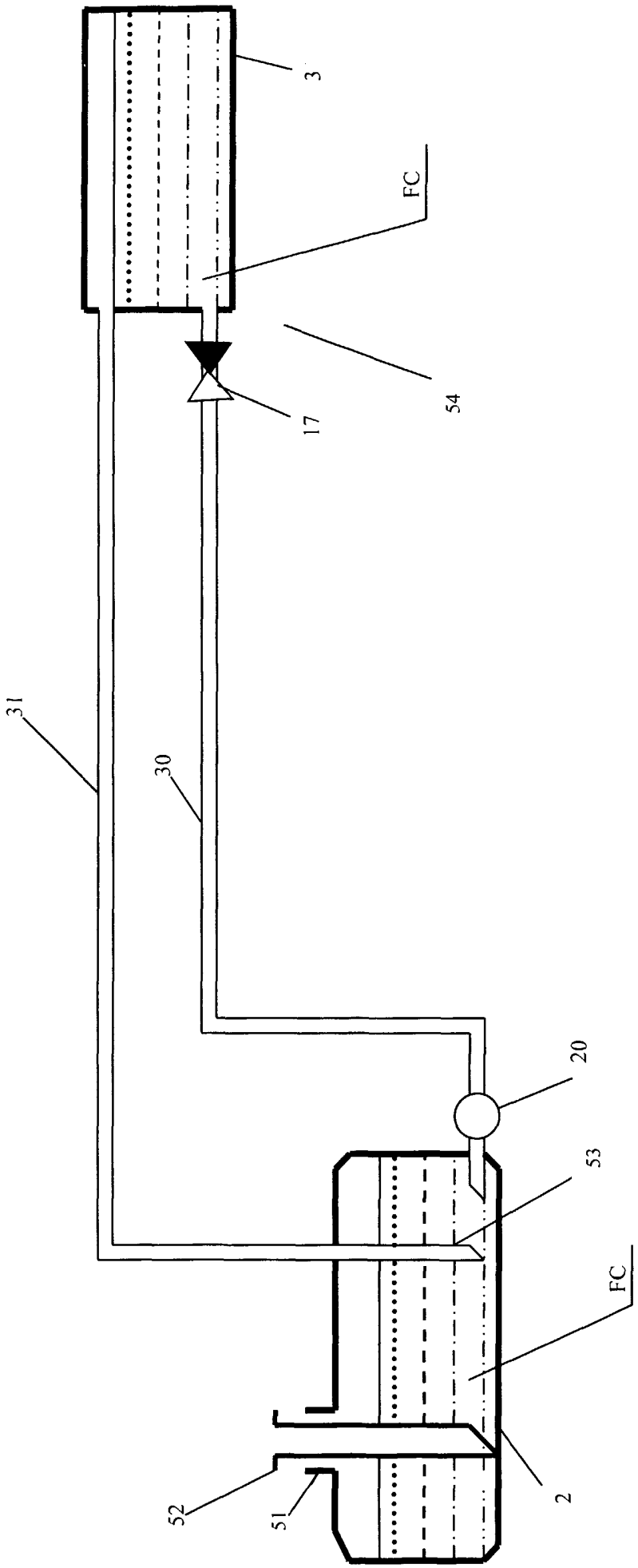


Fig. 7.

INTERNATIONAL SEARCH REPORT

In tional Application No
PCT/KZ 02/00009

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F02M25/00 F02D19/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 F02B F02D F02M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 183 338 A (LINDBERG JOHN E) 15 January 1980 (1980-01-15) abstract; figures column 5, line 40 -column 8, line 11 ---	1
A	US 4 416 224 A (HOBBY WILLIAM M; VALDESPINO JOSEPH M) 22 November 1983 (1983-11-22) abstract; figures column 5, line 24 -column 6, line 41 column 8, line 32 -column 9, line 2 --- -/--	1

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 October 2002	08/11/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Döring, M

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Int ional Application No
PCT/KZ 02/00009

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 409 931 A (LINDBERG JOHN E) 18 October 1983 (1983-10-18) abstract; figures column 17, line 62 -column 18, line 39 column 31, line 12 -column 38, line 9 column 49, line 31 -column 50, line 66 column 52, line 64 -column 53, line 59 column 62, line 12 -column 89, line 55	1
A	DE 196 39 488 A (HUBERT TIPPKÖTTER GMBH) 9 April 1998 (1998-04-09) abstract; figure column 2, line 32 -column 3, line 51	1
A	DATABASE WPI Section PQ, Week 199542 Derwent Publications Ltd., London, GB; Class Q53, AN 1995-327002 XP002218702 -& RU 2 030 620 C (VASIN ALEKSANDR PETROVICH (RU)), 10 March 1995 (1995-03-10) cited in the application abstract; figures	1
A	DATABASE WPI Section PQ, Week 198824 Derwent Publications Ltd., London, GB; Class Q53, AN 1988-167102 XP002218703 -& SU 1 353 918 A (BRATKOV ANATOLIJ A ET AL (SU)), 23 November 1987 (1987-11-23) cited in the application abstract; figures	1
A	EP 0 006 687 A (LEONG CHAI MUN) 9 January 1980 (1980-01-09) abstract; figures page 5, last paragraph -page 8, paragraph 1 page 10, paragraph 1 -page 11, paragraph 2	1
A	PATENT ABSTRACTS OF JAPAN vol. 010, no. 315 (M-529), 25 October 1986 (1986-10-25) -& JP 61 123752 A (SUPIRURINA KENKYUSHO:KK), 11 June 1986 (1986-06-11) abstract; figures	1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

information on patent family members

Int onal Application No
PCT/KZ 02/00009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4183338 A	15-01-1980	NONE	
US 4416224 A	22-11-1983	US 4480595 A	06-11-1984
US 4409931 A	18-10-1983	US 4393817 A	19-07-1983
DE 19639488 A	09-04-1998	DE 19639488 A1	09-04-1998
RU 2030620 C	10-03-1995	RU 2030620 C1	10-03-1995
SU 1353918 A	23-11-1987	SU 1353918 A1	23-11-1987
EP 0006687 A	09-01-1980	GB 1601496 A AU 4735179 A EP 0006687 A1	28-10-1981 29-11-1979 09-01-1980
JP 61123752 A	11-06-1986	NONE	