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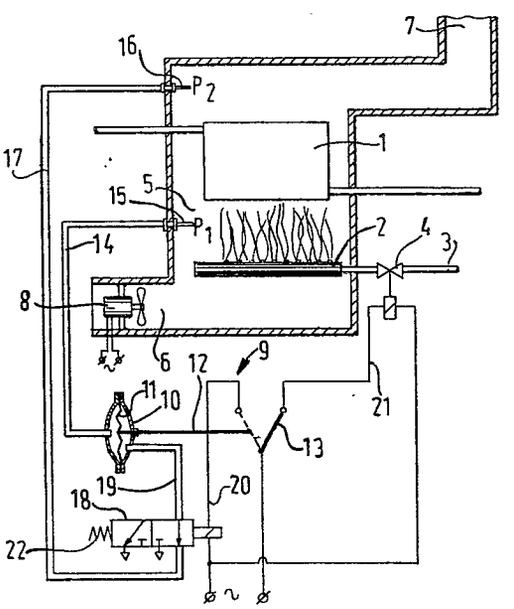
(54) Device for heating a fluid.

(57) A device for heating a fluid, for example, in a central heating boiler, comprising a heat exchanger (7) in the fluid conduit, a liquid or gaseous fuel burner (2) associated with said heat exchanger (1) and a housing (5) enveloping the heat exchanger (1) and the burner (2) to form a combustion channel having an inlet (6) for the combustion air and an outlet (7) for the exhaust gases, as well as a blowing apparatus (8) for producing a forced transport of combustion gases through the channel, wherein a pressure-difference switch (9) communicates on the one hand through a conduit (14) with a measuring point (P_1) of the channel near the blowing apparatus and on the other hand throuwh a further conduit (17) with a second measuring point (P_2) further remote from the blowing apparatus (8) in the channel, said switch (9) controlling a valve (4) in the fuel supply and in the further conduit a second valve (18) controlled by the pressure-difference switch (9) is included, said second valve (18) establishing a communication between the other side of the pressure-difference switch (9) with the atmosphere when the fuel valve (4) is closed in order to providing a sufficiently high pressure difference for overcoming the resistances in the various valves.



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Device for heating a fluid

The invention relates to a device for heating a fluid, for example, in a central heating boiler, comprising a heat exchanger in the fluid conduit, a liquid or gaseous fuel burner associated with said heat exchanger and a housing enveloping the heat exchanger and the burner to form a combustion channel having an inlet for the combustion air and an outlet for the exhaust gases.

The invention has for its object to provide a high-efficiency combustion process in the device whilst maintaining the safety required for such device.

The device is distinguished in that a blowing apparatus is provided for producing a forced transport of combustion gases through the channel, in which a pressure-difference switch communicates on the one hand through a conduit with a measuring point of the channel near the blowing apparatus and on the other hand through a further conduit with a second measuring point further remote from the blowing apparatus in the channel, said switch controlling a valve in the fuel supply.

Thanks to the presence of the blowing apparatus an excess amount of combustion air can be supplied to the combustion space, so that the combustion process will be optimal. In the event of failure of the blowing apparatus for any reason whatsoever the pressure-difference switch ensures that the fuel supply to the burner is cut off.

There will always prevail a pressure difference between two relatively spaced points in the flow channel as long as the blowing apparatus is operating. The invention utilises this pressure difference for controlling the fuel supply.

In a further development the invention proposes to include in the further conduit a second valve controlled by the pressure-difference switch, said second valve establishing a communication between the other side of the pressure-difference switch with the atmosphere when the fuel valve is closed. This arrangement permits of providing the most advantageous locations of the two measuring points in the channel without the need for considering a sufficiently high pressure difference for overcoming the resistance in the various valves, since then the difference from atmospheric pressure is used for changing over the switch for the fuel valve, said difference being usually higher than the difference between the two measuring points. However, as soon as the burner is operating, the control changes over to the measurement of the pressure difference between the two measuring points, so that the sensitivity of the device is maintained.

It may be advantageous to arrange the measuring points one on each of the heat exchanger with respect to the direction of flow, since the heat exchanger will have its specific resistance effect on the combustion gases. Thus the required pressure difference for the pressure-difference switch can be readily obtained.

The device described above is extremely suitable for use in heating apparatus, in which the blowing apparatus is disposed near the inlet of the device.

The device will be described more fully herinafter with reference to two embodiments.

Fig. 1 shows schematically the arrangement of a heating device comprising a control-system in accordance with the invention.

Fig. 2 shows an alternative embodiment.

In the figures identical component parts are designated with the same reference numerals.

The device mainly comprises a heat exchanger 1, which is included in a fluid flow system. This flow system may be part of the water pipe system of a boiler or the circulation system of a central heating system. Reference numeral 2 designates the burner fed from a conduit 3 including a fuel valve 4. The burner and the heat exchanger are surrounded by a housing 5 of any shape having an inlet 6 and an outlet 7, fresh combustion air being supplied through said inlet and the exhaust gases being conducted away through said outlet 7 to a chimney or the like.

According to the invention a blowing apparatus 8 is provided in the form of an electric blower in the embodiment shown: in fig. 1 it is arranged near the inlet 6 and in the embodiment of fig. 2 in the outlet 7.

The device comprises furthermore a pressure-difference switch 9 consisting in the embodiment shown of a housing 10, in which a diaphragm 11 is arranged. The diaphragm 11 is connected with a control-rod 12, which can change over a mechanical switch 13.

One side of the side of the housing 10 remote from the control-rod 12 communicates through a conduit 14 with a measuring point 15 in the flow channel across the housing 5.

From a measuring point 16 further remote from the blowing apparatus 8 a conduit 17 leads to a valve 18, from where a conduit 19 leads to the other side of the housing 10 of the pressure-difference switch 9.

In the embodiment shown the valve 18 is constructed in the form of an electrically controlled valve reset by a spring. The electric feed of the valve 18 is controlled through the cable 20 by the switch 13 of the pressure-difference switch 9. Finally a further terminal of the switch 13 is connected to the fuel valve 4 through a cable 21.

The device shown in fig. 1 operates as follows.

Owing to the air transport by the blowing apparatus 8 through the channel in the housing 5 a pressure P 1 will prevail at the measuring point 15 which exceeds the pressure P 2 at the measuring point 16. The pressure difference may amount to 4 mms water column.

The pressure difference between the measuring points 15 and 16 will cause the diaphragm 11 to move to the right in the housing 10 and hence the control-rod 12, as a result of which the contact of switch 13 changes over and the electric voltage energizes the fuel valve 4 so that fuel is supplied to the burner 2. For the sake of completeness it should be noted that the burner may be controlled as an alternative by other control-systems, for example, a thermostat connected in series with the valve 4.

Under these conditions the burner 2 can thus be switched on and off as long as the pressure difference between the points 15 and 16 is such that the control-rod 12 is maintained in the right-hand position. It should be noted that owing to the position of the switch 13 the valve 18 is not energized and the spring 22 establishes a direct communication between the conduits 17 and 19.

As soon as by some reason or other the blower 8 fails to operate, the pressure difference between the measuring points 15 and 16 becomes nil so that the control-rod 12 moves to the left. The switch 13 is then changed over and will energize the valve 18 so that the conduit 19 communicates with the atmosphere and the conduit 17 is cut off. In this situation the fuel valve 4 is also changed over so that the fuel supply conduit 3 is closed and the burner 2 can no longer be actuated.

When the blower 8 is re-actuated, a pressure difference will prevail between said points 15 and 16, to which the diaphragm 11 does, however, not respond.
The diaphragm 11 will respond to the pressure difference between the measuring point 15 and the atmosphere owing to the position of the valve 18. This pressure difference is appreciably higher than that between the points 15 and 16 so that the diaphragm 11 can exert a greater effort on the switch 13, which is changed over without fail, even in the case of comparatively high resistance forces.

As soon as the switch 13 is changed over, the energization of the valve 18 stops so that conduits 17 and 19 are interconnected and the system responds to the pressure difference between the measuring points 15 and 16.

The embodiment shown in fig. 2 operates as

follows.

Since the blower 8 is included in the outlet of the device a pressure P 3 will prevail at the measuring point 16, which is higher than the pressure P 4 at the measuring point 15.

In the normal operational position the diaphragm 11 will thus move to the left, since the conduits 17 and 19 are interconnected owing to the non-energized state of valve 18. In this situation the fuel valve 4 will be energized via the switch 13 so that fuel can be supplied.

As soon as the blower 8 fails to operate, the pressure difference between the points 15 and 16 becomes nil so that a change of conditions occurs like that in fig. 1. Upon re-actuation the conduit 19 also communicates with the atmosphere so that a pressure difference between the atmosphere and the measuring point 15 will act on the diaphragm 11, as a result of which the switch 13 will be changed over without fail.

The difference between these two embodiments resides in that the embodiment of fig. 1 operates on an excess of excess pressure of the combustion air, whereas the embodiment of fig. 2 operates on an excess of subatmospheric pressure of the combustion air.

As a matter of cours, the invention is not limited to the embodiments described above,neither to the diaphragm switch 10, 11 used therein. In this system any appropriate pressure-difference switch may be employed.

WHAT IS CLAIMED IS:

1. A device for heating a fluid, for example, in a central heating boiler, comprising a heat exchanger included in the fluid conduit, a liquid or gaseous fuel burner associated with the heat exchanger and a housing enveloping the heat exchanger and the burner to form a combustion channel having an inlet for the combustion air and an outlet for the exhaust gases, characterized in that a blowing apparatus is provided for producing a forced transport of combustion gases through the channel, in which a pressure-difference switch communicates on the one hand through a conduit with a measuring point in the channel near the blowing apparatus and on the other hand through a further conduit with a second measuring point in the channel further remote from the blowing apparatus, said switch controlling a valve in the fuel supply.

2. A device as claimed in claim 1 characterized in that the other conduit includes a second valve controlled by the pressure-difference switch, said valve establishing a communication between the other side of the pressure-difference switch and the atmosphere when the fuel valve is closed.

3. A device as claimed in claim 1 and 2 characterized in that the measuring points are located one on each side of the heat exchanger.

4. A device as claimed in claims 1 to 3 characterized in that the blowing apparatus is arranged near the inlet of the channel.

FIG. 1

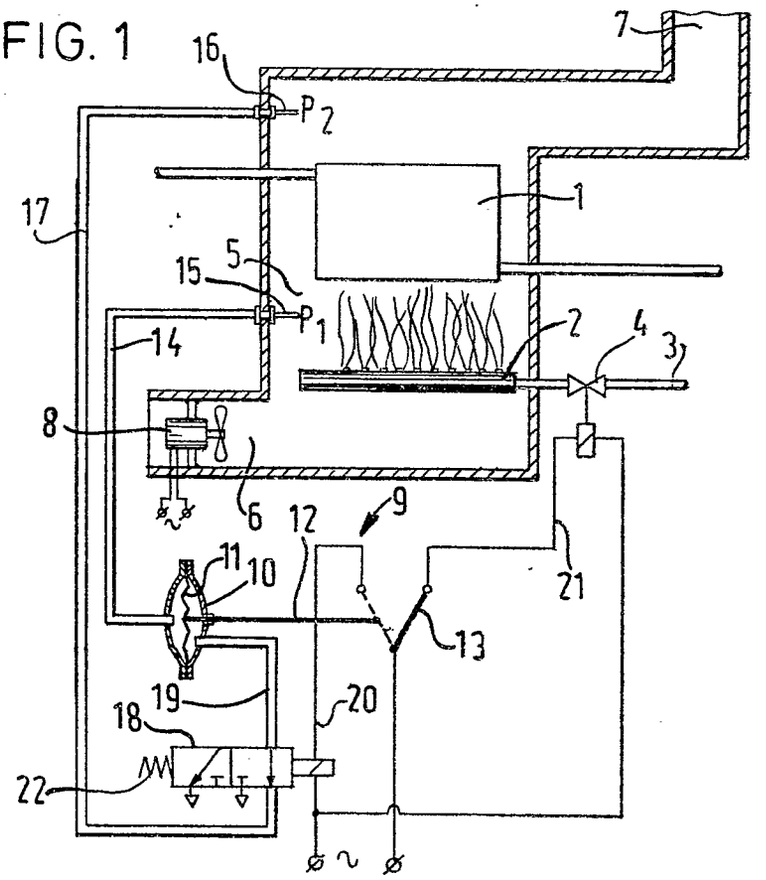
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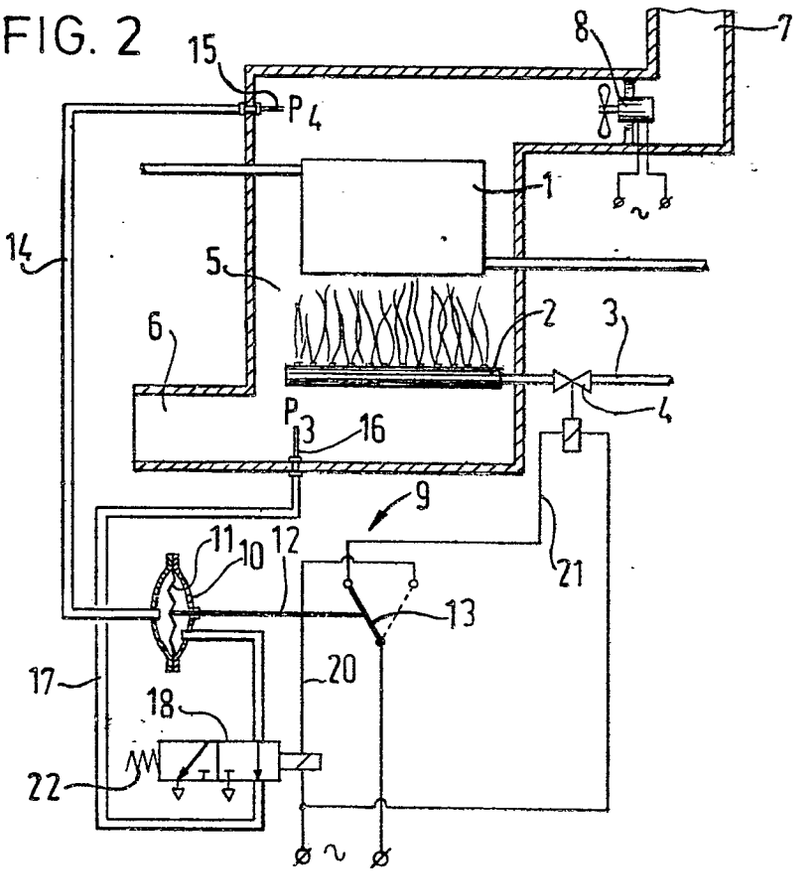
FIG. 2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European Patent Office

EUROPEAN SEARCH REPORT

0025622
Application number
EP 80 20 0824

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	THE STEAM ENGINEER, vol. 26, March 1957, no. 305, London, GB A. LINFORD: "The instrumentation and automatic control of small industrial boiler plants", pages 197-200. * Pages 199-200 *	1,3
	DE - A - 2 011 717 (J. VAILLANT KG) * Claims; figure *	1,4
	FR - A - 2 295 353 (SAUNIER-DUVAL) * Figure *	1
	US - A - 3 042 769 (N.G. CAMPBELL) * Column 1, line 63 to column 3, line 72; figure 1 *	1

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

F 23 N 1/06//
F 23 N 5/18
F 23 N 5/24

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

F 23 N 5/18
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1/10
5/24

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16-12-1980	FOURNIER

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