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(54) Stove with automatic flue gas reversal control

(57) The stove (10) is of the type provided with flue gas path reversal (20.1, 20.2), but also comprises a direct flue gas connection (18) between the combustion chamber and the connector (22H; 22V) for the flue gas discharge pipe, and means (16) which enable said direct connection (18) to be excluded but only starting from a first predetermined temperature attained by the flue gas leaving the combustion chamber (12). The means (16) preferably enable the direct connection (18) to be excluded gradually.

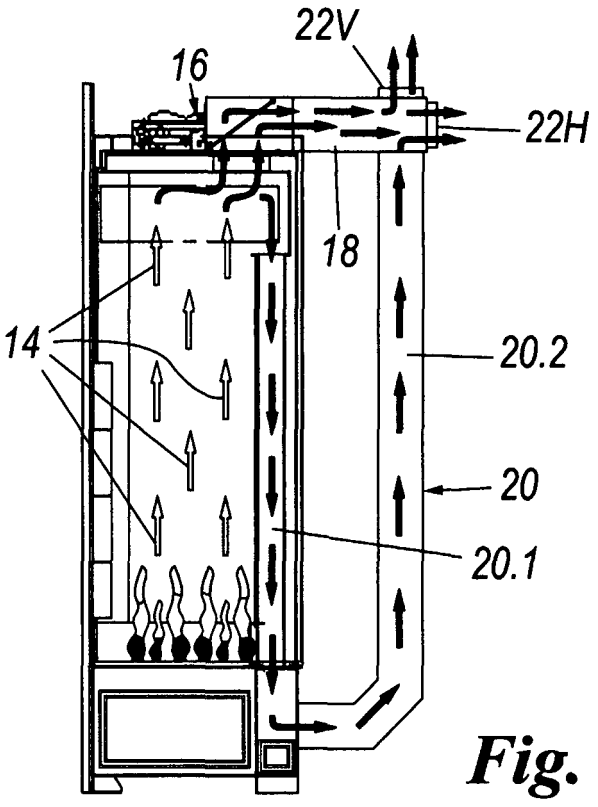

Fig. 1

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Description

[0001] The present invention relates to a stove of the type provided with flue gas flow reversal, to increase its efficiency.

[0002] IT-A-1,329,597 describes a stack-equipped stove, the combustion chamber of which is provided with a gas burner. The flue gas generated in the combustion chamber undergoes a path which initially rises and then descends (to provide so-called flue gas reversal), to finally rise to a connector for connection to an flue gas discharge pipe (normally a flue stack).

[0003] It has however been noted that until the flue gas temperature attains a sufficiently high value, its path reversal is not only not convenient, but is also counterproductive.

[0004] The object of the present invention is therefore to provide a stove of the flue gas reversal type which does not present the aforesaid drawback.

[0005] This object is attained by the stove of the present invention, characterised by also comprising a direct flue gas connection between the combustion chamber and the connector for the flue gas discharge pipe, and means which enable said direct connection to be excluded only when the temperature attained by the flue gas leaving the combustion chamber attains a first predetermined value.

[0006] According to one embodiment of the present invention, said means are of the type which enables the direct connection to be excluded gradually, the exclusion being completed on attaining a second predetermined flue gas temperature. In particular, for this purpose, said means comprise: a temperature sensor to measure the temperature of the flue gas leaving the combustion chamber; a damper arranged to close the direct connection between the combustion chamber and the flue gas discharge pipe; and an actuator which enables the damper to commence closure on attaining said first predetermined flue gas temperature, to complete it on attaining said second predetermined temperature value.

[0007] The invention will be more apparent from the ensuing description of one embodiment thereof. In this description reference is made to the accompanying drawing, in which:

Figure 1 is a vertical section through a stove according to the present invention, in which said direct connection exclusion means are completely open;

Figure 2 is similar to Figure 1, the only difference being that said direct connection exclusion means are completely closed;

Figure 3 is an enlarged schematic representation of the direct connection exclusion means, in their open condition;

Figure 4 shows the same means as Figure 3, but in their closed condition (direct connection excluded).

[0008] As can be seen in Figures 1 and 2, the stove 10 comprises a combustion chamber 12 burning firewood or pellets in its lower part. Consequently hot gases are produced in the combustion chamber 12 and tend to rise upwards, as indicated by the arrows 14. From the figures it can be seen that the stove is provided with a pipe 18 for its direct connection to a connector for connection to the flue gas discharge pipe (not shown in the figures), which connector can be of horizontal axis and indicated by 22H or of vertical axis and indicated by 22V.

[0009] The stove 10 is also provided with means, indicated overall by 16 and shown enlarged in Figures 3 and 4, which enable the direct connection 18 to be excluded. The means 16 are an actuator 24 which in the specific illustrated example comprise: a pneumatic cylinder-piston unit 25 with the free end 26 of the piston shank emerging partially from the cylinder; means 28, 30 for moving the piston on the basis of the temperature attained by the flue gas leaving the combustion chamber 12, such that the shank 26 projects further from the cylinder as the flue gas temperature increases; and a lever 32 which, on the basis of the amount by which the shank 26 projects from the cylinder of the cylinder-piston unit 25, rotates a damper 34 from an angular position in which it is completely open to an angular position in which it completely closes the direct connection 18.

[0010] From the figures it will be apparent that as the damper 34 closes, the flue gas flow through the direct connection 18 gradually decreases, the remainder of the flow being compelled to pass firstly through the descending conduit 20.1 adjacent to the combustion chamber 12 and then through ascending conduit 20.2, until it reaches the connector 22H or 22V.

[0011] The means 16 for moving the piston of the cylinder-piston unit 25 comprise, in the illustrated example, a hollow metal bulb 28 (for example of copper) located in the region in which the flue gas leaves the combustion chamber 12. The bulb 28 is preferably enclosed in a cup-shaped metal element 38 for its protection. The bulb 28 communicates with the end of a metal tube 30 (for example also of copper), the other end of which communicates with one of the two portions into which the piston of the cylinder-piston unit 25 divides the relative cylinder.

[0012] As the bulb 28, the tube 30 and the cylinder of the cylinder-piston unit 25 contain a gas (in particular air), when said gas expands due to the increase in the flue gas temperature above a first predetermined value the actuator 24 can be made to operate the lever 32 to initiate closing rotation of the damper 34 until it is completely closed on attaining a second predetermined flue gas temperature, with the final result that the entire flue gas flow passes through the reversal path 20.1 and 20.2. The advantage is that the reversal occurs automatically, only when required, and gradually. In particular, immediately after damper ignition, when the flue gas is still at low temperature, the absence of reversal ensures a good draught, which facilitates rapid increase in the flue gas temperature. When this temperature attains a value at which it begins to become convenient to recover part of

the flue gas thermal energy (value corresponding to said first predetermined temperature), the damper begins to rotate automatically in the closure direction, closing to a greater extent the higher the flue gas temperature, so that an increasingly large flue gas flow is deviated through the reversal path 20.1, 20.2, until its complete deviation (flow completely reversed) on attaining said second predetermined flue gas temperature value.

[0013] Conveniently the means 16 comprise a device for regulating the piston stroke of the cylinder-piston unit 25, this allowing control of the temperature at which the closure rotation of the damper 34 commences (said first predetermined temperature). In the specific illustrated example this device comprises an adjustment screw 36 disposed at that end of the unit cylinder 25 opposite the end from which the shank 26 projects.

[0014] From experiments carried out it has been found that in addition to the stated typical advantages of flue gas flow reversal stoves, the stove of the present invention presents the following further advantages:

- increase in efficiency, which can reach 90%;
- reduced CO emission.

Claims

1. A stove (10) of the type provided with flue gas path reversal (20.1, 20.2), **characterised by** also comprising a direct flue gas connection (18) between the combustion chamber and the connector (22H; 22V) for the flue gas discharge pipe, and means (16) which enable said direct connection (18) to be excluded but only starting from a first predetermined temperature attained by the flue gas leaving the combustion chamber (12).

2. A stove (10) as claimed in claim 1, wherein said means (16) are of the type which enables the direct connection (18) to be excluded gradually, the exclusion being completed on attaining a second predetermined flue gas temperature.

3. A stove (10) as claimed in claim 2, wherein said means (16) comprise: a temperature sensor (28) to measure the temperature of the flue gas leaving the combustion chamber (12); a damper (34) arranged to close the direct connection (18) between the combustion chamber (12) and the connector (22H; 22V) for the flue gas discharge pipe; and an actuator (24) which enables the damper (34) to commence closure on attaining said first predetermined flue gas temperature, and to complete it on attaining said second predetermined temperature value.

4. A stove (10) as claimed in claim 3, wherein the actuator (24) comprises: a pneumatic cylinder-piston unit (25) with the free end (26) of the piston shank emerging partially from the cylinder; means (28, 30) for moving the piston of the cylinder-piston unit (25) on the basis of the temperature attained by the flue gas leaving the combustion chamber (12), such that the shank (26) projects further from the cylinder as the flue gas temperature increases; and a lever (32) which, on the basis of the amount by which the shank (26) projects from the cylinder of the cylinder-piston unit (25), rotates a damper (34) from an angular position in which it is completely open to an angular position in which it completely closes the direct connection (18).

5. A stove (10) as claimed in claim 4, wherein The means (16) for moving the piston of the cylinder-piston unit (25) comprise a hollow metal bulb (28) located in the region in which the flue gas leaves the combustion chamber (12), the bulb (28) communicating with the end of a metal tube (30), the other end of which communicates with one of the two portions into which the piston of the cylinder-piston unit (25) divides the relative cylinder, the bulb (28), the tube (30) and the relative part of the cylinder of the cylinder-piston unit (25) containing a gas.

6. A stove (10) as claimed in claim 5, wherein the bulb (28) is enclosed in a cup-shaped metal element (38) for its protection.

7. A stove (10) as claimed in claim 1, of the type suitable for burning firewood or pellets.

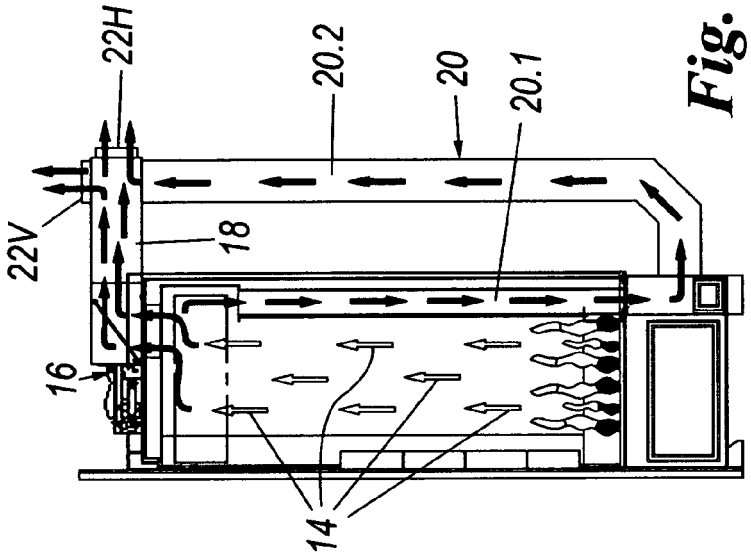

Fig. 1

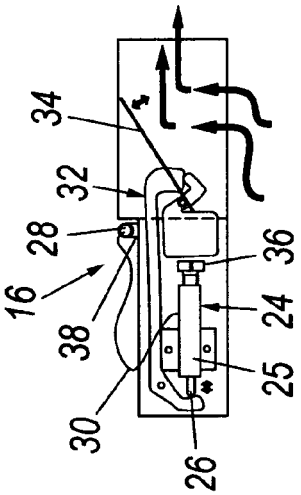

Fig. 3

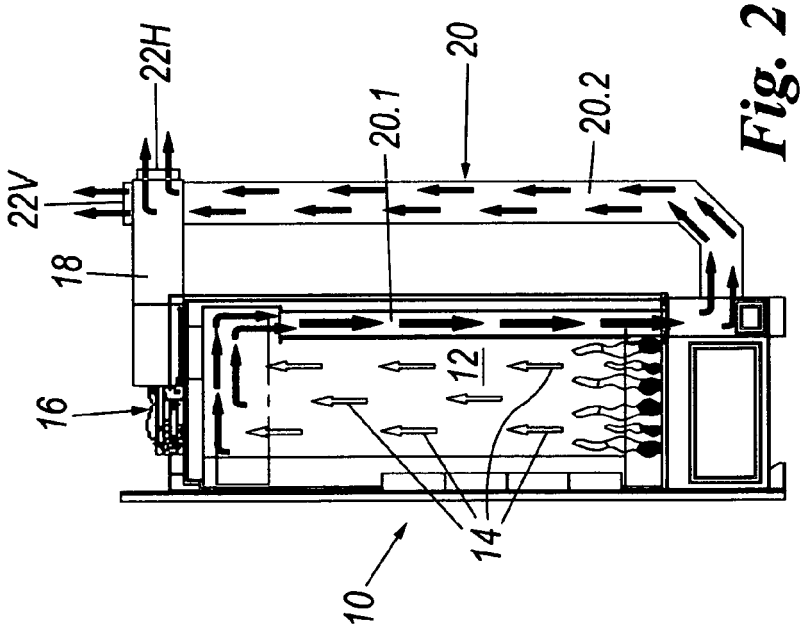

Fig. 2

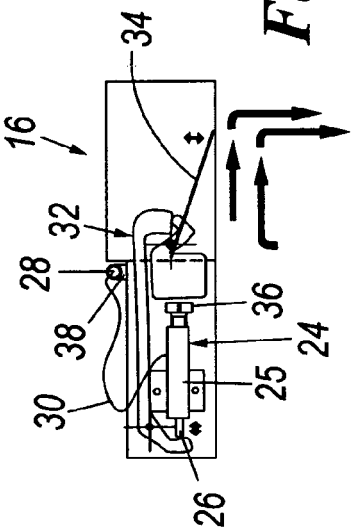

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 07 42 5222

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 Y	AT 393 898 B (PRUELLER JOSEF [AT]) 27 December 1991 (1991-12-27) * page 2, line 25 - line 44 * * figure *	1-3 4	INV. F23N3/04 F23B60/02 F23B80/04 F23G7/10 F23L13/02
Y	US 2 211 300 A (PAULSEN SPENCE) 13 August 1940 (1940-08-13) * page 1, left-hand column, line 43 - right-hand column, line 32 * * figure 1 *	4	
X	AT 395 905 B (PRUELLER JOSEF [AT]) 26 April 1993 (1993-04-26) * page 2, line 53 - line 60 * * page 3, line 15 - line 27 * * figure 1 *	1-3	
X	DE 100 22 877 A1 (HDG BAVARIA GMBH HEIZKESSEL & [DE]) 20 September 2001 (2001-09-20) * column 2, line 44 - line 48 * * column 2, line 68 - column 3, line 18 * * column 3, line 46 - line 58 * * column 4, line 24 - line 43 * * column 4, line 58 - column 5, line 14 * * column 5, line 24 - line 48 * * figures 1-3 *	1,7	TECHNICAL FIELDS SEARCHED (IPC) F23N F23B F23G F23L
A	EP 1 431 660 A (KUTZNER & WEBER GMBH & CO KG [DE]) 23 June 2004 (2004-06-23) * column 4, line 51 - column 6, line 35 * * figures 1a-1c *	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 September 2007	Gavriliu, Costin

CATEGORY OF CITED DOCUMENTS

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20-09-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
AT 393898 B	27-12-1991	AT 236189 A	15-06-1991
US 2211300 A	13-08-1940	NONE	
AT 395905 B	26-04-1993	AT 61888 A	15-08-1992
DE 10022877 A1	20-09-2001	SI 20125 A	30-06-2000
EP 1431660 A	23-06-2004	DE 20219557 U1	29-04-2004

EPO FORM P0459

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Patent documents cited in the description

- IT 1329597 A **[0002]**