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(54) Heating device with double fuel feed

(57) Heating device such as a fireplace, a heater (10) or similar, of the type able to be fed with two fuels of different type. The heater comprises a combustion chamber (14), in which means to contain a first and a second fuel are arranged, an inlet aperture (22, 24) being present for conveying comburent air into the combustion chamber (14). The heater comprises regulation means (30, 31a, 31b) to regulate a flow of comburent air into the combustion chamber (14) and cooperate with the inlet aperture (22, 24) in order to send a regulatable quantity of comburent air towards the first and/or second fuel, the introduction of the comburent air into the combustion chamber (14) occurring only due to the natural drawing force.

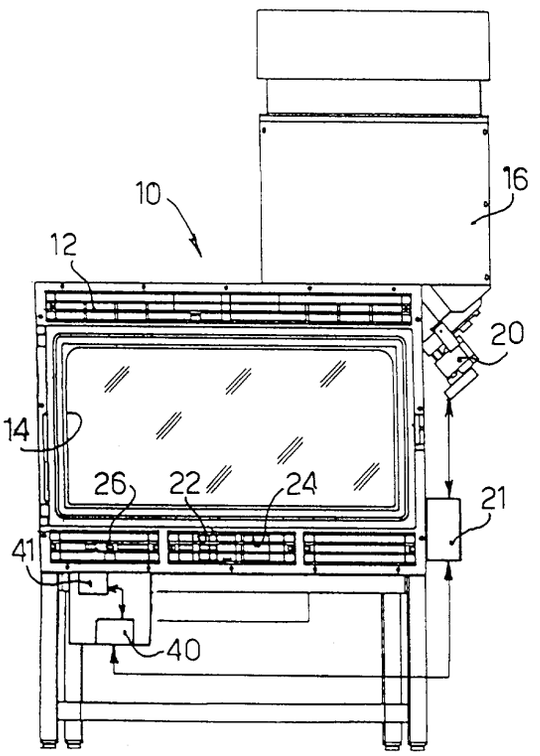

fig.1

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns a heating device such as a fireplace, a heater or similar, of the type suitable to be fed with at least two different types of fuel, such as for example pellets and wood, into which the comburent air is introduced into a combustion chamber only due to the natural drawing force.

[0002] The device according to the invention comprises a system to regulate and divide the flow, in order to introduce air into the combustion chamber in quantities functional to the different combustion requirements of the different fuels and also to the different quantities of fuel loaded.

BACKGROUND OF THE INVENTION

[0003] The state of the art includes fireplaces or heaters which can function alternately and/or conjointly with two types of fuel of different types, for example with pellets, that is, chips of pressed wood residue, and with wood.

[0004] This solution is particularly appreciated since it is possible to automate the feed with pellets by means of timed loading devices, which considerably increases the operating autonomy of the heating device and reduces the need for the user to intervene.

[0005] Conventional heating devices comprise a combustion chamber where the means to contain the two fuels are arranged, normally consisting of braziers and/or supporting grills.

[0006] Comburent air is introduced into the combustion chamber in order to actuate and maintain combustion.

[0007] Conventional devices provide to use at least a fan, which can be driven and powered in regulatable fashion, and is actuated at least when the combustion uses pellets. In fact, pellets require a greater quantity of comburent air with respect to wood, and above all they require a variation in the delivery of air according to the quantity of pellets loaded, which is normally variable during combustion.

[0008] Using a fan entails a first disadvantage in that, in the event of a sudden electricity failure, the comburent air needed for optimum combustion suddenly fails; this consequently causes an excess of unburnt particles to be emitted, which are dangerous for the environment. Moreover, the presence of the fan entails an increase in the costs and consumption of the device. Furthermore, the regulation of the fan may be imprecise and not correctly adapted to the loading dynamics of the pellets.

[0009] EP-A-985.883 and EP-A-1.134.497 disclose heating appliances able to be fed with two different kind of fuels.

[0010] US-A-4,387,700 discloses a stove having an automatic device for reduction of the flow to its combustion chamber.

[0011] These documents do not disclose a heating device able to vary the supply of the air sent to the combustion chamber according to the kind of fuel to use.

[0012] The present Applicant has devised and embodied this invention to overcome the shortcomings of the state of the art and to obtain further advantages.

SUMMARY OF THE INVENTION

[0013] The present invention is set forth and characterized essentially in the main claim, while the dependent claims describe other characteristics of the invention.

[0014] The purpose of the invention is to achieve a heating device such as a fireplace, a heater or similar, of the type with at least double fuel, such as for example pellets and wood, in which the comburent air is introduced into a combustion chamber due only to the natural drawing force and in regulatable fashion as the type of fuel used and the quantity of fuel loaded vary.

[0015] In accordance with this purpose a heating device of the type indicated above comprises at least a combustion chamber in which means to support and contain a first and second fuel are arranged.

[0016] According to a characteristic of the invention, the device comprises means to regulate and divide the introduction of comburent air, cooperating with at least an inlet aperture; the means allow the air to be introduced in regulatable quantities into the combustion chamber due to the natural drawing force alone.

[0017] The regulation means are able to selectively send a variable and controlled quantity of comburent air towards the first fuel and towards the second fuel. The regulation means comprise means to divide the flow able to be selectively located in pre-determined positions in order to close the at least one inlet aperture for the comburent air into the combustion chamber in a variable, but calibrated and controllable fashion.

[0018] In one embodiment of the invention, at least one position of the flow divisor means is adopted when there is a first fuel present, and at least a second position, different from the first, is adopted when there is a second fuel present.

[0019] In a preferential embodiment, said at least one aperture comprises a first and second aperture made on a front wall of the frame of the heating device and communicates with the combustion chamber so as to selectively convey the air towards the first and/or second fuel. In this embodiment, the flow divisor means comprise a movable shutter able to be arranged in a plurality of pre-determined positions, variable with respect to said inlet apertures, to vary the delivery of comburent air introduced into the combustion chamber.

[0020] The shutter is associated with actuation means, of a manual type such as a lever, a knob or similar, by which a user, actuating them from outside, can move the shutter to a pre-determined position.

[0021] The heating device according to the invention also comprises means for the automatic loading of the first fuel into the containing means.

[0022] The invention provides that a control unit receives input signals relating to the position of the divisor means and automatically conditions the drive of said automatic loading means according to the delivery of air introduced. In another embodiment, it is the quantity of fuel introduced which automatically conditions the position of the flow divisor means.

[0023] According to another variant, the device comprises temperature sensor means, able to send relative signals to said control unit in order to drive the flow divisor means in relation to the temperature detected, for example, in the combustion chamber and/or in the fume discharge conduit.

[0024] According to another variant, the device comprises means to analyze the fumes which send relative signals to the control unit to drive the flow divisor means in relation to the higher or lower content of unburnt substances in the discharge fumes.

[0025] According to a further variant, the device comprises optical sensor means associated to the combustion chamber and oriented at least towards the flame. The optical sensor means are able to detect at least the presence or not of the flame, and one or more feature of the flame such as its height, its prevailing colour, its prevailing contour, the luminosity emitted or other, and to send some input signals to the control unit according to this detection. On the basis of the optical detection of some features of the flame, the control unit is arranged to drive the flow divisor means so as to vary the amount of air introduced in the combustion chamber; for example, if the optical means detect that the flame is smaller than a pre-set value, or its luminosity is lesser than a defined value, the control unit will drive the flow divisor means so as, for example, to increase the amount of the air to the combustion chamber and restore the correct conditions of combustion of the flame.

[0026] With the device according to the invention it is possible to regulate - manually, from outside, and without using a regulatable delivery fan - the introduction of comburent air into a combustion chamber both according to the type of fuel used, and also the quantity of fuel present, and also the quantity of heat desired.

[0027] Moreover, the regulation of the flow can be automated by means of a driven actuator and hence correlated both to the quantity of fuel automatically introduced and also to the temperature reached and also to the composition of the fumes and further to the features of the flame burning in the combustion chamber.

[0028] Another advantage of the present invention is that, since the device functions with a natural drawing force of the comburent air, in the event of a sudden black-out, it guarantees that combustion is maintained, without causing dangerous emissions into the environment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] These and other characteristics of the present invention will be apparent from the following description of a preferential form of embodiment, given as a non-restrictive example, with reference to the attached drawings wherein:

- fig. 1 is a front view of the heating device according to the present invention;
- fig. 2 is a lateral section of the device in fig. 1;
- figs. 3 to 7 show the different operating positions which a flow regulation means of the device in fig. 1 can assume;
- fig. 8 is a front view of a flow regulation means from figs. 3-7.

DETAILED DESCRIPTION OF A PREFERENTIAL EMBODIMENT

[0030] With reference to figs. 1 and 2, a heating device according to the invention is represented by a heater 10 of the multiple feed type, fed by pellets 11 and wood (not shown in the drawings), and consists of a frame comprising a box-like structure 12, inside which a combustion chamber 14 is made.

[0031] In the upper zone of the box-like structure 12 there is a container 16 for the pellets 11 connected to a programmable feed member consisting of a screw, not shown in the drawings, driven by a motor-reduction unit 20 and provided with a timer unit 21. By means of the screw the pellet 11 is taken from the container 16 and discharged, through a feed conduit 18, into a brazier 15 arranged in the combustion chamber 14.

[0032] The box-like structure 12 comprises a front wall 19 in the lower zone of which there are apertures 22 and 24 communicating with the outside and with the combustion chamber 14; the air is conveyed through the apertures 22 and 24 for the combustion of the wood and pellets 11.

[0033] The size of the first 22 and the second aperture 24 is designed so that an optimized flow of comburent air can be sent for the combustion respectively of the wood and pellets 11. To be more exact, the first aperture 22 has a size designed for an optimum combustion when functioning with wood, while the second aperture 24, which can be shuttered as will be described hereafter, is designed for an optimum combustion when functioning with pellets 11.

[0034] The brazier 15 has through holes 15b on the bottom to allow the air to pass and the ash to be removed. The comburent air, both for combustion of pellets 11 and for combustion of wood, is introduced thanks to the natural drawing force, due to the depression created inside the combustion chamber 14 after the combustion fumes have been discharged through an outlet conduit 17.

[0035] The heater 10 also comprises means to divide

the flow of comburent air (figs. 3 to 8), consisting of a shutter 30 sliding in cooperation with the two apertures 22 and 24. The shutter 30 is associated with a drive lever 26 inserted in a front grill 29 and connected to the shutter 30 by an arm 27. In the shutter 30 there is also a first window 31a and a second window 31b, of a size mating respectively with the first aperture 22 and the second aperture 24. The shutter 30 can slide in front of or behind the inlet apertures 22 and 24, along a pair of guides 32 (figs. 2 and 8), arranged opposite each other respectively above and below the apertures 22 and 24.

[0036] The lever 26 can be selectively moved to a plurality of pre-determined positions A, B, C, D and E, which each correspond to a different closed condition of the apertures 22 and 24 for the introduction of comburent air with variable delivery. In this case, the position of the drive lever 26 can be detected by a sensor 41 associated with a regulation device 40 which, according to the delivery of air introduced, conditions the drive of the timer unit 21 of the motor-reduction unit 20, to automatically vary the speed and loading times of the pellet 11 into the combustion chamber 14, according to the quantity of air introduced.

[0037] The heating device according to the invention functions as follows. In the examples shown here the shutter 30 slides in front of the inlet apertures 22 and 24, but it is completely analogous and equivalent if the shutter 30 slides behind said apertures 22 and 24.

[0038] When the lever 26 is in a first position A, the shutter 30 is completely displaced to the right (fig. 3) and completely closes the second aperture 24, while the first window 31a coincides with the first aperture 22, to allow the comburent air to be introduced into the combustion chamber 14. This position is adopted when the device 10 is functioning mainly with wood, and the air introduced only through the aperture 22 corresponds to the quantity needed to obtain optimum combustion.

[0039] By moving the regulation lever 26 completely to the left to position B, as shown in fig. 4, the shutter 30 closes the first aperture 22, while the second window 31b is arranged completely in correspondence with the second aperture 24, so as to obtain a maximum flow of comburent air towards the brazier 15 containing the pellets 11. This position, which determines the introduction of air only through the second aperture 24, is actuated when the device 10 is functioning mainly with pellets 11.

[0040] The sensor 41 detects the position B of the lever 26, corresponding to the maximum flow of comburent air, and conditions the speed of the screw to load the pellets 11 into the brazier 15 in a quantity correlated and proportional to the flow of air, in order to optimize the combustion conditions.

[0041] On the contrary, by positioning the regulation lever in the intermediate positions, respectively C and D, the shutter 30 closes about 1/3 (fig. 5) and 2/3 (fig. 6) of the second aperture 24 to obtain lesser quantities of comburent air introduced to the brazier 15.

[0042] In correspondence with the positions C and D, the sensor 41 also detects the position of the lever 26 and, by means of the device 40, sends a command signal to regulate the speed of the screw in order to load a quantity of pellets 11 which is correlated and proportional to the flow of air introduced into the combustion chamber 14.

[0043] On the contrary, by moving the shutter 30 into the position E, both the aperture 22 and the aperture 24 are partly opened. In this position E the heater 10 is regulated for the simultaneous combustion of wood and pellets 11.

[0044] The heating device 10 comprises, in an upper zone of the combustion chamber 14, a plurality of holes 51 to introduce a flow of air, which achieves the so-called secondary combustion of the substances which have not been burnt during primary combustion. According to a variant of the invention, a door 50 is mechanically connected, by means of an articulated arm (not shown here), directly to the lever 26, to selectively close said holes 51.

[0045] When the regulation lever 26 is in position A, or E, corresponding to the introduction of air for the combustion of wood, the door 50 is opened to introduce air to the upper part of the combustion chamber 14 and to achieve secondary combustion. On the contrary, when the drive lever 26 is in any of positions B, C or D, wherein combustion is regulated for burning pellets 11, the door 50 is closed so as to prevent the circulation of air in the upper part of the combustion chamber 14 and to concentrate said circulation on the level of the brazier 15, to optimize the post-combustion of the pellets 11.

[0046] Modifications and/or additions can be made to the heating device 10 as described heretofore, without departing from the field and scope of the present invention.

[0047] In a variant not shown here, for example, the device may comprise at least a temperature sensor and/or a sensor to analyse the composition of the fumes and/or an optical sensor to detect at least a feature of the flame burning in the combustion chamber. The above sensors are connected to a processing unit which is able, from the signals sent by the sensors, to obtain information about the characteristic of the combustion and to drive automatically the movement of the shutter 30 to regulate accordingly the amount of the air introduced in the combustion chamber 14.

Claims

1. Heating device such as a fireplace, a heater (10) or similar, of the type able to be fed with at least two fuels of different type, comprising at least a combustion chamber (14), in which means to contain at least a first and a second fuel are arranged, at least an inlet aperture (22, 24) being present able to convey comburent air into said combustion chamber (14), **characterized in that** regulation means (30,

31a, 31b) to regulate a flow of comburent air into said combustion chamber (14) are able to cooperate with said at least one inlet aperture (22, 24) in order to selectively send a regulatable quantity of comburent air towards said first and/or second fuel, the introduction of said comburent air into said combustion chamber (14) occurring only due to the natural drawing force.

2. Device as in claim 1, **characterized in that** said regulation means comprise flow divisor means (30) able to be selectively arranged in a plurality of positions with respect to said at least one inlet aperture (22, 24), each of said positions corresponding to a pre-defined delivery of comburent air introduced into said combustion chamber (14).

3. Device as in claim 1 or 2, **characterized in that** said at least one inlet aperture comprises at least a first aperture (22) with an optimized size for the combustion of a first fuel and at least a second aperture (24) with an optimized size for the combustion of said second fuel.

4. Device as in claim 2 or 3, **characterized in that** said flow divisor means comprise a shutter (30) able to be displaced by means of actuation means (26) in order to close in variable fashion said at least one inlet aperture (22, 24) for the introduction of comburent air.

5. Device as in claim 4, **characterized in that** said actuation means comprise a manual drive lever (26).

6. Device as in claim 4, **characterized in that** said actuation means comprise a driven actuator.

7. Device as in any claim from 2 to 6 inclusive, comprising automatic loading means (18, 20, 21) for one (11) of the two fuels, **characterized in that** it comprises a control unit (40) associated with sensor means (41) to detect the position of said divisor means (30) in order to condition the drive of said automatic loading means (18, 20, 21) according to the quantity of air introduced into said combustion chamber (14).

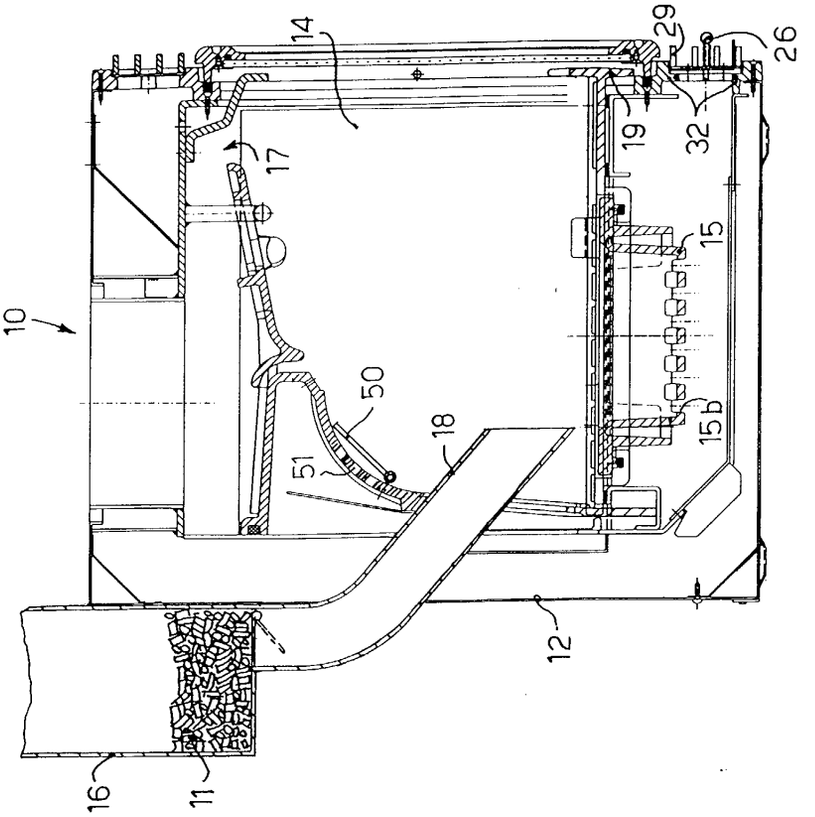
8. Device as in any claim from 2 to 7 inclusive, **characterized in that** it comprises temperature sensor means able to condition the position of said flow divisor means (30) according to the temperature reached in at least one zone of the heating device.

9. Device as in any claim from 2 to 8 inclusive, **characterized in that** it comprises analysing means to analyze the discharge fumes able to condition the position of said flow divisor means (30) according to the composition of said fumes.

10. Device as in any claim from 2 to 9 inclusive, **characterized in that** it comprises optical sensor means to detect at least a feature of a flame burning in said combustion chamber (14) and able to condition the position of said flow divisor means (30) according to the feature of the flame.

11. Device as in claim 10, **characterized in that** said feature of the flame is at least one between the presence or not of the flame, its height, its prevailing colour, its prevailing contour or the luminosity emitted.

12. Device as in any claim from 2 to 11 inclusive, comprising means (50, 51) for the selective introduction of secondary comburent air into an upper part of the combustion chamber (14), **characterized in that** said means (50) are able to be arranged in a position wherein the introduction of the secondary air is closed when said flow divisor means (30) are put in a determinate position.


14
29
26
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32
17
15
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50
18
15b
51
12
16
11

fig. 2

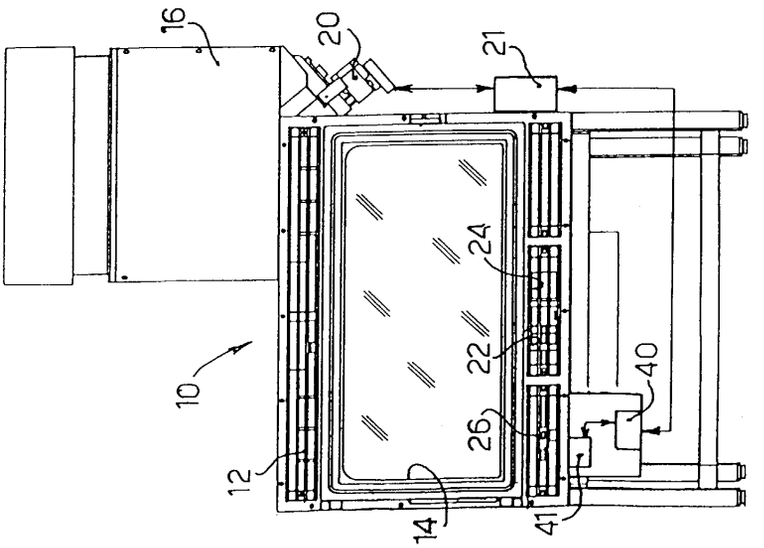
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fig.1

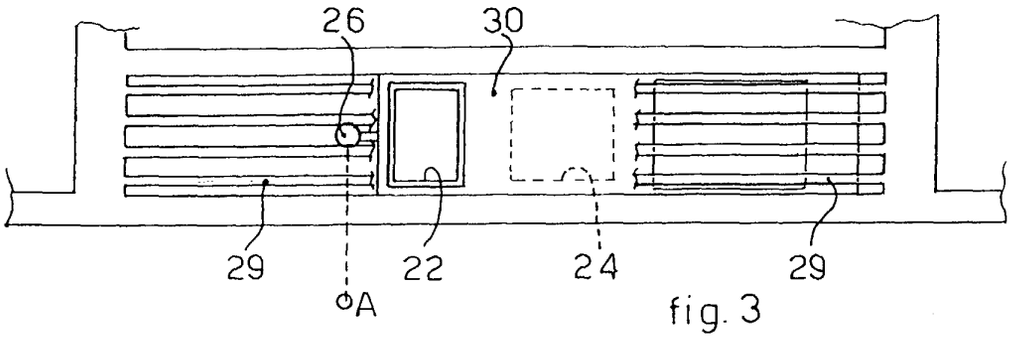

fig. 3

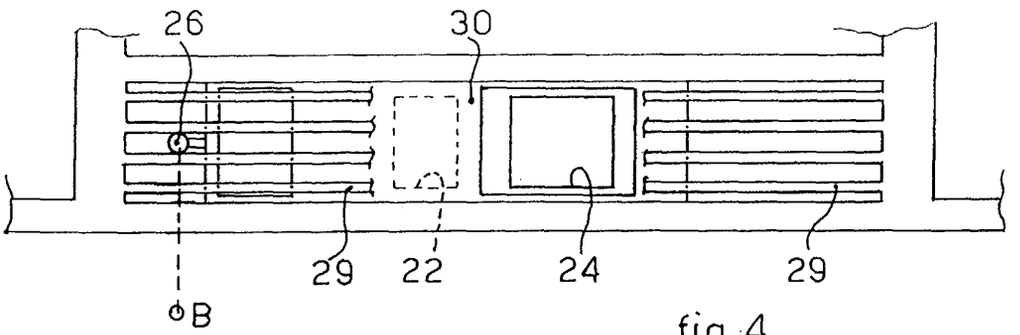

fig. 4

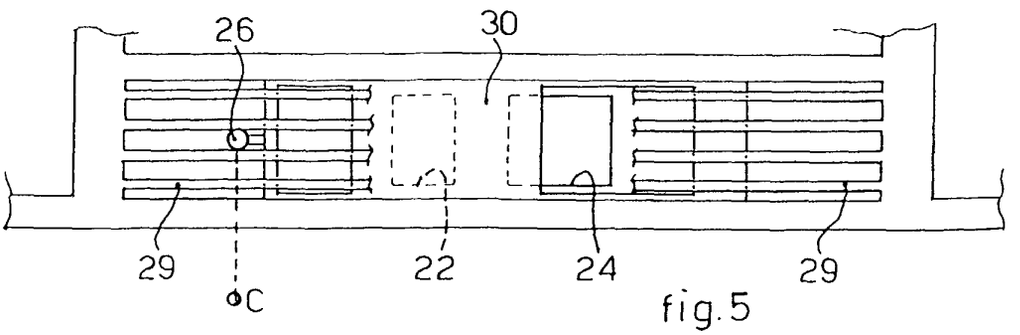

fig. 5

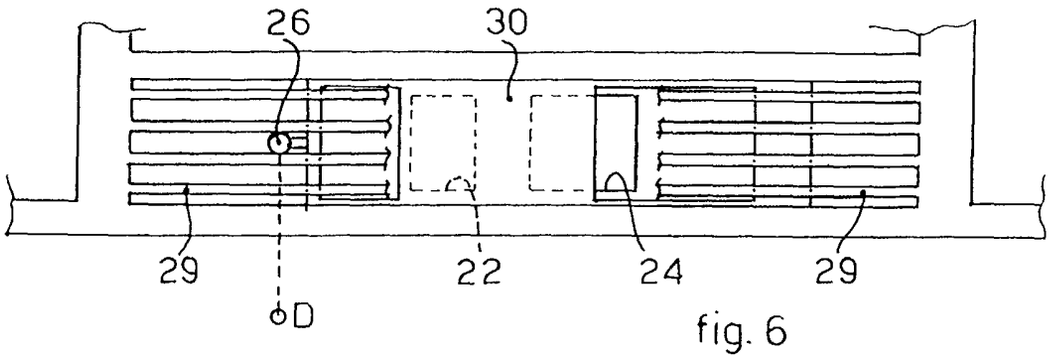

fig. 6

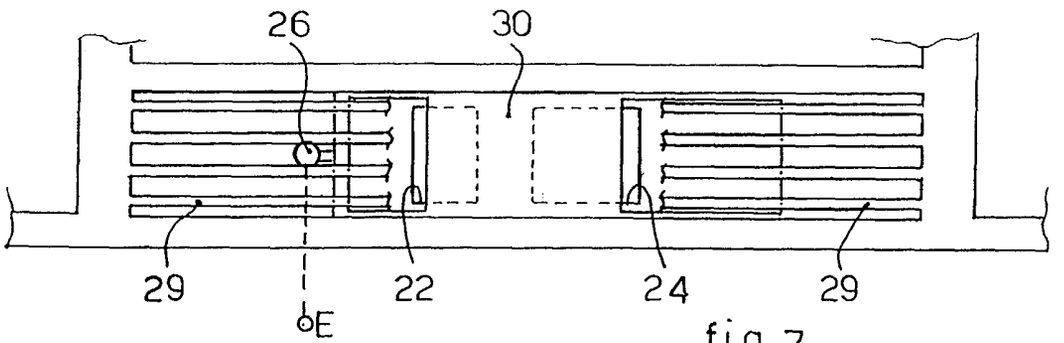

fig. 7

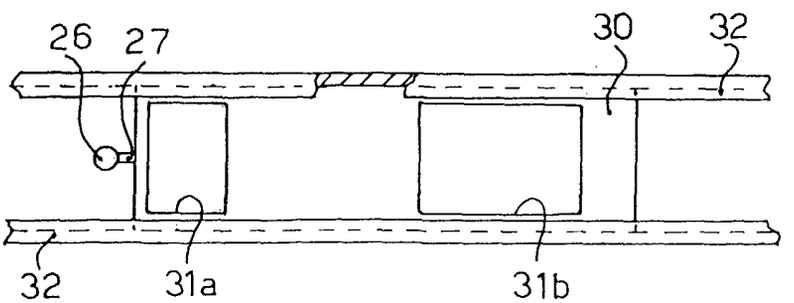

fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 03 00 5789

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	EP 0 985 883 A (EUROFIAMMA S R L) 15 March 2000 (2000-03-15) * abstract; figures * ---	1	F24B5/02 F24B1/02
A	US 4 387 700 A (EGGLESTON MERRITT J) 14 June 1983 (1983-06-14) * claim 1; figures * ---	1-3	
A	EP 1 134 497 A (MARANA FORNI DI MARANA FERDINA) 19 September 2001 (2001-09-19) -----		

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

F24B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 July 2003	Vanheusden, J

CATEGORY OF CITED DOCUMENTS

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08-07-2003

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0985883 A	15-03-2000	IT MO980181 A1	21-02-2000
		IT MO980221 A1	26-04-2000
		IT MO980220 A1	26-04-2000
		EP 0985883 A2	15-03-2000
US 4387700 A	14-06-1983	NONE	
EP 1134497 A	19-09-2001	IT VR20000024 A1	14-09-2001
		EP 1134497 A1	19-09-2001

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