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(54) Solid fuel heating device

(57) A high safety solid fuel heating device for the user, of the type comprising a tank (15), within which the fuel, especially pellet (12), is loaded, which falls into a burner or furnace (11) of a combustion chamber (14), next to the tank (15) and connected with at least one chimney flue (28) for exhausting the combustion fumes; the tank (15) includes at least one fuel accumulation compartment (24) having at the top an opening (17), which can be closed through a door (18), and at least one moving back wall (23), mechanically connected with a portion (30) of the door (18), so that, when opening the outer door (18) of load of the fuel by a user, the back wall (23) rotates closing the passage between the accumulation compartment (24) and the tank (15) and, vice versa, when closing the door (18), the back wall (23) rotates in the opposite direction opening the passage between the compartment (24) and the tank (15), exhausting the accumulated fuel into it.

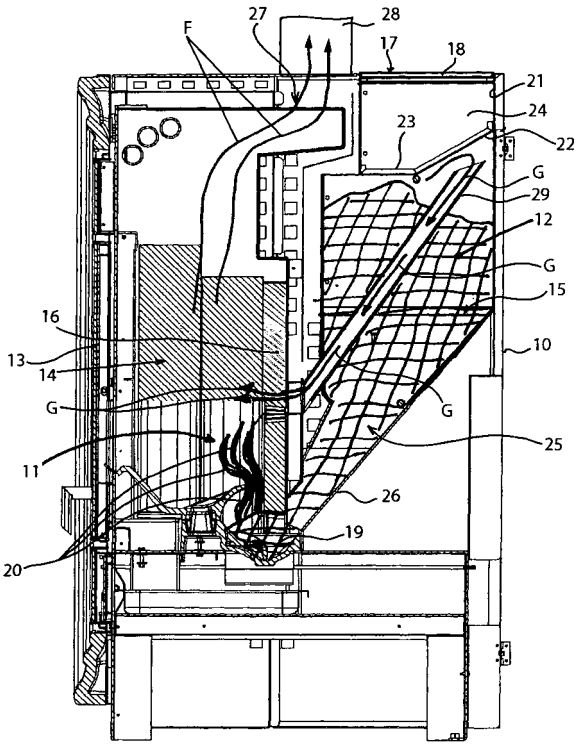

Fig.1

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Description

[0001] The present invention relates to a high safety solid fuel heating device for the user.

[0002] More in particular, the invention refers to stoves, fireplaces, fireplace inserts, oven inserts, thermo-stoves, generic heaters and/or heating plants and the like, running with solid fuel such as pellet or wood sawdust and/or biomass of any kind, as maize seeds, soybean seeds, barley, etc., and suitable to be loaded with fuel while operating, i.e. when the heating device is on.

[0003] On the other hand, the heating device according to the invention can be turned off also when the tank is partially full; specifically, after having burned a prefixed quantity of fuel (left in the burner of the stove and in a compartment below a closing door provided in the fuel tank), the device can be turned off, keeping in the tank the residual fuel, and then turned again on.

[0004] Currently, heating devices, such as combustion stoves or thermo-stoves, are more and more popular, which use as fuel wood and/or derivatives and, in particular, wood pellet, an innovative heating system extremely functional, cheap and ecological, keeping the maximum environment respect.

[0005] The stoves of this type do not use the common wood trunks, but tiny pre-compressed products (pellet), derived from wastes and fragments of the best wood, nearly devoid of moisture and with very high calorific efficiency.

[0006] These stoves are, moreover, equipped with operating autonomy and an intelligent control system, comprising an electronic gearcase which drives the stove adjusting its fire power and requiring the necessary amount of pellet in the combustion chamber.

[0007] Easy to install, the pellet stoves need a single pipe for exhausting fumes and an outer air intake, in case the stove is installed in rooms where an enough air recycling is not guaranteed.

[0008] Finally, a front grille assures an optimum diffusion of the hot air, which, by means of a tangential fan, allows a fast and efficient heat distribution.

[0009] These stoves can be also equipped with pullers and fans, which induce the circulation of the primary and secondary air flows and assure the effective evacuation of exhaust fumes.

[0010] Pellet loading usually occurs through an upper tank and, at the side of the burner, one or more inner compartments, equipped or not with removable tray, to collect the ashes, are further provided.

[0011] In addition, a control board, accessible also by means of a remote control, allows the user to automatically turn on and setup the calorific power, so that the user himself can determine the desired temperature through an integrated room thermostat.

[0012] However, it is more and more felt the need to achieve a total safety for the user of such solid fuel heating devices, especially during turning on and turning off operations of the device and during fuel refuelling.

[0013] Moreover, it is also felt the need to bring the heating device to an acceptable temperature value in relatively short times and the possibility to turn off the device even when the tank is at least partially full.

[0014] As part of these requirements, then, purpose of the present invention is to overcome the abovementioned drawbacks and, in particular, to provide a high safety solid fuel heating device, which allows to carry out a refuelling of the tank containing the fuel in complete user's safety, without having to fear that the flames or exhaust fumes leak into the room and invest the user engaged in the fuel loading operation.

[0015] Another purpose of the present invention is to carry out a high safety solid fuel heating device which allows the user to turn off the device even when the tank is, at least partially, full, so as it is not necessary to wait for the run out of the fuel in order to implement the turning off operation.

[0016] Another purpose of invention is to carry out a high safety solid fuel heating device which assures in any cases a high efficiency and an extreme versatility of use, compared with solid fuel heating devices already known, as well as a high reliability, allowing, at the same time, the compliance with the procedures and the stillness in general.

[0017] These and other purposes are achieved by a high safety solid fuel heating device, according to the appended claim 1; other technical features of detail are contained in the subsequent claims.

[0018] In advantageous way, the heating apparatus according to the invention provides an accumulation tank of the solid fuel at the fuel loading opening, which can be closed, at the top end, through an outer door, in turn connected, through a levers mechanism, with an inner seal element provided on the bottom of the accumulation tank.

[0019] Such a levers mechanism is structured in such a way that the user can never open the outer door for loading the fuel as long as the inner seal element is not fully closed, thus preventing the entry of combustive air and the turning on of the fuel contained into the main tank of the heating device.

[0020] A wrong manoeuvre can only occur as a result of tampering of the levers mechanism (for example, by removing some union screws).

[0021] Furthermore, the heating device object of the present invention also presents a further intermediate door, inserted into the fuel main tank of the heating device, which can be operated by the user, through a proper lever, in order to turn off the device, keeping the residual fuel in the tank.

[0022] Additional features and advantages of the present invention will become clear from the following description, relating to a preferred and illustrative, but not limiting, embodiment of the high safety solid fuel heating device, according to the present invention, and from the appended drawings where:

figure 1 is a longitudinal section view of a high safety solid fuel heating device, carried out in accordance with the present invention;
figure 2A is a side view of the heating device of figure 1, according to the present invention, with the outer door of the fuel load in opening position;
figure 2B is a longitudinal section view of the heating device of figure 1, according to the present invention, with the outer door of the fuel load in opening position;
figure 3A is a side view of the heating device of figure 1, according to the present invention, with the outer door of the fuel load in closing position;
figure 3B is a longitudinal section view of the heating device of figure 1, according to the present invention, with the outer door of the fuel load in closing position;
figure 4 is a side view of the heating device of figure 1, according to the present invention, where an operating lever of intermediate supply door placed inside the fuel tank is visible;
figure 4A is a longitudinal section view of the heating device of figure 1, according to the present invention, with the intermediate supply door placed inside the tank in opening position;
figure 4B is a longitudinal section view of the heating device of figure 1, according to the present invention, with the intermediate supply door placed inside the tank in closing position.

[0023] It is right now underlined that, even if the following description and the attached figures refer to a heating device running with solid fuel and, in particular, to a stove which uses wood, pellet, chips and/or sawdust as solid fuel, the innovative concept described in the present invention can be easily extended to any other type of heating device which uses a solid fuel material of any kind.

[0024] Referring to the figures mentioned, with 10 is generally indicated a containment and support structure of the solid fuel heating device, according to the present invention, with 11 is generally indicated a burner or furnace, where the solid fuel, particularly pellet 12, coming from the main tank 15, which is in turn arranged sideways or behind the furnace 11, is burned and from which the products of combustion are generated, while with 13 is indicated a closing door of the combustion chamber 14, in turn thermally insulated from the main tank 15, through a wall insulation 16.

[0025] The combustion chamber 14 has at least one exit aperture 27 for the exhaust of combustion fumes (whose route is generally indicated by the arrows F in the appended figures), which is connected with the chimney flue 28.

[0026] The main tank 15 of pellet 12 can be fed through a refilling opening 17, which can be closed by means of a door 18, and is connected, through a funnel-shaped portion 25 having at least one sloping wall 26, with the lower area or zone 19 of the burner 11, so that the pellet 12 slides down, by fall, and is thus introduced into the combustion chamber 14, as it is burned, in order to continuously feed the flame 20.

[0027] At the refilling opening 17 and the door 18 and immediately below the latter a shaped compartment or cavity 21 is made, which acts as an accumulation tank or compartment of pellet 12, closed at the top by the aforesaid door 18 (which can be made in transparent or partially transparent material in order to allow the user to control the refilling level of the compartment 24) and at the bottom by a fixed sloping wall 22 and a moving seal bottom 23.

[0028] The door 18 may be permanently closed by means of a suitable locking mechanism (for example, of the snap type) and may present an opening 17 shaped in such a way as to be able to place in it a hopper for a smooth and safe refilling of pellet 12 in the accumulation compartment 24.

[0029] Since the combustion chamber 14 is located adjacent to the main tank 15 and the accumulation compartment 24 of pellet 12, the pellet 12 heats itself when the device is operating and this heating causes the compacting of pellet 12 and the formation of gas, which accumulate in the main tank 15 and the compartment 24, above the surface of the fuel loaded.

[0030] Therefore, when opening the door 18, in order to avoid that these gases leak and spread into the room environment, investing the user and/or causing unpleasant smells in the environment, it is provided to insert into the main tank 15 of pellet 12 a suction pipe 29, whose inlet is placed near the walls 22, 23 of the accumulation compartment 24 and inside of which the formed pellet gases are conveyed.

[0031] In particular, the suction pipe 29 is inserted into the insulating wall 16 and lead to the combustion chamber 14, so that the gases follow the path indicated by the arrows G of figure 1, leak into the combustion chamber 14 and are here totally burnt, in order to achieve a more ecological combustion and a lower emission of fumes and exhaust gases into the environment.

[0032] On the other hand, the combustion fumes (arrows F) climb up through the aperture 27 and from here into the chimney flue 28 or in another discharge pipe.

[0033] In this way, the leakage of gas from the opening 17, towards the user, is prevented and the combustion of pellet 12 is improved, since are reduced the resins and/or tar waste present in the stowed pellet 12, thus improving the sliding of the pellet 12, inside the main tank 15, towards the lower zone 19 and from here to the burner 11.

[0034] In particular, the pellet 12 loading system is shown in figures 2A-2B and 3A-3B when the stove is running (turned on).

[0035] It is, specifically, provided to equipped the door 18 with an angular shaped portion 30, placed at the side of the door 18 bound to the accumulation compartment 24, on which a rigid rod 31 is free to angularly slide, which is in turn hinged, at the fulcrum point 32, on the back wall 23 of the accumulation compartment 24 of pellet 12, close

to the fixed sloping wall 22.

[0036] As clearly visible from the comparison between the figures 2A-3A and 2B-3B, the closure of the door 18, starting from an open position of the door 18 (figures 2A-2B), determines a shift of the rod 31 on the angular portion 30, to the point that the rod 31, starting from a vertical position, takes a sloping position, with the consequence of shifting in angular position the moving back wall 23 of the accumulation compartment 24, until it reaches a position almost parallel to the fixed sloping wall 22 of the compartment 24 itself (figures 3A-3B).

[0037] Therefore, when the door 18 is open, it is possible to load pellet 12 in the accumulation compartment 24 till a predefined and variable with the depth of such accumulation compartment 24 level; as shown in figure 2B, in that position, the back wall 23 is horizontal, closing the compartment 24, and does not allow the fall of pellet 12, loaded in the compartment 24, into the main tank 15.

[0038] Vice versa, when the door 18 is closed, the moving back wall 23 can be operated to a sloping position (figure 3B) and allows the discharge of pellet 12 accumulated in the compartment 24, by fall, into the main tank 15.

[0039] The general principle is constituted by the fact that, when the user opens the outer door 18, so as to load pellet 12 in the accumulation compartment 24, the back wall 23 remains totally closed (figure 2B), thus avoiding that any fumes and/or gas formed on the surface of pellet 12 loaded in the main tank 15 and produced by the overheating of the tank 15 itself, since close to the combustion chamber 14, invest the user intent on loading pellet 12 and/or leak in the environment, creating nuisance and unpleasant smells.

[0040] On the other hand, once loaded pellet 12 in the accumulation compartment 24, after closing the door 18, the user can act on the moving back wall 23, through a proper lever, causing the opening of the accumulation compartment 24, with the consequent fall of pellet 12 accumulated inside the compartment 24 into the main tank 15 (figure 3B).

[0041] All this is obtained through a human error proof lever mechanism, according to which a wrong manoeuvre, whereby the back wall 23 of the accumulation compartment 24 and the outer door 18 would both result in open position, may occur only after tampering the mechanism itself (for example, owing to the removal of some tightening screws), which, by its nature, is in any case clearly visible and identifiable.

[0042] According to the present invention, the solid fuel heating device so far described also is provided with an additional door or intermediate door 33, placed inside the main tank 15 and, in particular, at a shrinkage made by a lengthening 34 of at least one wall of the funnel portion 25 of the tank 15.

[0043] The intermediate door 33 is operated from the outside by the user, through the lever 35, in order to turn off the heating device.

[0044] Indeed, when the intermediate door 33, from the rest position, wherein is supported along the wall 26 of the funnel portion 25 of the tank 15 (figure 4A), is operated in closing, through the lever 35, the same extends, inside the tank 15, between the wall 26 and the lengthening 34 of the opposite wall (figure 4B), blocking, as clearly visible in figure 4B, the natural fall of pellet 12 from the tank 15 to the zone 19 and from here to the burner 11.

[0045] Therefore, following the operation in closing of the intermediate door 33, after having consumed the pellet 12 remained in the burner 11 and in the compartment 36 below the door 33 itself, the heating device turns off, keeping in the main tank 15 some residual pellet 12; therefore, the user can turn off the stove even when the tank 15 is, at least partly, full.

[0046] Operating in opening the lever 35 again and, consequently, opening the intermediate door (figure 4A), it is possible to burn again pellet 12 in order to restart the stove.

[0047] From the description made the characteristics of the high safety solid fuel heating device for the user, object of the present invention, as well as the resulting benefits, are clear.

[0048] It is, finally, clear that many other variations can be made to the heating device in question, without for this reason going out of the novelty principles inherent to the inventive idea, as it is clear that in the practical implementation of the invention, materials, shapes and dimensions of the illustrated details could be any, depending on the needs, and the same could be replaced with others technically equivalent.

Claims

1. High safety solid fuel heating device for the user, of the type comprising a tank (15), within which the fuel, in particular wood or wood pellet (12), is loaded and which falls into a burner or furnace (11) of a combustion chamber (14), which is next to said tank (15) and thermally insulated from the tank (15) and connected with at least one chimney flue (28) for exhausting the combustion fumes, wherein said tank (15) comprises at least one cavity (21) which defines at least one fuel accumulation compartment (24) having at least one opening (17) which can be closed through at least one shutter or door (18), the fuel being loaded from said opening, and at least one moving back wall (23) which defines at least one passage between said fuel accumulation compartment (24) and said tank (15), **characterized in that** said back wall (23) is fixed to at least one rod (31), which is free to slide on at least one angular portion (30) connected with said door (18) at a part of said accumulation compartment (24) bound to said door (18), so as to load the fuel even when the heating device is turned on or operating.

2. Heating device as claim 1, **characterized in that**

said fuel tank (15) is connected with said burner (11) through a funnel-shaped portion (25) having at least one sloping wall (26), suitable to allow the fuel to fall sliding inside the burner (11) of said combustion chamber (14) as it is burned, so as to continuously feed the flame (20) of the burner (11).

3. Heating device as claim 1, **characterized in that** said fuel accumulation compartment (24) is delimiting at the bottom by said moving back wall (23) which is mechanically connected with at least one fixed sloping wall (22).

4. Heating device as claim 1, **characterized in that** at least one gas suction pipe (29), whose inlet is placed near said back wall (23) of the accumulation compartment (24), is inserted into said tank (15), said suction pipe (29) leading (G) to the combustion chamber (14), so that said gases are burned inside said combustion chamber (14).

5. Heating device as claim 3, **characterized in that** said rod (31) is fixed to said back wall (23) of the fuel accumulation compartment (24), at a fulcrum point (32) placed close to said fixed sloping wall (22).

6. Heating device as claim 1, **characterized in** fact that, when the door (18) is open, said rod (31) takes a vertical position and said back wall (23) of the fuel accumulation compartment (24) takes a horizontal position to close said compartment (24), preventing the fall of fuel from said compartment (24) within said tank (15), while, when the door (18) is closed, said rod (31) and said back wall (23) of the fuel accumulation compartment (24) can be operated, allowing the exhaust of fuel accumulated in the compartment (24), by fall, within said tank (15).

7. Heating device as claim 2, **characterized in that** at least one intermediate door (33), placed at a shrinkage made by at least one lengthening (34) of at least one wall (26) of said funnel portion (25) of the tank (15), is present within said fuel tank (15), said intermediate door (33) being operated from the outside by the user through at least one lever (35).

8. Heating device as claim 7, **characterized in that** said intermediate door (33) is operated in closing through said lever (35), which allows to place it inside said tank (15), between said wall (26) of the funnel portion (25) and said lengthening (34), in order to stop the fuel fall from the tank (15) to said burner (11), also turning off the heating device, after having consumed the fuel left in the burner (11) and in the compartment (36) below the intermediate door (33) and keeping in the tank (15) some residual fuel.

9. Heating device as claim 7, **characterized in that** said intermediate door (33) is operated in opening, through said lever (35), which allows to place it alongside said wall (26) of the funnel-shaped portion (25) in order to enable the fall of the fuel into the burner (11) and operate the heating device again.

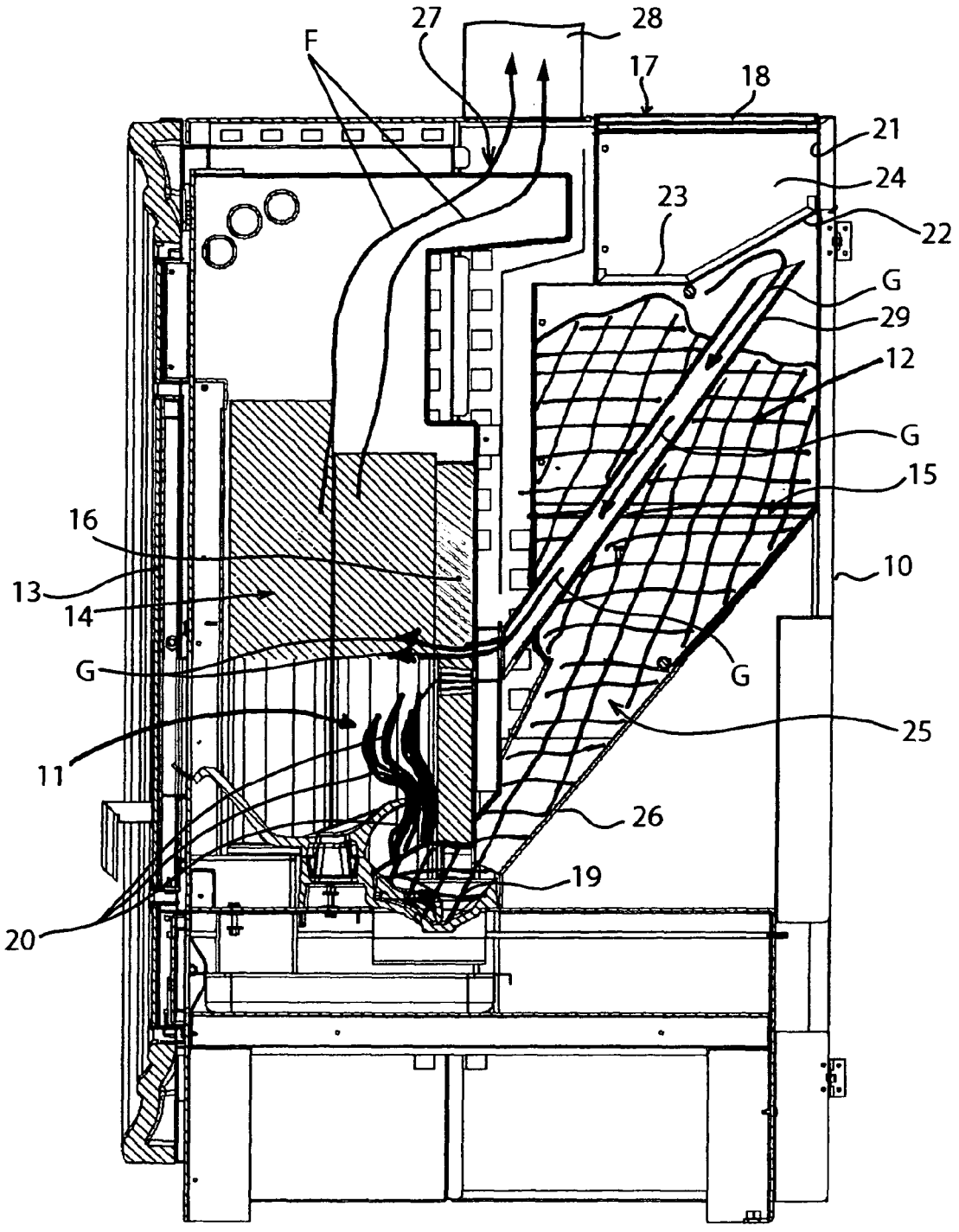

Fig.1

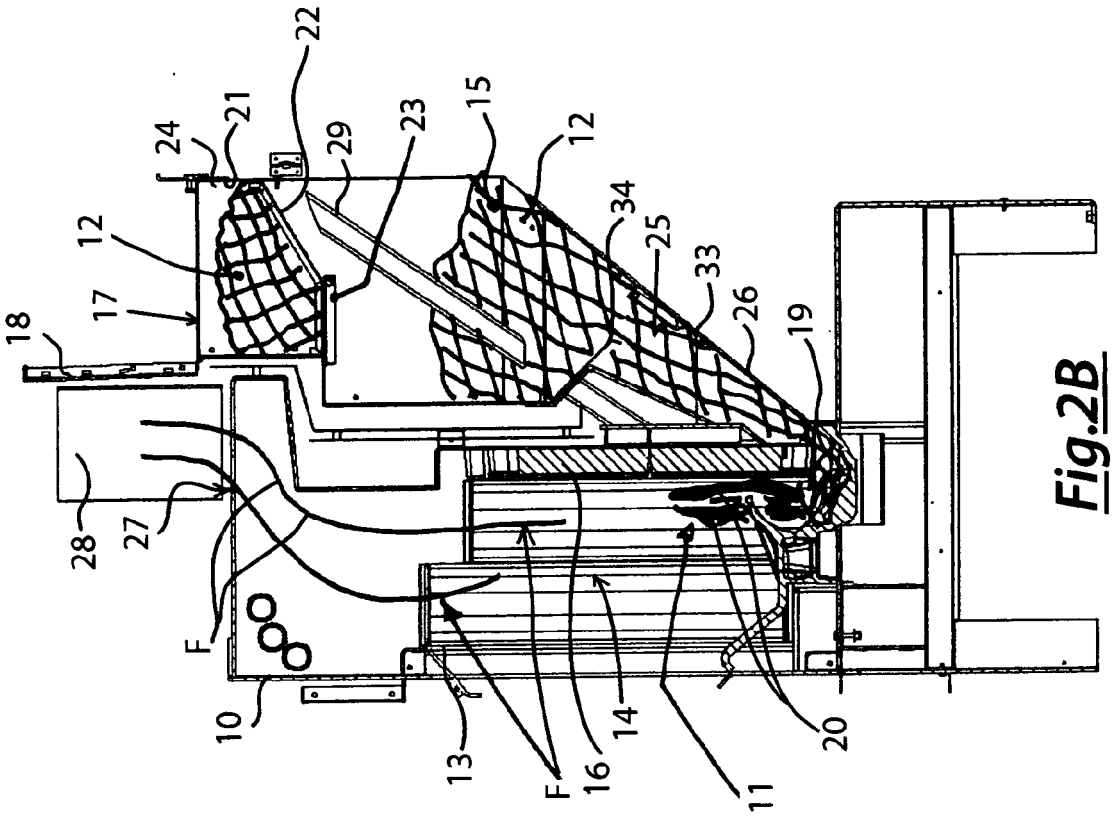
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Fig.2B

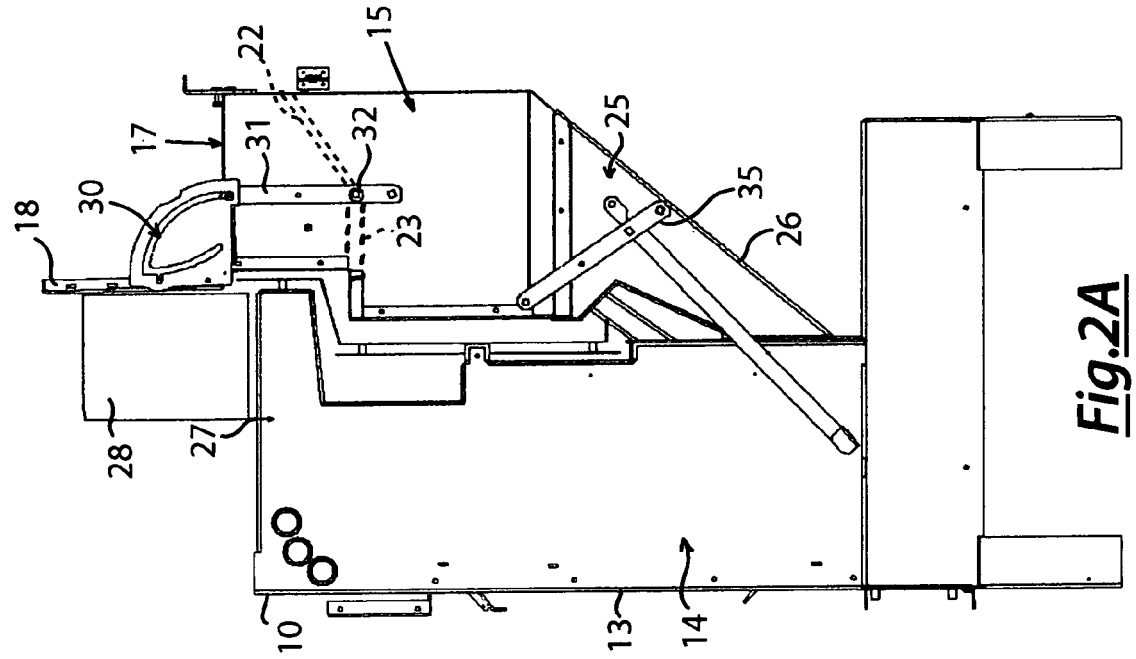
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Fig.2A

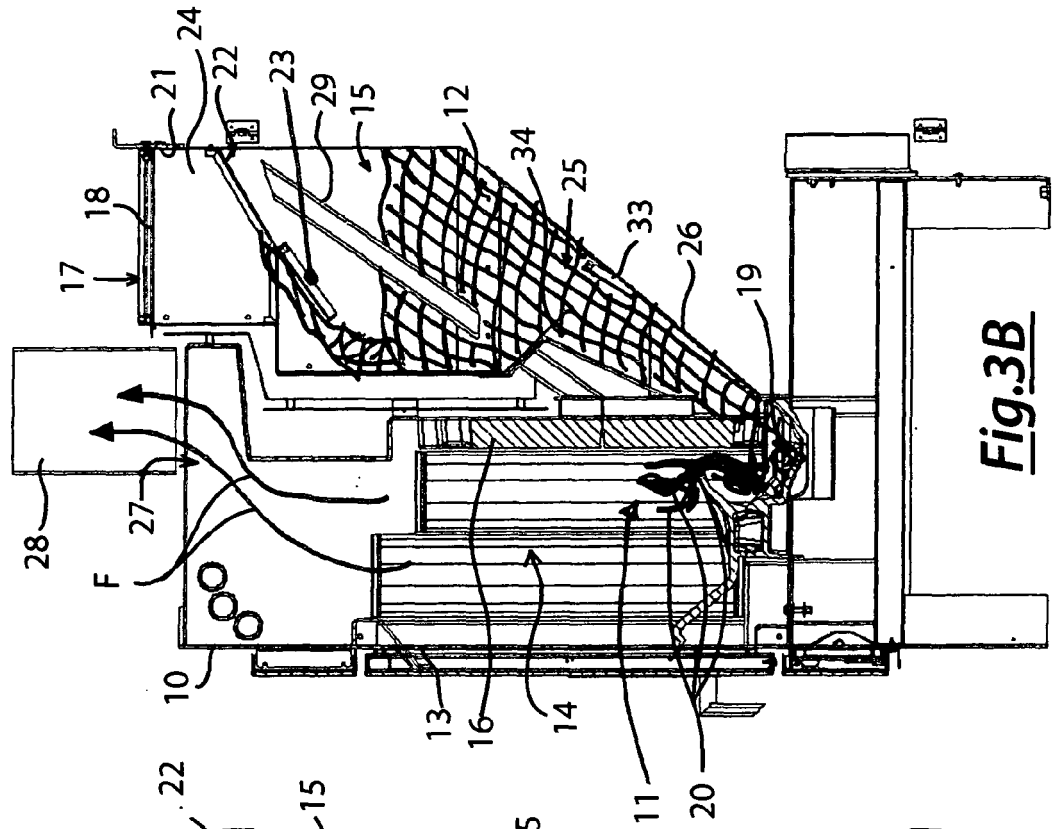
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Fig.3B

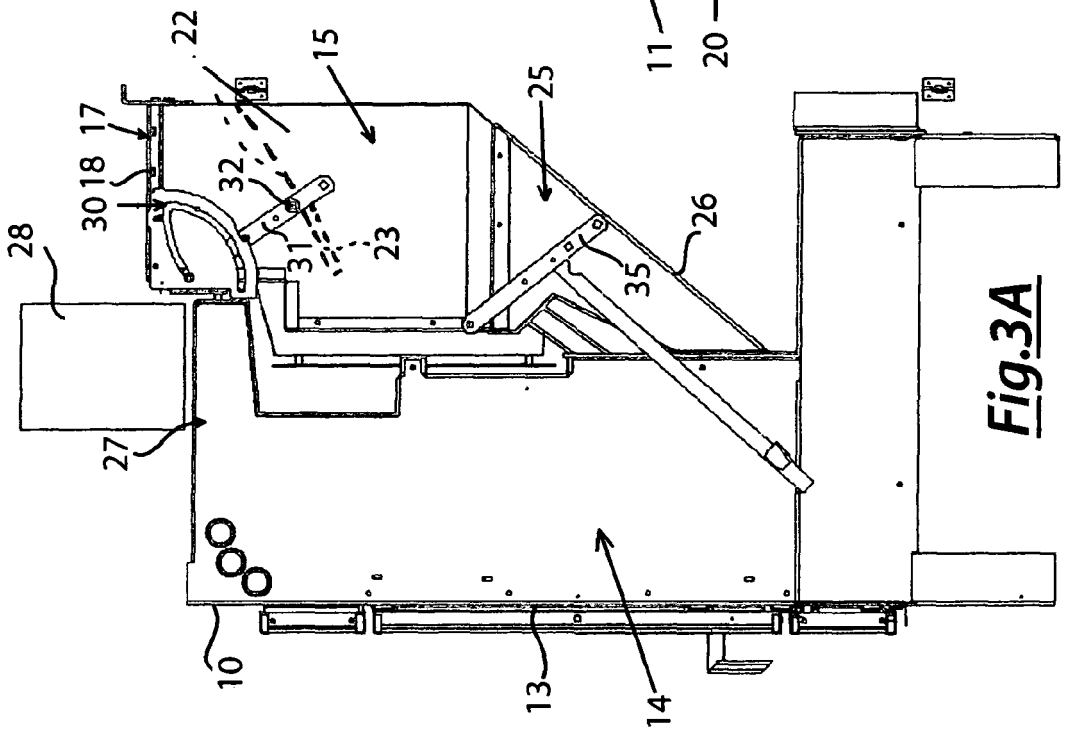
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Fig.3A

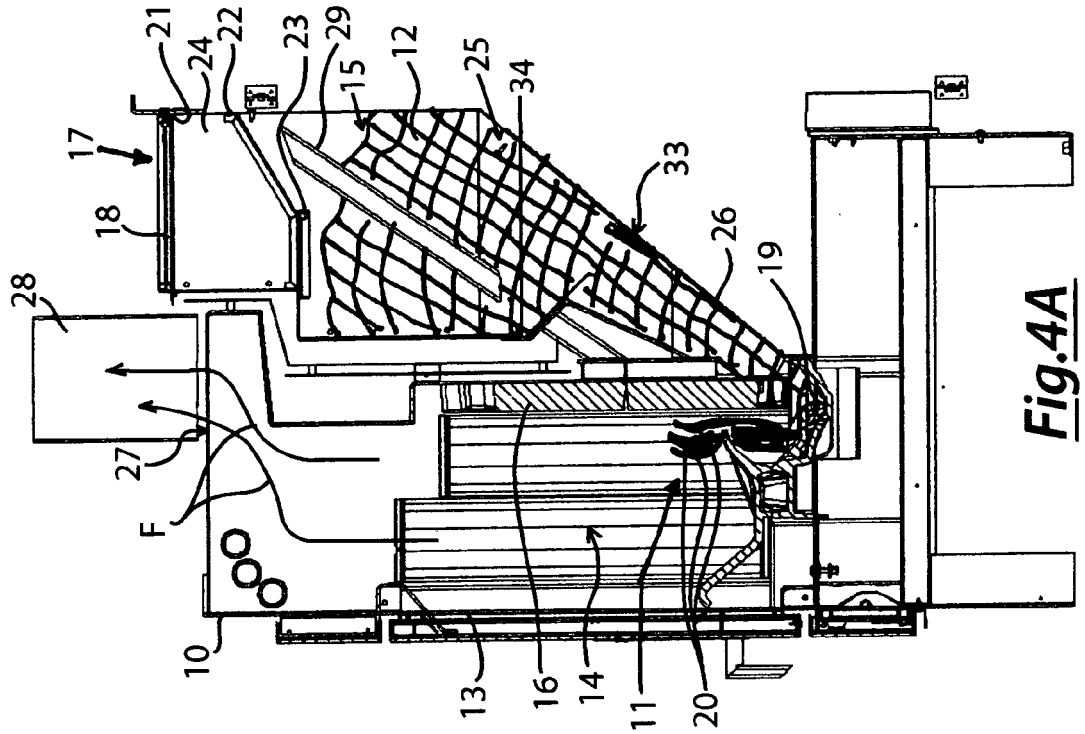
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Fig.4A

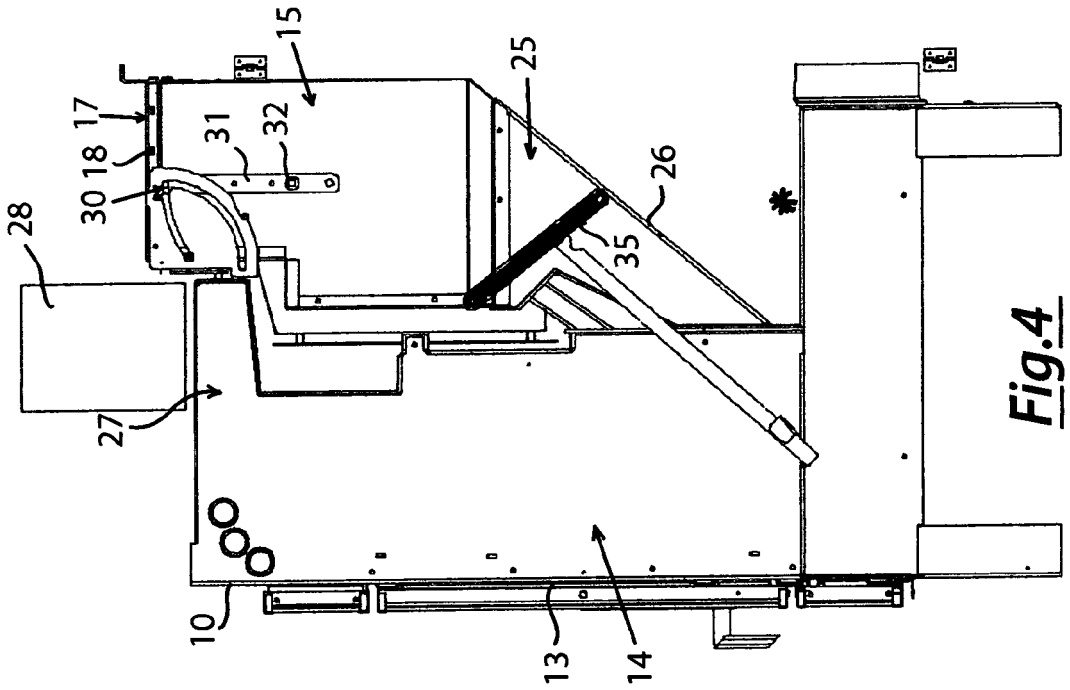
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Fig.4

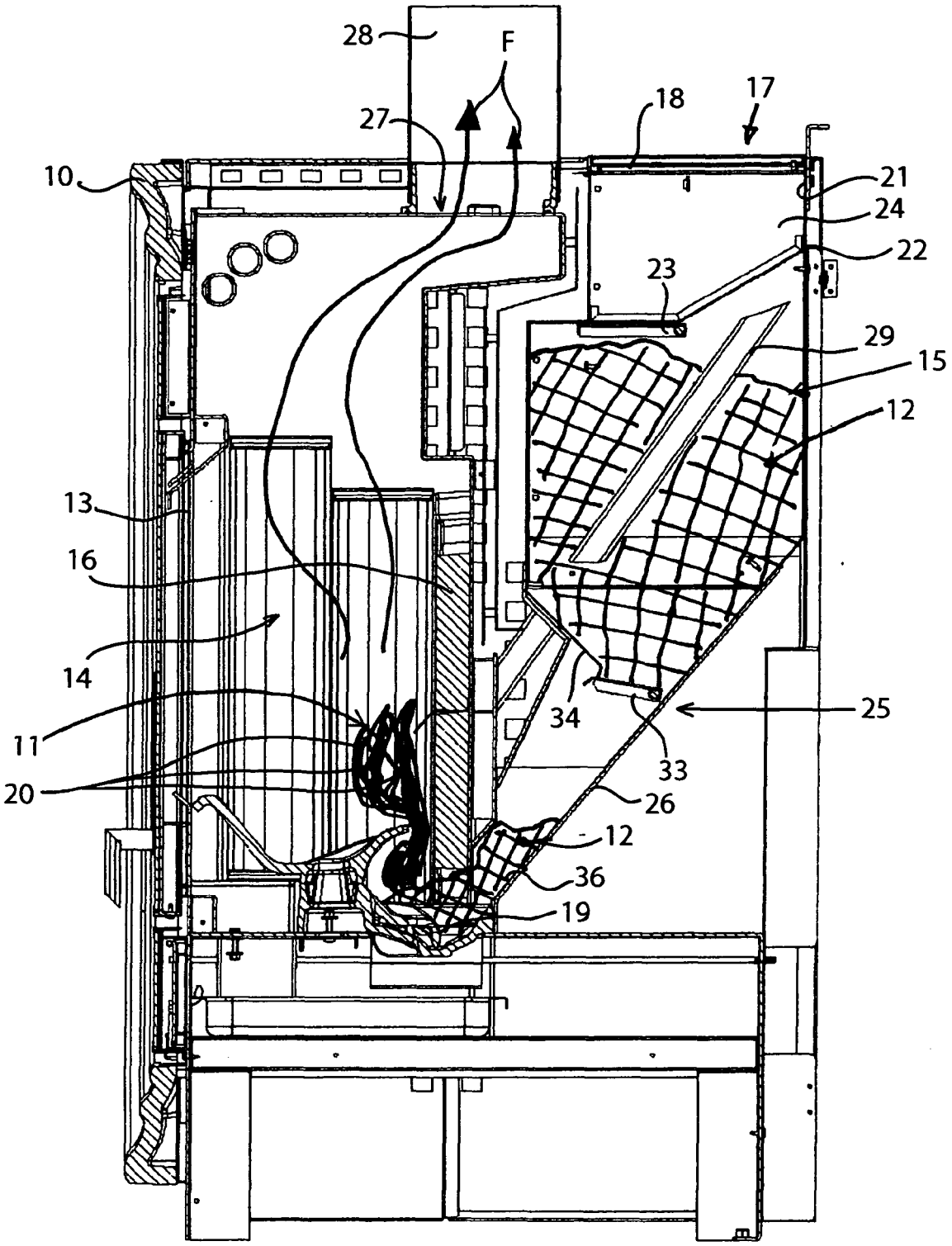

Fig.4B

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EUROPEAN SEARCH REPORT

Application Number
EP 09 42 5010

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 May 2009	Verdoodt, Luk

CATEGORY OF CITED DOCUMENTS

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