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(54) **COMBUSTION DEVICE**

BRENNVORRICHTUNG

DISPOSITIF DE COMBUSTION

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(73) Proprietor: **Swedish Bioburner System Aktiebolag**
662 24 Amal (SE)

(72) Inventor: **INGVARSSON, Robert**
S-662 91 m l (SE)

(74) Representative: **Johansson, Lars E.**
Hynell Patenttjänst AB
Patron Carls väg 2
683 40 Hagfors/Uddeholm (SE)

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Description

TECHNICAL FIELD

[0001] The present invention relates to a device for the combustion of granular solid fuel, for example wood flour pellets, chippings and the like, comprising a combustion chamber, an air inlet having a fan for providing air to the combustion chamber and for creating a predetermined through blowing of air through the combustion chamber before, during and after the combustion of the fuel, a dosing unit for feeding of the fuel to the combustion chamber, an ignition device for ignition of the fuel, a control and checking unit for operation of associated or cooperating parts arranged in or at the combustion device and also an outlet for hot combustion gases from the combustion of the fuel from the combustion chamber to a boiler section in a heating boiler for transfer of the heat to the heating system of the heating boiler, for example through water-cooled surfaces in the heating boiler.

PROBLEM PRESENTATION AND BACKGROUND OF THE INVENTION

[0002] Combustion devices, also called burners below, of the type specified above are known in different designs, for example by way of the Swedish patent document SE-B-450 734, which shows a burner having a rotary combustion chamber for solid granular fuel, for instance in the form of pellets, or through the Swedish patent SE-C-63 193, which shows an oven for combustion of especially city waste. Also the latter combustion device comprises a rotating drum that serves as a fuel grate. Consequently, in such combustion devices, the fuel is rotated during a simultaneous combustion of the same. At the combustion are partly combustion gases, partly ash and other slag products formed. The largest portion of the ashes, approximately 80-90 % of all ashes, follows the airflow through the burner as fly ash, which falls out from the combustion gases inside the actual heating boiler. The desire is that 100 % of the ashes shall fall out on the outside of the burner, which normally happens if the melting point of the ashes lies over the temperature interval in which the burner is intended to work, i.e. if the melting point of the ashes lies over a normal operation temperature of approx. 1100 °C. At combustion at temperatures over the melting point of the ashes, the originally powdered and alleviated ashes are transformed to pieces of together melted materials, so called sinter. Document EP-A2-0915289 discloses also a combustion device relating to the technical field of the present invention.

[0003] However, in certain special cases and above all at combustion of impure fuel with a too large proportion of certain substances with lesser or with deteriorating combustion properties, the ashes becomes soft and adheres together to sinter already at lower temperatures then at said 1100 °C. The basic reason or reasons for this are somewhat indistinct but can depend on the content of boron and/or other flux forming substances in the pellets, i.e. substances which lowers the normal melting point of the ash particles. Fuel pellets for burning in heating boilers for smaller houses are a domestic renewable bio-fuel, which is harmless to the environment and which do not bring any net increase of carbon dioxide to the atmosphere and which, for instance, is produced from residual products from the building and saw mill industry, e.g. saw and cutter shavings. Normally, the fuel pellets consist of approx. 10 % water and approx. 12 % pure coal, while substantially the rest of the pellets consist of different hydrocarbon compounds. However, the content of the pellets varies greatly.

[0004] The sintering cause an obstruction of the openings, which are necessary for the air flowing through the fuel bed, and that an accretion of ash, unburned pellets and sinter slag is formed. The more sintering, the more air must be added, which leads to less efficiency for the burner when the combustion gases are diluted and because that the extra air supplied also acts as a cooling agent. As will be understood, combustion devices that are without any rotating combustion chamber increases the problems mentioned above very obviously. The accretion of ashes, pellets, and slag grows fairly soon, why a larger heap is formed from it, which can cause the position of the fuel bed to be transferred to a position that is unfavourable for the function, simultaneously as the risk for backfire increases dramatically as well, i.e. that the seat of fire is lifted up towards and into the feeding tube for the fuel, which causes the sintering to be both technical difficult and in addition dangerous as well.

[0005] In many heating boilers there are a container in the form of a box inside the boiler and in which box the ashes end up while the front portion of the burner is inserted into the actual heating boiler. The ashes in the box are emptied either manually or by a suction of the ashes by means of a suction device. The ash pan can be relatively large, why it can be emptied relatively rarely without causing any nuisances. The pellet consumption, when burning fuel pellets with an energy content of approx. 4.7-5.0 kWh/kg, is approx. 4 ton/year for an ordinary heating boiler for a smaller house and with a normal ash content of 0.5-1.0 weight-% there will not be any need for emptying the ashes for approximately one month. With "heating boiler for a small house" is here meant boilers that have burners with effects in the region of approx. 5-20 kW. The pellet burners used today are normally intended for higher effects, approx. 30 kW, while they are needlessly large in order to be used in standard heating boilers for smaller houses.

[0006] Consequently, it is realised that the clearly dominant problem for pellet burners is the sinter formation inside the actual burner. In a known construction with fixed combustion chamber, a detachable grate is arranged, which grate constitutes a shelf with through going holes and on top of which shelf the pellets fall

down through a feeding conduit. The described sintering obstructs the openings in the grate, why this normally must be taken out for cleaning each week, but occasionally this must be done a lot more often, which then causes large worries and irritation for the user. Because of this, it is a whish that the burner must function without special measures during a longer period, for instance there must not be any need for the grate to be taken out and/or to be cleaned more then once per month.

[0007] The problem of sintering could probably be reduced by certain additions at the actual pellet production, for instance from intermixing of one or several substances which act as catalysts or which are raising the melting point, but when the will of the manufacturers of pellets to correct the mentioned problems is low, workarounds must instead be achieved in the burner construction in order to eliminate or at least substantially decrease the problems which follow said sintering of the ashes.

THE OBJECT OF THE INVENTION AND ITS CHARACTERISTICS

[0008] The object of the present invention is to achieve a device for combustion of solid granular fuel, which device eliminates or at least substantially reduces said problems mentioned above of accretion of ashes, unburned residues of fuel and other slag products as sinter.

[0009] According to the invention, the device is characterised by that the combustion device also comprises a movably arranged ash feeder with a drive unit, controlled by the control and checking unit for automatic outfeeding out of the combustion chamber of ashes, unburned fuel and slag products, which are created during the combustion of the fuel.

[0010] According to additional aspects for a device according to the invention it is applicable that:

- It is included in a system for central heating of a building, which central heating system, beyond said heating boiler with accompanying heating system, comprises at least another fuel supply and at least one fuel conveyer for a automatic feeding of the fuel from the fuel supply to the dosing device.

- The combustion device, beyond or instead of the fuel conveyer and the fuel supply, has a fuel supply, which is built into the dosing device.

- The dosing device comprises a fuel feeder for dosing of the fuel from the dosing device and further into the combustion chamber via a feeding tube.

- The feeding tube has the form of a preferably somewhat inclined fall shaft, along which the fuel falls freely a certain, determined length for prevention of backfire.

- In the proximity of the feeding tube, there are safety means arranged which are comprised of a thermo guard, which gives the alarm if the heat is spreading in the tube, and/or one or more slide valves, for shutting of the feeding tube.

- The fuel feeder comprises a feeding screw, which is pivotally arranged between and in the proximity of the upper end of said feeding tube at the dosing device and either an inlet to the dosing device or to the base of the built in fuel supply.

- The blowing fan comprises a variable-speed controlled motor and is mounted at the rear part of the combustion chamber for blowing and circulation of air through said air inlet and forward and further out through the outlet of the front part of the combustion chamber.

- The combustion chamber comprises outer walls, inner limiting walls and a movable inner bottom, the latter of which is arranged on a determined distance from the outer walls for division of the consequently double-walled combustion chamber in a front, a rear and a lower air chamber and two air-ducts along the longitudinal sides of the combustion chamber.

- One, several or preferably all the limiting walls have perforations in the form of smaller apertures, holes and/or larger openings for through blowing of air.

- The limiting walls enclose an inner part of the combustion chamber, which inner part, together with the bottom, constitutes a fireplace for the combustion of the fuel.

- The ignition device is arranged in the rear air chamber at the rear limiting wall.

- The ignition device is arranged in the lower air chamber and is arranged in cooperation with the ash feeder.

- The ignition device is arranged within the ash feeder, wherein the ignition device follows the reciprocating movements of the ash feeder.

- The rear limiting wall has air holes into the ignition device for through blowing of air from the blowing fan through the ignition device and further into the fireplace.

- The ignition device comprises an ignition coil for electrical heating ofthe ignition device.

- The ignition coil is provided as an induction heater.

- The ignition device has a casing with an air inlet for blowing of air from the blowing fan.

- The ash feeder comprises a front part and one or several elongated rods that are attached at and between the front part and the drive unit for the ash feeding.

- The front portion and the front end of each rod are arranged in the lower air chamber, while the drive unit and the rear end of each rod are arranged in a casing of their own.

- The casing is arranged outside the heat-insulated combustion chamber at the rear outer wall and with each rod running through an aperture in said rear outer wall.

- The front portion has the form of an upside down box, open backwards, with three sides and one perforated bottom arranged upwards, which bottom simultaneously constitutes the movable inner bottom mentioned above, in which one side constitutes a front edge from which the bottom and the other two sides are arranged in the backward direction towards the drive unit and in which the sides are arranged at a distance from the longitudinal outer walls of the combustion chamber for forming of a continuation downwards of the air ducts mentioned above.

- That the ash feeder comprises two end positions, one front position, the drive position, at which the front portion shuts the lower end of the fireplace and a rear position, the ash evacuating position, at which the fireplace is open downwards, and between said end positions the front portion is arranged to be transferred by means of the drive unit via the rods.

- The drive unit comprises a fixed front stop, two sliding sleeve, which are movably arranged along each rod as a front and a rear sliding sleeve, and a spring, which is arranged between the sliding sleeves, an eccentric and also a fixed rear stop at the rear end part of the rod.

- The eccentric comprises a pivot bar and two link arms, of which one is longer then the other, and that the two link arms are pivotally joined to each other at a mutual end part, that the other end of the shorter link arm is attached to the pivot bar while the other end of the long link arm is pivotally fixed at the rear sliding sleeve.

- The drive unit has a motor for operation of the eccentric by way of the pivot bar and thereby of the reciprocating movements of the front part.

ADVANTAGES OF THE INVENTION:

[0011] The solution of constructing an ash feeder which removes the ashes, the sinter deposits and any other unburned residues from the fuel out of the combustion device and over to the ash container of the conventional heating boiler constitutes a very simple construction with few parts. The burner is especially intended to replace an oil burner in a conventional, oil fired boiler, i.e. the basic idea is that a pellet burner is mounted in a conventional heating boiler instead of the now so usually frequent oil burner. This results in a burner that is small, easily operated and very effective, which, beyond the ash feeder, substantially only contains a blowing fan, an ignition device and a dosing device, why the burner is both not expensive to manufacture and, furthermore, is very reliable. In addition, the risk for backfire is almost entirely eliminated.

LIST OF FIGURES

[0012] With reference to the annexed figures the invention will be more closely described in the following, in which:

Fig. 1 is a schematic view of parts of a combustion device for solid fuel, which is installed in a conventional central heating system in a small house, which central heating system also displays fuel supply, conveyor, boiler and chimney.

Fig. 2 is a schematic cross-section through parts of a combustion device according to the present invention, which is to be used in a central heating system according to Fig. 1.

Fig. 3 is a schematic cross-section through parts of the combustion device according to Fig. 2, in which the necessary air circulation is shown more closely.

Fig. 4a-f shows schematically the course of action for an ash and slag evacuation in the combustion device according to Fig. 3.

DETAILED DESCRIPTION OF THE DESIGN

[0013] With reference to Fig. 1, it is shown a schematic view of parts of a device 3 for combustion of solid fuel in the form of granular materials, for instance compressed wood flour pellets or briquettes, chips or the like with a suitable diameter of approx. Ø 6- Ø 12 mm, which is installed at a conventional central heating system 1 for heating of a building 2, for instance a small house, which central heating system 1 also shows, in relation to the combustion device 3, a free standing fuel supply 4, at least one fuel conveyer 5, a conventional heating

boiler 6 with a known heating system (not shown), for instance a waterborne circulation system that is provided with radiators, which system comprise water-cooled surfaces in the heating boiler 6, and a chimney 7 for the fumes that are created.

[0014] The fuel feeder comprises a motor 8 with a transmission box for operation of a feed screw 10 which is revolvably arranged in a stiff feed tube 9 for automatic feeding of fuel from the fuel supply 4 through a down pipe 11, suitably in the form of a flexible hose, to a smaller dosing device 12 in the combustion device 3. The fuel feeder 5 can also be provided with several feed screws 10 with an optional length decided from operational and space dependant reasons. Feeding with a feed screw 10 is the best alternative according to expertise in the point of view of operation and safety but also other types of known fuel feeders can of course be used at the combustion device 3 according to the invention. In the embodiment shown in Fig. 2 of the combustion device 3 may this also, or instead of the described fuel feeder 5 with a external fuel supply 4, have a smaller fuel supply 13 which is built-in to the actual dosing device 12, which can be filled manually, and then one to two times per week regularly.

[0015] The dosing device 12 comprises another fuel feeder 14 having a drive motor 15 for the automatic dosage of the fuel from the dosing device 12 and further into a substantially horizontal combustion chamber 16, which is arranged underneath said dosing device 12, through a feeding tube 17. The feeding tube 17, which emerges into the top part of the combustion chamber 16 is preferably in the form of a somewhat inclined fall shaft along which the fuel, after feeding of the correct fuel dose by the fuel feeder 14, falls freely a certain and determined length for prevention of backfire. Additional safety means are arranged in the proximity of the feeding tube 17. These comprise for instance of a thermo guard 18, which gives the alarm if the heat spreads upwards in the tube 17, and one or more slide walls 19 for closing of the heating tube 17. In the embodiment shown in Fig. 2, the additional fuel feeder 14 is comprised of a feeding screw 20, which is arranged substantially horizontal and pivotally between the proximity of the upper end part 21 of said feeding tube 17 at the dosing device 12 and either the inlet 22 of the down pipe 11 to the dosing device 12 or the bottom 23 of the built in smaller fuel supply 13, if a such is arranged.

[0016] The combustion device 3 comprises beyond said dosing device 12 and combustion chamber 16 an air inlet 24 with a blowing fan 25 for supply of air to the combustion chamber 16 for the combustion of the fuel and for transporting out of the combustion gases and the fly ash, which are produced thereby, through an outlet 26 from the combustion chamber 16 further into a boiler section 27 in the heating boiler 6 for transfer of the combustion heat to the heating system of the heating boiler 6 (not shown), an automatic ignition device 28 for ignition of the fuel, a movably arranged ash feeder 29 with a drive unit 30 for raking out the slag products, the ashes and the unburned fuel 31 out of the combustion chamber 16 and further into the heating boiler 6 and a control and checking unit 32 for a substantially all-automatic operation of the combustion device 3 and certain or all associated or cooperating parts arranged in or at the combustion device 3.

[0017] The control and checking unit 32 constitutes a known microprocessor based device having sensors necessary for the function, for instance the thermo guard 18, and is not described any closer here, however it is to be noticed that by means of said unit 32 and through the boiler 6 drive thermostat a fully automatic system is obtained from the delivery of fuel from the supply 4 to the raking out of the slag products 31 to the ashbin 61 of the heating boiler 6, including the ability to use several pre-programmed power steps, for instance 9, 12, 18, 23 kW.

[0018] The blowing fan 25, which is mounted at the rear part 33 of the combustion chamber 16 for blowing and for circulation of air in through said air inlet 24 and forward and further out through the outlet 26 at the front upper part 34 of the combustion chamber 16, has a silent-running, variable-speed controlled motor 35 with a built in thermo switch which switch's off at an overload. The combustion chamber 16 comprises partly outer walls 36, which preferably are shaped into a substantially box-shaped combustion chamber 16 on the outside, partly inner limiting walls 37 and a movable inner bottom 45, which is arranged at a determined distance from the outer walls 36 for a division of the thus double-walled combustion chamber 16 in a front, a rear and a lower air chamber 38, 39, 40 and two air-ducts 41, 42 along the longitudinal sides of the combustion chamber 16. In a preferred embodiment, the combustion chamber 16 constitutes on its outside a square pipe having a quadratic cross-section with the wideness of approx. 160 mm. One, several or preferably all of the limiting walls 37 have perforations in the form of smaller apertures and/or larger openings 43 for the through blowing of air (see Fig. 3). The limiting walls 37, of which several or only one is arranged starting from and with a downwards slope from the inside of, and inwards from, the ceiling 48 of the combustion chamber 16 or from one, several or all of the insides of the outer walls 36, are enclosing an inner and suitably downwardly funnel-formed part 44 of the combustion chamber 16, which inner part together with a bottom 45 constitute a fireplace for the combustion of the fuel. The bottom 45 of the fireplace 44 constitutes the grate, i.e. the usually lattice-formed bottom 45 on which a fuel bed 46 rests during combustion and intermittent or continuous through flowing of air. The muzzle 47 of the feeding tube 17 is suitably arranged in the ceiling 48 of the fireplace 44 and in a near proximity to one or several of the inner insides of the limiting walls 37, of which inner walls 37 one or several have a pitch which is intended to give an alignment towards the fuel bed 46 for the fuel that is falling

down in a controlled manner from the dosing device 12 above. The upper and wider tunnel end of the fireplace 44 is open at the front upper part 34 of the combustion chamber 16, into the boiler section 27 and, consequently, constitutes said outlet 26 for the combustion gases mentioned above.

[0019] Suitably, the ignition device 28 for the automatic ignition of a determined amount of fuel that has fallen down from the dosing device 12 onto the grate 45 (see Fig. 4e), which is called ignition composition 49 below and which is arranged in the rear air chamber 39 at the rear limiting wall 37a. After the ignition, the ignition composition 49 constitutes said fuel bed 46 mentioned above. The rear limiting wall 37a has air holes 57 into the ignition device 28 for through blowing of air from the blowing fan 25, through the ignition device 28 and further into the fireplace 44. Preferably, the air holes 57 are oval for allowing of an optimal airflow. In the embodiment shown in the figures, the ignition device 28 comprises an ignition coil 50 of any known type, for instance comprising a so called kanthal-thread for electrical heating of the ignition device 28 to a temperature of approx. 800 °C, wherein the kanthal-thread has a temperature of around 1100 °C. The ignition coil may also be provided as an induction heater (not shown).

[0020] The ash feeder 29 comprises a front part 51, also called rake below, and one or several elongated rods 52 which are attached at and between the front part 51 and the drive unit 30 for feeding of the ashes. The rake 51 and the front end of each rod 52 are arranged in the lower air chamber 40, while the drive unit 30 and the rear end of each rod 52 are arranged in a containment 53 of their own, suitably arranged outside the heat insulated combustion chamber 16 at the rear outer wall 36a and having each rod 52 running through a hole 60 in the same 36a. The front portion 51 has the shape of an upside down turned box with three sides 54, 55, 56, which box is open in the back, and a perforated bottom that is arranged upwards and which bottom simultaneously constitutes the grate 45 mentioned above. One side 54 constitutes a front edge which is substantially vertical and from which the bottom 45 and the two other sides 55, 56 extend backwards and towards the drive unit 30. The longitudinal sides 55, 56 are arranged at substantially the same distance from the longitudinal outer walls 36 of the combustion chamber 16 as the longitudinal inner limiting walls 37 forming a continuation downwardly of said air-ducts mentioned above. The ash feeder 29 comprises two end positions, one front position, the operational position 58, at which the rake 51 shuts the lower end of the fireplace 44, see Fig. 4a, and a rear position, the ash evacuating position 59, at which the fireplace 44 is almost fully open downwards, see Fig. 4c, between which end positions 58, 59 the rake 51 is arranged to be transferred by means of the drive unit 30 via the rods 52. The ignition device 28 may also be arranged within the ash feeder 29, so that the ignition device 28 follows the ash feeder 29 in its reciprocating movements under the fireplace 44. The ignition device 28 has a casing 71 with air inlets 72 for blowing air from the blowing fan 25.

[0021] The drive unit 30, see the figures 3 and 4, comprises a fix front stop 62 at each rod hole 60, suitably consisting of the separating wall 36a between the combustion chamber 16 and the containment 53, sliding sleeves 63, 64, which are arranged movably along said rod 52, and a spring 65, which, in the embodiment shown in Fig. 3 and 4, is arranged around each rod 52 between the sliding sleeves 63, 64, an eccentric 66, which comprises a pivot-bar 67 and two link arms 68, 69, and a fixed rear stop 70 arranged at the rear end of the bar 52. The two link arms 68, 69, of which one 68 is substantially twice as long as the other 69, are pivotally incorported with each other at one of their end parts. The other end of the shorter link arm 69 is attached to the pivot bar 67 while the other end of the long link arm 68 is pivotally attached to the rear sliding sleeve 64. Furthermore, the drive unit has a motor, not shown, for the operation of the eccentric 66 via the pivot bar 67 and thereby of the reciprocating movements of the rake 51.

FUNCTIONAL DESCRIPTION

[0022] The function and the use of the combustion device 3 according to the invention are as follows.

[0023] By means of the current electronics for the heating boiler 6, and controlled by the controlled and checking unit 32, the combustion device 3 starts and stops automatically in accordance with the configuration that the operational thermostat of the central heating system 1 has. Before starting the combustion device 3, the ash feeder 29 has been transferred to its front operational position 58, see Fig. 4a, so that the bottom 45 of the fireplace 44 is closed and the fuel feeder 14 has fed fuel to the dosing device 12, see Fig. 1. At start up, a certain, smaller quantity of fuel is automatically fed by the feed screw 10 of the dosing device 12, see Fig. 2, actuated by the motor 15, which quantity falls down along the feeding tube 17 so that an ignition composition 49 necessary for ignition of the fire bed 46 is created on the bottom 45 of the fireplace 44 and in front of the air holes 57 in the rear limiting wall 37a into the ignition device 28, see Fig. 4e.

[0024] The ignition device 28, see Fig. 2 and 3, is initiated and at which the ignition coil 50 is heated considerably to approx. 750-800 °C, which takes approx. 2 min. When a correct temperature has been reached for the ignition coil 50, the motor 35 to the blowing fan 25 starts so that air is blown in through the air inlets 24 to the rear air chamber 39 and further in through the air inlet 72 in the casing 71 of the ignition device 28 and beyond and past the ignition coil 50. Consequently, no air is blown during the heating of the ignition coil 50, while this only would cool it off. Alternately, the fuel can also be fed during the time the ignition coil 50 is heated up to the intended temperature and until an ignition com-

position 49, having a suitable combustion time, has been received on the bottom 45 of the fireplace 44.

[0025] After approx. 2 minutes the blowing fan 25 starts so that short, intermittent air thrusts of very hot air are forced out and/or up through the ignition composition 49 through the openings57 and the holes 43, depending on if the ignition device 28 is mounted in the rear (which is shown in Figs. 2-4) or in the lower air chamber 39, 40 (not shown). When the fuel reaches its ignition temperature caused by the high air temperature, which takes approx. 1 minute, the ignition composition 49 catches fire. More precise, a primary combustion of the fuel occurs on top of the grate 45 at which the fuel emits the combustion gases, which then ignites. Already after approx. 3 minutes, the ignition normally occurs, but the ignition coil 50 is yet operated up to the full time (5 minutes) just to be sure.

[0026] When it has gone approximately 3.5 minutes from start, the fan 25 is adjusted so that each specific air thrust becomes longer with shorter interruptions between each air thrust. After the ignition of the combustion gases, these are brought to a secondary combustion in the form of a flame of fire out through the outlet 26 created by the airflow from the blowing fan 25, and having a direction determined by the air chambers 38, 39, 40 and the air-ducts 41, 42. The operation is then continued by the fact that the control and checking unit 32 and the drive thermostat of the heating boiler 6 make the dosing devise 12 to dose out sufficient fuel quantities with a correct interval for achieving a chosen temperature. For example, at a full power drain, well-defined fuel doses are fed into the fireplace 44 with intervals so defined that the fuel bed 46 burns continuously. At a lower power requirement, the burner 16 doesn't have to be in operation continuously, why the fuel bed is allowed to go out. Consequently, the automatic ignition of an ignition composition 49 occurs at start of the central heating system 1, at certain defined occasions during the operation of said central heating system 1 and after unscheduled power failures, which ignition is controlled by the control and checking unit 32.

[0027] After the secondary combustion of the combustion gases, the desire is that substantially all fuel has been transformed into fumes with merely a small amount of fly ash as a rest, which ash rest follows the fumes out into the boiler section 27 and into the ash bin 61 arranged there. However, this is not always the case, which have been explained above. During the ignition, the ignition coil 50 becomes approx. 800 °C and the kanthal-thread then attains a temperature of around 1100 °C. The kanthal-thread can not endure more then 1200 °C, while the magnesium oxide in the thread melts if it reaches a temperature over 1200 °C. The expired fuel bed 46 comprising unburned fuel, the ashes and the sinter 31, which are created during the last production period before the stop, creates a heap on top of the bottom grating 45 of the fireplace 44, i.e. the rake 51, which heap 31 grows larger as the heating boiler 6 is used. Each new ignition composition 49, which is being dosed downwards, ends up in a smaller heap somewhat further back on the bottom 45 on top of the sinter 31. Thereby, the new ignition composition 49 increases the heap 31 and, furthermore, it obstructs the holes 43 and the openings 57 additionally, why it becomes increasingly more difficult for the hot airflow to get through and start the ignition of every new ignition composition 49. Consequently, the fuel is free from direct contact with the ignition coil 50.

[0028] Before restart, and after that the ignition coil 50 has cooled off, the drive unit 30 brings the rake 51, which rake constitutes both a bottom 45 for the fuel and an ash feeder 29 for the sinter products 31, to a reciprocating movement, during which movement air is simultaneously blown so that the holes 43 and openings 57 does not get obstructed. Inside the heating boiler 6 a negative pressure is prevailing, why the air must be forced in by means of the blowing fan 25 into the front portion 51 of the ash feeder 29 and then further into the fireplace 44 through the grate holes 43 and up through the fuel bed 46. Furthermore, the double walls 36, 37 in the combustion chamber 16 constitutes air-ducts 41, 42 around the box shaped grate rake 51 and through which channels 41, 42 the blowing fan 25 feeds air along the sides 55, 56 of the grate bin 51 to the front air chamber 38 and further inwards from the holes 43 of the front air chamber 38, but also through the holes 43 in the longitudinal sides 37 of the fireplace 44. In the drive position 58, the grate is completely dense along the inner walls 37 in to the fireplace 44, while the grate bin 51 is somewhat wider then the inner walls 37 in order to prevent the fuel to fall outside and beside the grate bin/the rake 51. Initially the rake 51 is moved backwards so that the ashes, the slag and the sinter 31 are scraped of against the rear edge of the inner wall 37a, which serves as an anvil, and down in front of the rake 51 while this is moved backwards to its hindmost end position, the ash evacuating position 59. At the ash evacuating position 59, substantially the entire rake 51 is pulled back inside the rear limiting wall 37a, after which the rake is made to turn and go back in the forward direction by the drive unit 30, and then at least to its drive position 58 or even further, preferably at least to the level of the front outer wall 36 of the combustion chamber 16, while the ashes, the sinter products and the unburned fuel 31 are pushed in front of the rake and further down into the ashbin 61 of the heating boiler 6. The rake 51 is then reverted to the initial position, i. e. the drive position 58.

[0029] Slag feeding is done when the operation is interrupted; normally about approximately every 30 minutes, and after that the temperature has been lowered in the combustion chamber 16. At the temperature of 200 °C is reached an initial 30 sec fan blowing is done for blowing out the fly ashes. The slag 31 has then become solid and is left behind. The thermostat switches on and off maybe 6 times in the summer and up to 24 times in the winter. 30 min. operation, 30 min. cooling,

24 hours a day.

[0030] The closer function of the drive unit for the embodiment shown in the figures 3 and 4a-f is as follows:

[0031] During operation of the combustion device. 3; the two link arms 68, 69 of the drive unit 30 eccentric 66 are being arranged forwards and towards the combustion chamber 16. When launching an ash evacuation the control and checking unit 32 activates the motor of the drive unit 30, which rotates the pivot bar 67 (in accordance with Fig. 4a) so that the eccentric 66, by way of the link arms 68, 69, pushes the grate bin 51 backwards from its front drive position 58. At the ash evacuation position 59, the two link arms 68, 69 are completely directed backwards. The fireplace 44 is fully open and the slag products 31, which were left after the blow cleaning before the withdrawal of the rake 51 started, is now in front of the rake 54. The pivot bar 67 continues to rotate so that it pulls the bar 52 with it in a forward direction, until the original position, i.e. the drive position 58, once again is taken. By using one or more and somewhat longer rods together with the drive unit, in an alternative and not shown embodiment, the ash feeder may be brought all the way forwards and in level with the front outer wall of the combustion chamber before the drive position of the rake is taken, and in which position the link arms in this specific case have an angle between them which is larger than zero and less than 180 °C.

[0032] If the forward going movement of the rake 51 is blocked by a too large heap of slag products and unburned fuel 31, which have fallen down in front of the rake 51 during the backward movement, the spring 65 allows the eccentric to make one complete rotation, after which the control and checking unit 32, or a switch not shown, make sure that the ash evacuating movement is repeated until one complete strike have been obtained for the rake 51, i.e. that the rake 51 is reciprocated between its maximum end position 58, 59, which are set by the length of the rods 52 used.

ALTERNATIVE EMBODIMENTS

[0033] The invention is not limited to the shown embodiment and it can be varied in different ways within the frame of the claims. It is for instance realized that with a conventional heating boiler 6 it is here for instance meant a so called oil-fired boiler for smaller hoses 2 in which the normal oil burner is replaced by a burner 16 for solid fuel, preferably pellets, and in which the heating system, for instance the existing waterborne system is used in exactly the same way as in normal oil firing. The pellet burner 16 is installed with a connection to the standard drive thermostat of the boiler 6. Of course there is not any limitation made in the use of the combustion device 3, for example into it being used only in already existing boilers 6, why the combustion device may be used in every new installation of applicable central heating systems 1.

Claims

1. A device (3) for the combustion of granular, solid fuel, for example wood flour pellets, chippings, and the like, comprising
a combustion chamber (16) which comprises outer walls (36) as well as inner limiting walls (37) and an inner bottom (45), which inner limiting walls (37) and inner bottom are provided at a fixed distance from the outer walls (36) for division of the double-walled combustion chamber (16) into a front, a rear, and a lower air chamber (38,39,40), and two air ducts (41, 42) provided along longitudinal sides of the combustion chamber (16), which limiting walls (37) and inner bottom (45) enclose an inner part (44) of the combustion chamber (16) forming a fire place (44) for the combustion of the fuel,
an air inlet (24) having a fan (25) for feeding of air to the combustion chamber (16) via air chambers (38,39,40) and air-ducts (41,42) for attaining a predetermined air flow through the combustion chamber (16),
a dosing unit (12) for feeding of the fuel into the combustion chamber (16),
an ignition device (28) for ignition of the fuel,
a control and checking unit (32) for operation of the combustion device (3) and of parts thereof or cooperating therewith,
an outlet (26) for hot combustion gases from the combustion of the fuel from the combustion chamber (16) to a boiler section (27) in a heating boiler (6) for transferring the heat to the heating system of the heating boiler (6), for example through water-cooled surfaces in the heating boiler (6),
a movably arranged ash feeder (29) with a drive unit (30), controlled by the control and checking unit (32) for automatic feeding of ashes, unburned fuel, and slag products (31), created during the combustion of the fuel, out of the combustion chamber(16),
characterised by that the ash feeder (29) comprises a movable front part (51) provided in the lower air chamber (40), and which part comprises a perforated bottom which constitutes the above mentioned inner bottom (45), which front part (51) is provided to be moved by the drive unit (30) between at least a drive position (58), in which said front part (51) is provided to shut the lower end of the fire place (44), and an ash evacuating position (59), in which the fire place (44) is open downwards.

2. A device according to claim 1, **characterised by** that it is included in a system (1) for central heating of a building (2), which central heating system 81) beyond said heating boiler (6) with accompanying heating system comprises at least another fuel supply (4) and at least one fuel conveyer (5) for a automatic feeding of the fuel from the fuel supply (4) to the dosing device (12).

3. A device according to claim 2, **characterised by** that the combustion device (31) beyond or instead of the fuel conveyer (5) and the fuel supply (4) has a fuel supply (13), which is built in to the dosing device (12).

4. A device according to claims 1, 2 or 3, **characterised by** that the dosing device (12) comprises a fuel feeder (14) for dosing of the fuel from the dosing device (12) and further into the combustion chamber (16) via a feeding tube (17).

5. A device according to claim 4, **characterised by** that the feeding tube (17) has the form of a preferably somewhat inclined fall shaft, along which the fuel falls freely a certain, determined length for prevention of backfire.

6. A device according to claims 4 or 5, **characterised by** that in the proximity of the feeding tube (17), there are safety means arranged which are comprised of a thermo guard (18), which gives the alarm if the heat is spreading in the tube (17), and/or one or more slide valves (19) for shutting of the feeding tube (17).

7. A device according to claim 4 in combination with claim 3, **characterised by** that the fuel feeder (14) comprises a feeding screw (20), which is pivotally arranged between and in the proximity of the upper end (21) of said feeding tube (17) at the dosing device (12) and either an inlet (22) to the dosing device (12) or to the base (23) of the built in fuel supply (13).

8. A device according to any of the claims above, **characterised by** that the blowing fan (25) comprises a variable-speed controlled motor (35) and is mounted at the rear part (33) of the combustion chamber (16) for blowing and circulation of air through said air inlet (24) and forward and further out through the outlet (26) of the front part (34) of the combustion chamber (16).

9. A device according to any of the claims above, **characterised by** that one, several or preferably all the limiting walls (37) have perforations in the form of smaller apertures, holes and/or larger openings (43) for through blowing of air.

10. A device according to any of the claims above, **characterised by** that the ignition device (28) is arranged in the rear air chamber (39) at the rear limiting wall (37a).

11. A device according to claims 1-9, **characterised by** that the ignition device (28) is arranged in the lower air chamber (39) and is arranged in cooperation with the ash feeder (29).

12. A device according to claims 1-9, **characterised by** that the ignition device is arranged within the ash feeder, wherein the ignition device follows the ash feeders reciprocating movements.

13. A device according to claim 10, **characterised by** that the rear limiting wall (37a) has air holes (57) into the ignition device (28) for through blowing of air from the blowing fan (25) through the ignition device (28) and further into the fireplace (44).

14. A device according to any of the claims above, **characterised by** that the ignition device (28) comprises an ignition coil (50) for electrical heating of the ignition device (28).

15. A device according to claim 14, **characterised by** that the ignition coil (50) is provided as an induction heater.

16. A device according to any of the claims above, **characterised by** that the ignition device (28) has a casing (71) with an air inlet (72) for blowing of air from the blowing fan (25).

17. A device according to any of the claims above, **characterised by** that the ash feeder (29) comprises one or several elongated rods (52) that are attached at and between the front part (51) and the drive unit (30) for the ash feeding.

18. A device according to claim 17, **characterised by** that the front portion (51) and the front end of each rod (52) are arranged in the lower air chamber (40), while the drive unit (3 0) and the rear end of each rod (52) are arranged in a casing of their own.

19. A device according to claim 18, **characterised by** that the casing is arranged outside the heat insulated combustion chamber (16) at the rear outer wall (36a) and with each rod (52) running through an aperture (60) in said rear outer wall (36a).

20. A device according to any of the claims 17-19, **characterised by** that the front portion (51) has the form of an upside down box, open backswords, with three sides (54, 55, 56) and one perforated bottom arranged upwards, which bottom simultaneously constitutes the movable inner bottom (45) mentioned above, in which one side (54) constitutes a front edge from which the bottom (45) and the other two sides (55, 56) are arranged in the backward direction towards the drive unit (30) and in which the sides (55, 56) are arranged at a distance from the longitudinal outer walls (36) of the combustion chamber (16) for forming of a continuation downwards of the air ducts (41, 42) mentioned above.

21. A device according to any of the claims 17-20, **characterised by** that the drive unit (30) comprises a fixed front stop (62), two sliding sleeves (63, 64), which are movably arranged along each rod (52) as a front and a rear sliding sleeve, and a spring (65), which is arranged between the sliding sleeves (63, 64), an eccentric (66), and also a fixed rear stop (70) at the rear end part of the rod (52).

22. A device according to claim 21, **characterised by** that the eccentric (66) comprises a pivot bar (67) and two link arms (68, 69), of which one (68) is longer then the other (69), and that the two link arms (68, 69) are pivotally joined to each other at a mutual end part, that the other end of the shorter link arm (69) is attached to the pivot bar (67) while the other end of the long link arm (68) is pivotally fixed at the rear sliding sleeve (64).

23. A device according to any of the claims 21-22, **characterised by** that the drive unit (30) has a motor for operation of the eccentric (66) by way of the pivot bar (67) and thereby of the reciprocating movements of the front part (51).

Patentansprüche

1. Vorrichtung (3) für die Verbrennung von körnigem Festbrennstoff, beispielsweise Holzmehl-Pellets, Spänen und ähnlichem, die folgendes aufweist:

eine Verbrennungskammer (16), die äußere Wände (36) sowie innere Begrenzungswände (37) und eine inneren Boden (45) aufweist, wobei die inneren Begrenzungswände (37) und der innere Boden in einem festgelegten Abstand von den äußeren Wänden (36) vorgesehen sind, um die doppelwandige Verbrennungskammer (16) in eine vordere, eine hintere und eine untere Luftkammer (38, 39, 40) zu unterteilen, sowie zwei Luftkanäle (41, 42), die entlang von Längsseiten der Verbrennungskammer (16) vorgesehen sind, wobei die Begrenzungswände (37) und der innere Boden (45) einen inneren Teil (44) der Verbrennungskammer (16) umschließen, welcher einen Feuerraum (44) für die Verbrennung des Brennstoffs bildet,

einen Lufteinlaß (24) mit einem Gebläse (25) zum Zuführen von Luft zu der Verbrennungskammer (16) über Luftkammern (38, 39, 40) und Luftkanäle (41, 42) zum Erreichen einer vorbestimmten Luftströmung durch die Verbrennungskammer (16),

eine Dosiereinheit (12) zum Zuführen des Brennstoffs in die Verbrennungskammer (16),

eine Zündeinrichtung (28) zum Zünden des Brennstoffs,

eine Steuer- und Prüfeinheit (32) zum Betrieb der Verbrennungsvorrichtung (3) und von damit zusammenwirkenden Teilen,

einen Auslaß (26) für heiße Verbrennungsgase aus der Verbrennung des Brennstoffs von der Verbrennungskammer (16) zu einem Kesselabschnitt (27) in einem Heizkessel (6) zum Übertragen der Wärme zu dem Heizsystem des Heizkessels (6), beispielsweise durch wassergekühlte Flächen in dem Heizkessel (6) ,

eine beweglich angeordnete Aschenzufuhreinrichtung (29) mit einer Antriebseinheit (30), die von der Steuer- und Prüfeinheit (32) zum automatischen Führen von Aschen, unverbranntem Brennstoff und Schlackeprodukten (31) aus der Verbrennungskammer (16), die während der Verbrennung des Brennstoffs erzeugt werden,

dadurch gekennzeichnet, daß die Aschenzufuhreinrichtung (29) einen in der unteren Luftkammer (40) vorgesehenen, beweglichen vorderen Teil (51) aufweist, welcher einen perforierten Boden aufweist, der den oben erwähnten inneren Boden (45) bildet, wobei der vordere Teil (51) dazu vorgesehen ist, von der Antriebseinheit (30) zwischen wenigstens einer Antriebsposition (58), in welcher der vordere Teil (51) vorgesehen ist, um das untere Ende des Feuerraums (44) zu schließen, und einer Aschenevakuierungsposition (59) bewegt zu werden, in welcher der Feuerraum (44) nach unten offen ist.

2. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet, daß sie in ein System (1) zur Zentralheizung eines Gebäudes (2) einbezogen ist, wobei das Zentralheizungssystem (1) neben dem Heizkessel (6) mit dem zugehörigen Heizsystem wenigstens einen weiteren Brennstoffvorat (4) und wenigstens eine Brennstoffördereinrichtung (5) zum automatischen Zuführen des Brennstoffs von dem Brennstoffvorrat (4) zu der Dosiereinrichtung (12) aufweist.

3. Vorrichtung nach Anspruch 2,
dadurch gekennzeichnet, daß die Verbrennungsvorrichtung (31) neben oder anstelle der Brennstoffördereinrichtung (5) und des Brennstoffvorrats (4) einen Brennstoffvorrat (13) hat, der in die Dosiereinrichtung (12) eingebaut ist.

4. Vorrichtung nach den Ansprüchen 1, 2 oder 3,

dadurch gekennzeichnet, daß die Dosiereinrichtung (12) eine Brennstoffördereinrichtung (14) zum Dosieren des Brennstoffs von der Dosiereinrichtung (12) und weiter in die Verbrennungskammer (16) über ein Zufuhrrohr (17) aufweist.

5. Vorrichtung nach Anspruch 4,
dadurch gekennzeichnet, daß das Zufuhrrohr (17) die Form eines bevorzugt etwas geneigten Fallschachts hat, entlang dessen der Brennstoff zur Verhinderung von Flammenrückschlag frei eine gewisse bestimmte Länge fällt.

6. Vorrichtung nach Anspruch 4 oder 5,
dadurch gekennzeichnet, daß in der Nähe des Zufuhrrohrs (17) Sicherheitsmittel angeordnet sind, die aus einem Hitzewächter (18) bestehen, der Alarm gibt, wenn sich die Hitze in dem Rohr (17) ausbreitet und/oder einem oder mehreren Schiebern (19) zum Schließen des Zufuhrrohrs (17).

7. Vorrichtung nach Anspruch 4 in Kombination mit Anspruch 3,
dadurch gekennzeichnet, daß die Brennstoffzufuhreinrichtung (14) eine Zufuhrschnecke (20) aufweist, die schwenkbar zwischen und in der Nähe des oberen Endes (21) des Zufuhrrohrs (17) an der Dosiereinrichtung (12) und entweder einem Einlaß (22) zu der Dosiereinrichtung (12) oder zu der Basis (23) des eingebauten Brennstoffvorrats (13) angeordnet ist.

8. Vorrichtung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, daß das Gebläse (25) einen Regelmotor (35) aufweist und an dem hinteren Teil (33) der Verbrennungskammer (16) angeordnet ist, zum Blasen und Umwälzen von Luft durch den Lufteinlaß (24) und nach vorne und weiter nach außen durch den Auslaß (26) des vorderen Teils (34) der Verbrennungskammer (16).

9. Vorrichtung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, daß eine, mehrere oder bevorzugt alle Begrenzungswände (37) Perforationen in Form von kleineren Öffnungen, Löchern und/oder größeren Öffnungen (43) zum Durchblasen von Luft haben.

10. Vorrichtung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, daß die Zündeinrichtung (28) in der hinteren Luftkammer (39) an der hinteren Begrenzungswand (37a) angeordnet ist.

11. Vorrichtung nach den Ansprüchen 1 - 9,
dadurch gekennzeichnet, daß die Zündeinrichtung (28) in der unteren Luftkammer (39) angeordnet ist und im Zusammenwirken mit der Aschenzufuhreinrichtung (29) angeordnet ist.

12. Vorrichtung nach den Ansprüchen 1 - 9,
dadurch gekennzeichnet, daß die Zündeinrichtung innerhalb der Aschenzufuhreinrichtung angeordnet ist, wobei die Zündeinrichtung den Hin- und Herbewegungen der Aschenzufuhreinrichtung folgt.

13. Vorrichtung nach Anspruch 10,
dadurch gekennzeichnet, daß die hintere Begrenzungswand (37a) Luftlöcher (57) in die Zündeinrichtung (28) zum Durchblasen von Luft von dem Gebläse (25) durch die Zündeinrichtung (28) und weiter in den Feuerraum (44) hat.

14. Vorrichtung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, daß die Zündeinrichtung (28) eine Zündspule (50) zum elektrischen Erwärmen der Zündeinrichtung (28) hat.

15. Vorrichtung nach Anspruch 14,
dadurch gekennzeichnet, daß die Zündspule (50) als ein Induktionsheizelement vorgesehen ist.

16. Vorrichtung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, daß die Zündeinrichtung (28) ein Gehäuse (71) mit einem Lufteinlaß (72) zum Blasen von Luft von dem Gebläse (25) hat.

17. Vorrichtung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, daß die Aschenzufuhreinrichtung (29) eine oder mehrere längliche Stangen (52) aufweist, die an und zwischen dem vorderen Teil (51) und der Antriebseinheit für die Aschezufuhr befestigt sind.

18. Vorrichtung nach Anspruch 17,
dadurch gekennzeichnet, daß der vordere Abschnitt (51) und das vordere Ende jeder Stange (52) in der unteren Luftkammer (40) angeordnet sind, während die Antriebseinheit (30) und das hintere Ende jeder Stange (52) in einem eigenen Gehäuse angeordnet sind.

19. Vorrichtung nach Anspruch 18,
dadurch gekennzeichnet, daß das Gehäuse außerhalb der wärmeisolierten Verbrennungskammer (16) an der hinteren äußeren Wand (36a) angeordnet ist, und wobei jede Stange (52) durch eine Öffnung (60) in der hinteren äußeren Wand (36a) verläuft.

20. Vorrichtung nach einem der Ansprüche 17 - 19, **dadurch gekennzeichnet, daß** der vordere Abschnitt (51) die Form eines umgekehrten, an der Breitseite offenen Kastens hat, wobei drei Seiten (54, 55, 56) und ein perforierter Boden nach oben angeordnet sind, wobei der Boden gleichzeitig den oben erwähnten, beweglichen inneren Boden (45) bildet, bei welchem eine Seite (54) eine Vorderkante bildet, von welcher der Boden (45) und die anderen zwei Seiten (55, 56) in Richtung nach hinten zu der Antriebseinheit (30) angeordnet sind, und bei welchem die Seiten (55, 56) in einem Abstand von den äußeren Längswänden (36) der Verbrennungskammer (16) angeordnet sind, um eine Fortführung der oben erwähnten Luftkanäle (41, 42) nach unten zu bilden.

21. Vorrichtung nach einem der Ansprüche 17 - 20, **dadurch gekennzeichnet, daß** die Antriebseinheit (30) einen festgelegten vorderen Anschlag (62), zwei Gleithülsen (63, 64), die als eine vordere und eine hintere Gleithülse beweglich entlang jeder Stange (52) angeordnet sind, und eine Feder (65) aufweist, die zwischen den Gleithülen (63, 64), einem Exzenter (66) und ebenfalls einem festgelegten hinteren Anschlag (70) an dem hinteren Endteil der Stange (52) angeordnet ist.

22. Vorrichtung nach Anspruch 21, **dadurch gekennzeichnet, daß** der Exzenter (66) einen Schwenkstab (67) und zwei Verbindungsarme (68, 69) aufweist, von welchen einer (68) länger als der andere (69) ist, und daß die zwei Verbindungsarme (68, 69) an einem gegenseitigen Endteil schwenkbar aneinander gefügt ist, daß das andere Ende des kürzeren Verbindungsarms (69) an dem Schwenkstab (67) befestigt ist, während das andere Ende des langen Verbindungsarms (68) schwenkbar an der hinteren Gleithülse (64) festgelegt ist.

23. Vorrichtung nach einem der Ansprüche 21 - 22, **dadurch gekennzeichnet, daß** die Antriebseinheit einen Motor zum Betrieb des Exzenters (66) mittels des Schwenkstabs (67) und dadurch der Hin- und Herbewegungen des vorderen Teils (51) hat.

Revendications

1. Dispositif (3) destiné à la combustion de combustible solide granulaire, par exemple des pastilles de farine de bois, des gravillons, et autres éléments semblables, comprenant

une chambre de combustion (16) qui comprend des parois externes (36) ainsi que des parois de limitation internes (37) et un fond interne (45), lesquels parois de limitation internes (37) et fond interne sont pourvus à une distance fixe des parois externes (36) en vue de diviser la chambre de combustion à double paroi (16) en une chambre à air avant, une chambre à air arrière, et une chambre à air inférieure (38, 39, 40), et deux conduites d'air (41, 42) pourvues le long des côtés longitudinaux de la chambre de combustion (16), lesquels parois de limitation (37) et fond interne (45) entourent une partie interne (44) de la chambre de combustion (16) formant un foyer (44) destiné à la combustion du combustible,

un orifice d'entrée d'air (24) comportant une soufflante (25) destinée à l'alimentation en air de la chambre de combustion (16) via les chambres à air (38, 39, 40) et les conduites d'air (41, 42), en vue d'atteindre un débit prédéterminé à travers la chambre de combustion (16),

une unité de dosage (12) destinée à l'alimentation du combustible dans la chambre de combustion (16),

un dispositif d'allumage (28) destiné à l'allumage du combustible,

une unité de contrôle et de vérification (32) destinée au fonctionnement du dispositif de combustion (3) et des parties de celui-ci, ou coopérant avec celui-ci,

un orifice de sortie (26) destiné aux gaz de combustion chauds provenant de la combustion du combustible depuis la chambre de combustion (16) jusqu'à une section de bouilleur (27) dans un bouilleur de chauffe (6) destiné au transfert de la chaleur vers le système de chauffe du bouilleur de chauffe (6), par exemple à travers des surfaces refroidies par eau dans le bouilleur de chauffe (6),

un chargeur de cendre agencé de manière mobile (29) avec une unité d'entraînement (30), contrôlé par l'unité de contrôle et de vérification (32) en vue d'un chargement automatique des cendres, du combustible non brûlé, et des scories (31), créés au cours de la combustion du combustible, hors de la chambre de combustion (16),

caractérisé en ce que le chargeur de cendre (29) comprend une partie avant mobile (51) pourvue dans la chambre à air inférieure (40), et laquelle partie comprend un fond perforé qui constitue le fond interne (45) ci-dessus mentionné, laquelle partie avant (51) est pourvue de façon à être entraînée par l'unité d'entraînement (30) entre au moins une position d'entraînement (58), dans laquelle ladite partie avant (51) est pourvue de façon à fermer l'extrémité inférieure du foyer (44), et une position d'évacuation des cendres (59), dans laquelle le foyer (44) est ouvert vers le bas.

2. Dispositif selon la revendication 1, **caractérisé en ce qu'**il est inclus dans un système (1) destiné au chauffage central d'un bâtiment (2), lequel système de chauffage central (1), au-delà dudit bouilleur de

chauffe (6) avec le système de chauffe d'accompagnement, comprend au moins un autre dispositif d'avitaillement en combustible (4) et au moins un convoyeur de combustible (5) destinés à une alimentation automatique du combustible provenant du dispositif d'avitaillement en combustible (4) vers le dispositif de dosage (12).

3. Dispositif selon la revendication 2, **caractérisé en ce que** le dispositif de combustion (31) au-delà ou à la place du convoyeur de combustible (5) et du dispositif d'avitaillement en combustible (4) comporte un circuit de combustible (13), lequel est intégré dans le dispositif de dosage (12).

4. Dispositif selon les revendications 1, 2 ou 3, **caractérisé en ce que** le dispositif de dosage (12) comprend un chargeur de combustible (14) destiné au dosage du combustible provenant du dispositif de dosage (12) et ensuite dans la chambre de combustion (16) via un tube de chargement (17).

5. Dispositif selon la revendication 4, **caractérisé en ce que** le tube de chargement (17) présente de préférence la forme d'une manche de chute quelque peu inclinée, le long de laquelle le combustible tombe librement sur une certaine longueur déterminée pour prévenir un retour de flamme.

6. Dispositif selon les revendications 4 ou 5, **caractérisé en ce qu'**à proximité du tube de chargement (17), se trouvent agencés des moyens de sécurité comprenant un dispositif de protection contre la surchauffe (18) qui donne l'alarme si la chaleur se répand dans le tube (17), et/ou une ou plusieurs vannes coulissantes (19) pour fermer le tube de chargement (17).

7. Dispositif selon la revendication 4 en combinaison avec la revendication 3, **caractérisé en ce que** le chargeur de combustible (14) comprend une vis de chargement (20), laquelle est agencée, de manière à pouvoir pivoter, entre et à proximité de l'extrémité supérieure (21) dudit tube de chargement (17) sur le dispositif de dosage (12), et soit un orifice d'entrée (22) vers le dispositif de dosage (12) ou soit vers la base (23) du circuit de combustible intégré (13).

8. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la soufflante (25) comprend un moteur contrôlé à pas variable (35), et est montée à la partie arrière (33) de la chambre de combustion (16) en vue du soufflage et de la circulation de l'air à travers ledit orifice d'entrée (24) et vers l'avant et ensuite en dehors à travers l'orifice de sortie (26) de la partie avant (34) de la chambre de combustion (16).

9. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'une, plusieurs, ou de préférence toutes les parois de limitation (37) présentent des perforations sous la forme de petites ouvertures, de trous, et/ou d'ouvertures plus grandes (43) destinés au soufflage de l'air à travers.

10. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le dispositif d'allumage (28) est agencé dans la chambre à air arrière (39) sur la paroi de limitation arrière (37a).

11. Dispositif selon les revendications 1 à 9, **caractérisé en ce que** le dispositif d'allumage (28) est agencé dans la chambre à air inférieure (39) et est agencé en coopération avec le chargeur de cendre (29).

12. Dispositif selon les revendications 1 à 9, **caractérisé en ce que** le dispositif d'allumage est agencé dans le chargeur de cendre, dans lequel le dispositif d'allumage suit les mouvements de va et vient du chargeur de cendre.

13. Dispositif selon la revendications 10, **caractérisé en ce que** la paroi de limitation arrière (37a) comporte des trous pour l'air (57) dans le dispositif d'allumage (28) en vue du soufflage à travers de l'air provenant de la soufflante (25) à travers le dispositif d'allumage (28) et ensuite dans le foyer (44).

14. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le dispositif d'allumage (28) comprend une bobine d'allumage (50) destinée au chauffage électrique du dispositif d'allumage (28).

15. Dispositif selon la revendication 14, **caractérisé en ce que** la bobine d'allumage (50) est fournie en tant que four à induction.

16. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le dispositif d'allumage (28) comporte un boîtier (71) avec un orifice d'entrée d'air (72) destiné au soufflage de l'air provenant de la soufflante (25).

17. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le chargeur de cendre (29) comprend une ou plusieurs tiges allongées (52) qui sont attachées à, et se trouvent entre, la partie avant (51) et l'unité d'entraînement (30) destinée au chargement des cendres.

18. Dispositif selon la revendications 17, **caractérisé en ce que** la partie avant (51) et l'extrémité avant de chaque tige (52) sont agencées dans la chambre à air inférieure (40), tandis que l'unité d'entraîne-

ment (30) et l'extrémité arrière de chaque tige (52) sont agencées dans un boîtier propre.

19. Dispositif selon la revendications 18, **caractérisé en ce que** le boîtier est agencé à l'extérieur de la chambre de combustion isolée de la chaleur (16) sur la paroi externe arrière (36a), et avec chaque tige (52) se déplaçant à travers une ouverture (60) dans ladite paroi externe arrière (36a).

20. Dispositif selon l'une quelconque des revendications 17 à 19, **caractérisé en ce que** la partie avant (51) présente la forme d'une boîte à l'envers, ouverte vers l'arrière, avec trois côtés (54, 55, 56) et un fond perforé agencé vers le haut, lequel fond constitue simultanément le fond interne mobile (45) ci-dessus mentionné, dans laquelle un côté (54) constitue un bord avant à partir duquel le fond (45) et les deux autres côtés (55, 56) sont agencés en direction arrière vers l'unité d'entraînement (30), et dans laquelle les côtés (55, 56) sont agencés à distance des parois externes longitudinales (36) de la chambre de combustion (16) en vue de former un prolongement vers le bas des conduites d'air (41, 42) ci-dessus mentionnées.

21. Dispositif selon l'une quelconque des revendications 17 à 20, **caractérisé en ce que** l'unité d'entraînement (30) comprend une butée avant fixe (62), deux manchons coulissants (63, 64), lesquels sont agencés, de façon mobile, le long de chaque tige (52) en tant que manchon coulissant avant et manchon coulissant arrière, et un ressort (65), lequel est agencé entre les manchons coulissants (63, 64), un excentrique (66), et également une butée arrière fixe (70) sur la partie d'extrémité arrière de la tige (52).

22. Dispositif selon la revendications 21, **caractérisé en ce que** l'excentrique (66) comprend une barre de pivot (67) et deux bras de liaison (68, 69), dont l'un (68) est plus grand que l'autre (69), et **en ce que** les deux bras de liaison (68, 69) sont joints l'un avec l'autre, de manière à pouvoir pivoter, sur une partie d'extrémité mutuelle, **en ce que** l'autre extrémité du bras de liaison le plus court (69) est attachée à la barre de pivot (67) tandis que l'autre extrémité du bras de liaison long (68) est fixée, de manière à pouvoir pivoter, au manchon coulissant arrière (64).

23. Dispositif selon l'une quelconque des revendications 21 à 22, **caractérisé en ce que** l'unité d'entraînement (30) comporte un moteur destiné au fonctionnement de l'excentrique (66) au moyen de la barre de pivot (67), et, de ce fait, aux mouvements de va et vient de la partie avant (51).

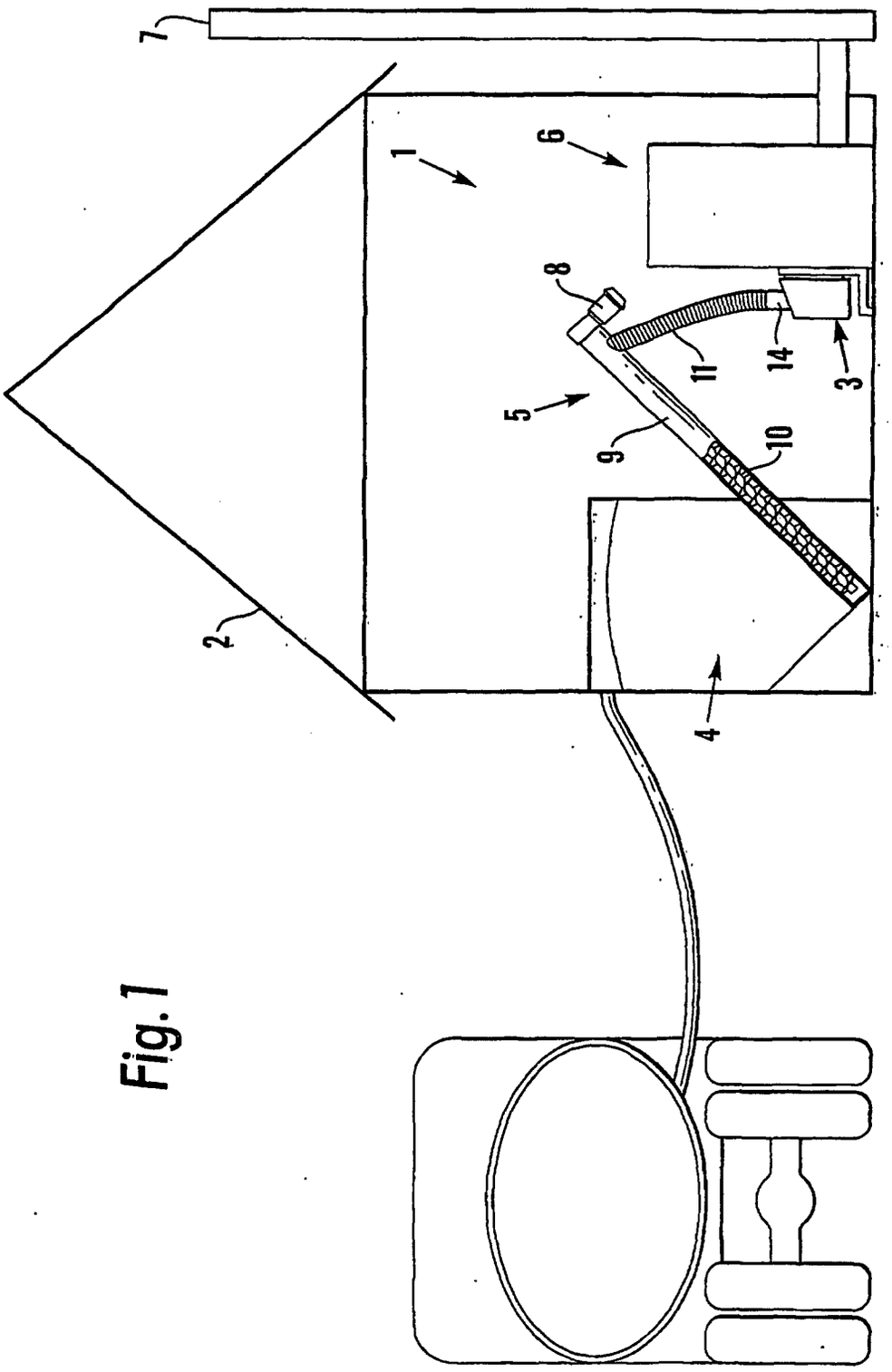

Fig. 1

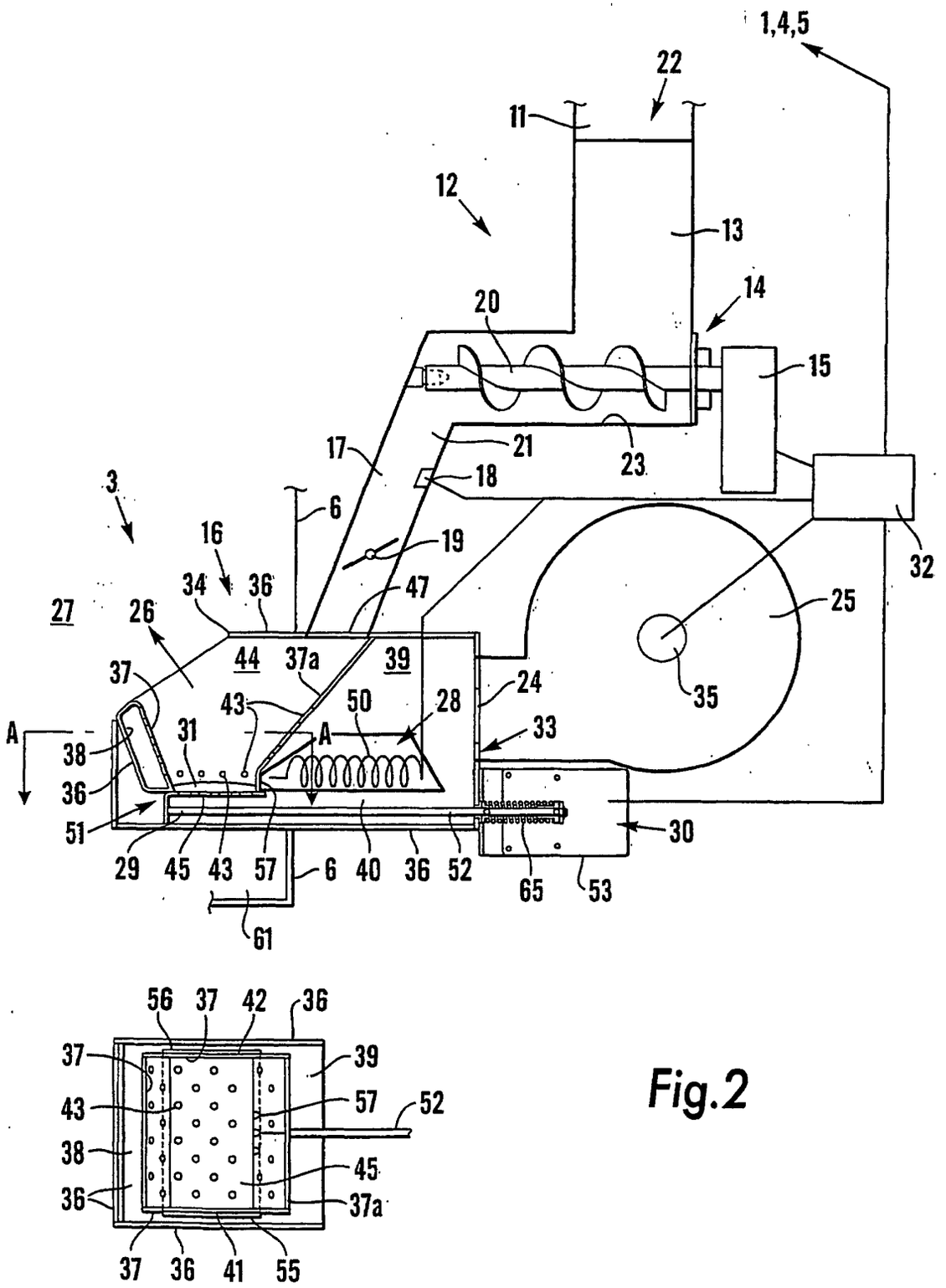
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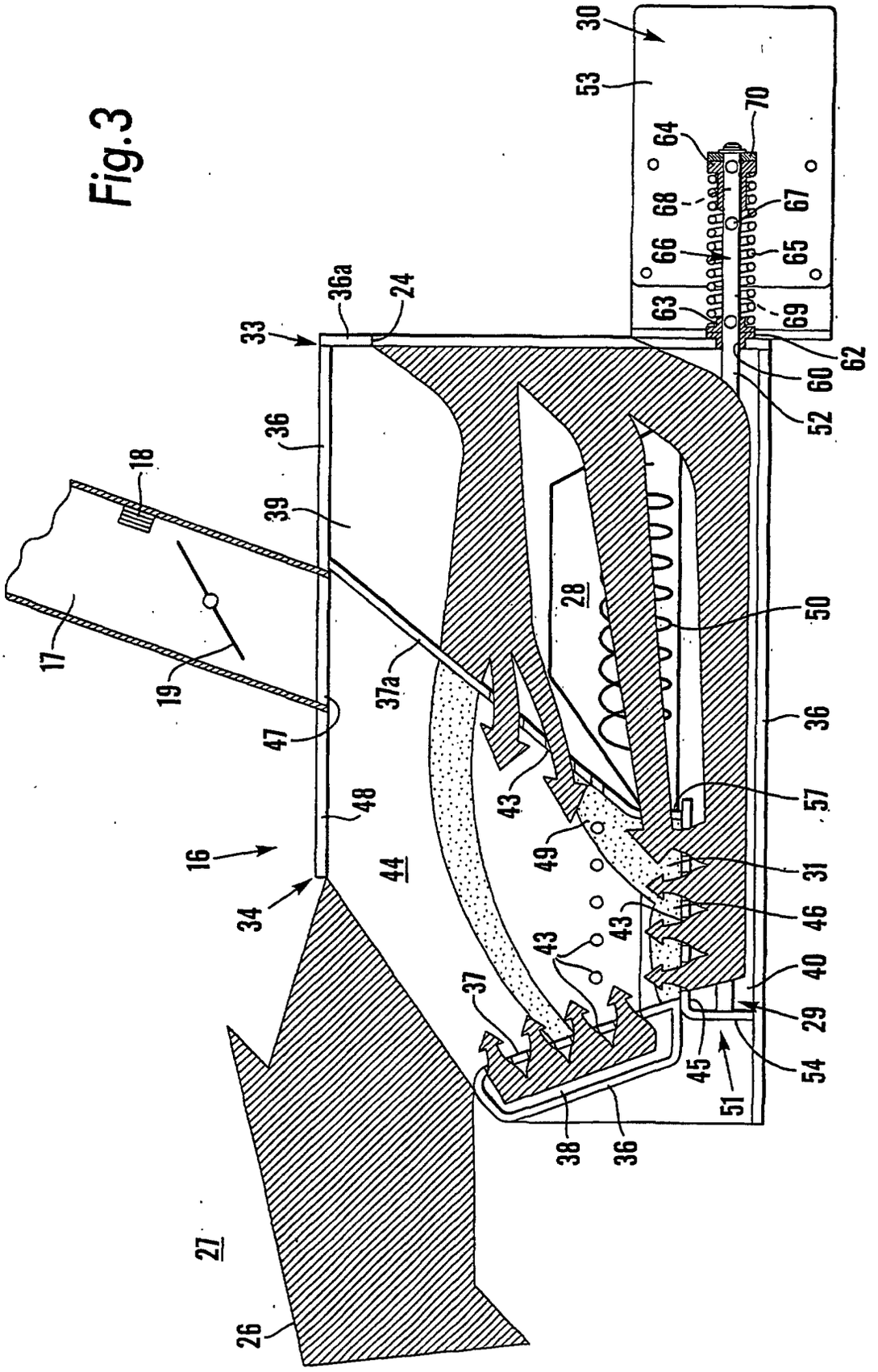
Fig.2

Fig.3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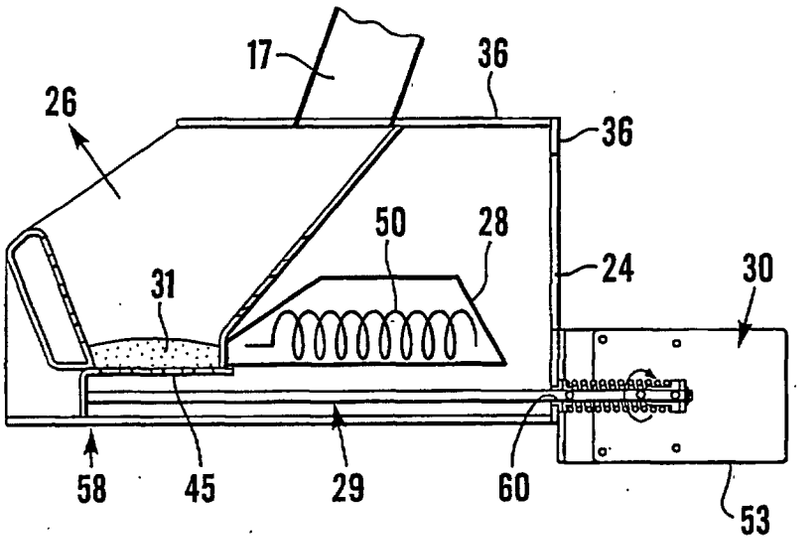
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Fig.4a

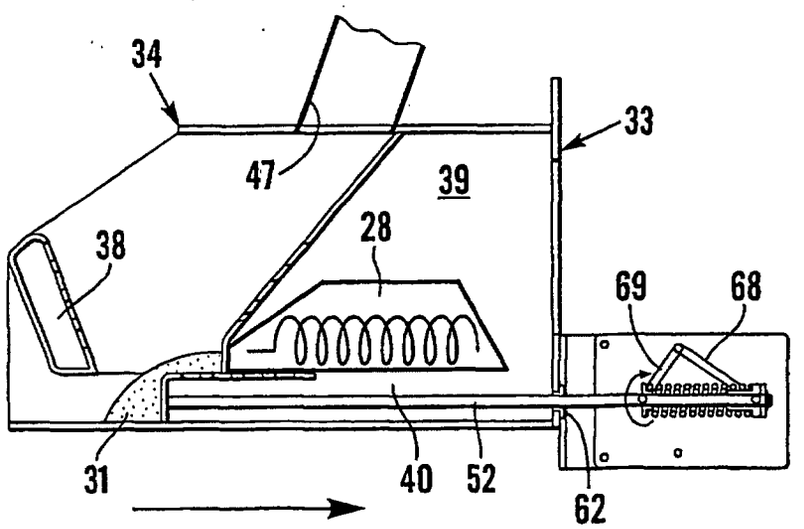
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Fig.4b

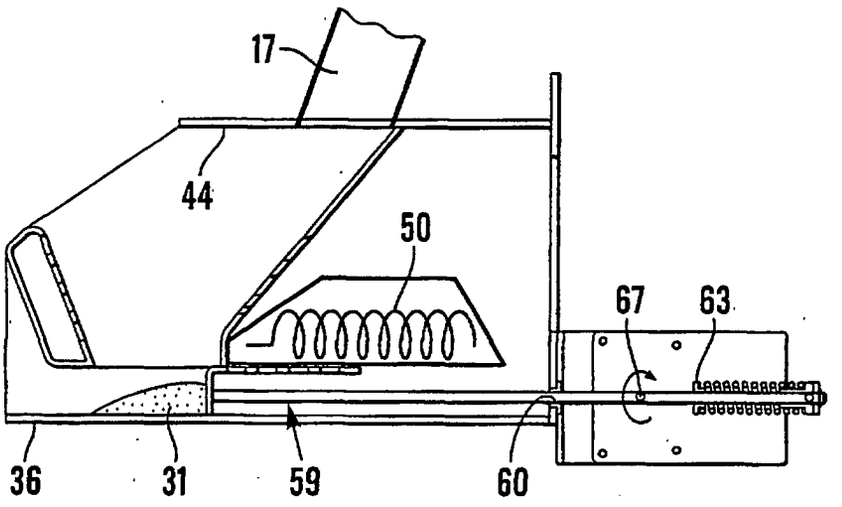

Fig.4c

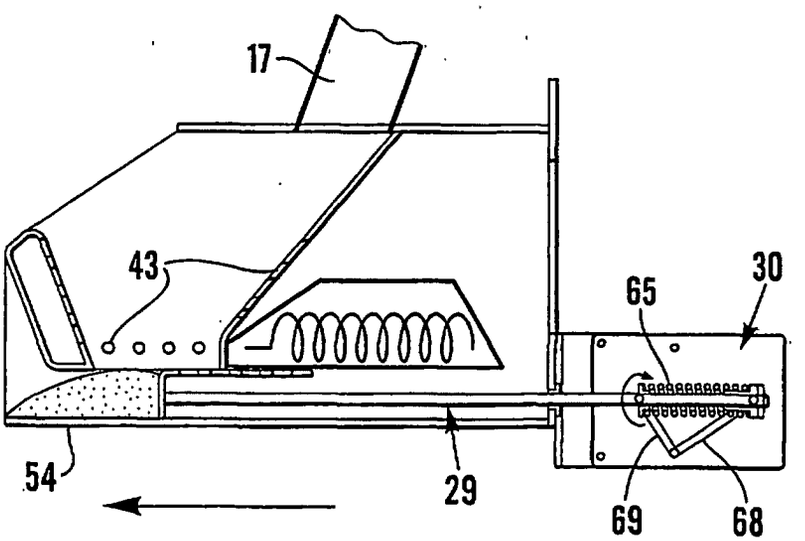

Fig.4d

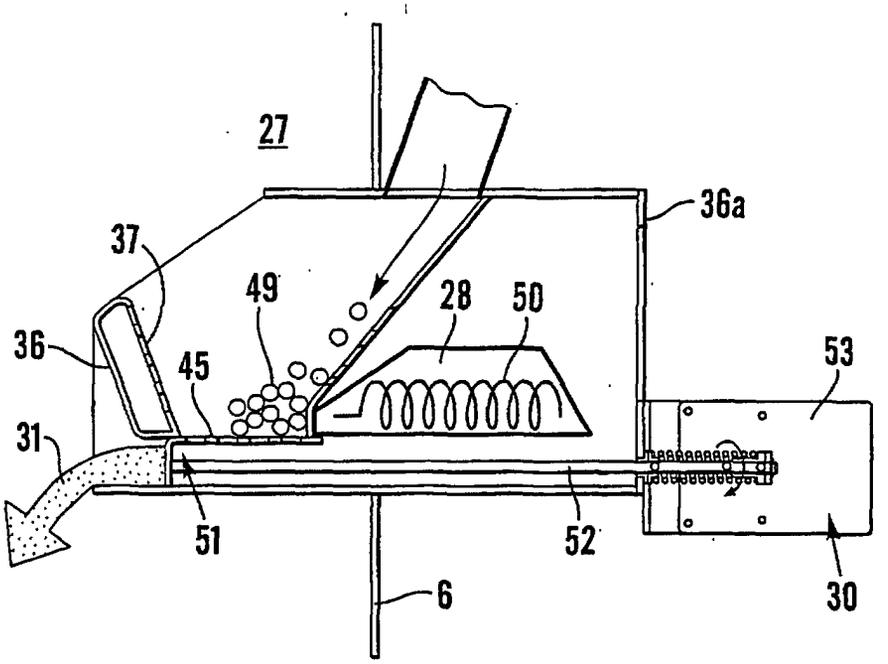

Fig.4e

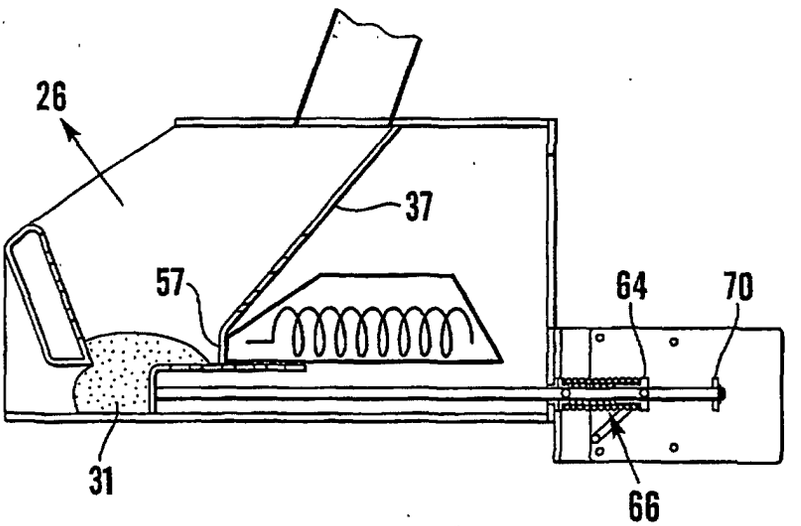

Fig.4f