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(71) Applicant: **ALLEY ENTERPRISES LIMITED**
Birr,
County Offaly (IE)

(72) Inventor: **Grant, Stephen William John**
Birr
County Offaly (IE)

(74) Representative: **O'Connor, Donal Henry et al**
Cruickshank & Company
8A Sandyford Business Centre
Sandyford
Dublin 18 (IE)

(54) **A burner assembly**

(57) An enclosed water heater boiler (1) for burning solid fuel is disclosed. The burner assembly (10) has two burners namely a granular fuel burner (11) and a fuel fired burner (12). The granular fuel burner (11) has a brazier fed with the granular fuel and the fluid fired burner (12) being mounted remote from the brazier such that the flame generated by the fluid fired burner (12) is di-

rected beside and substantially away from the brazier. A flame transfer device (15) is provided to direct some of the flame generated by the fluid fired burner (12) as a concentrated jet against portion of the granulated fuel (25) to ignite the granular fuel allowing for extremely efficient ignition and a substantial reduction in CO generation. This burner assembly provides additional heat from boilers as required over short periods of time.

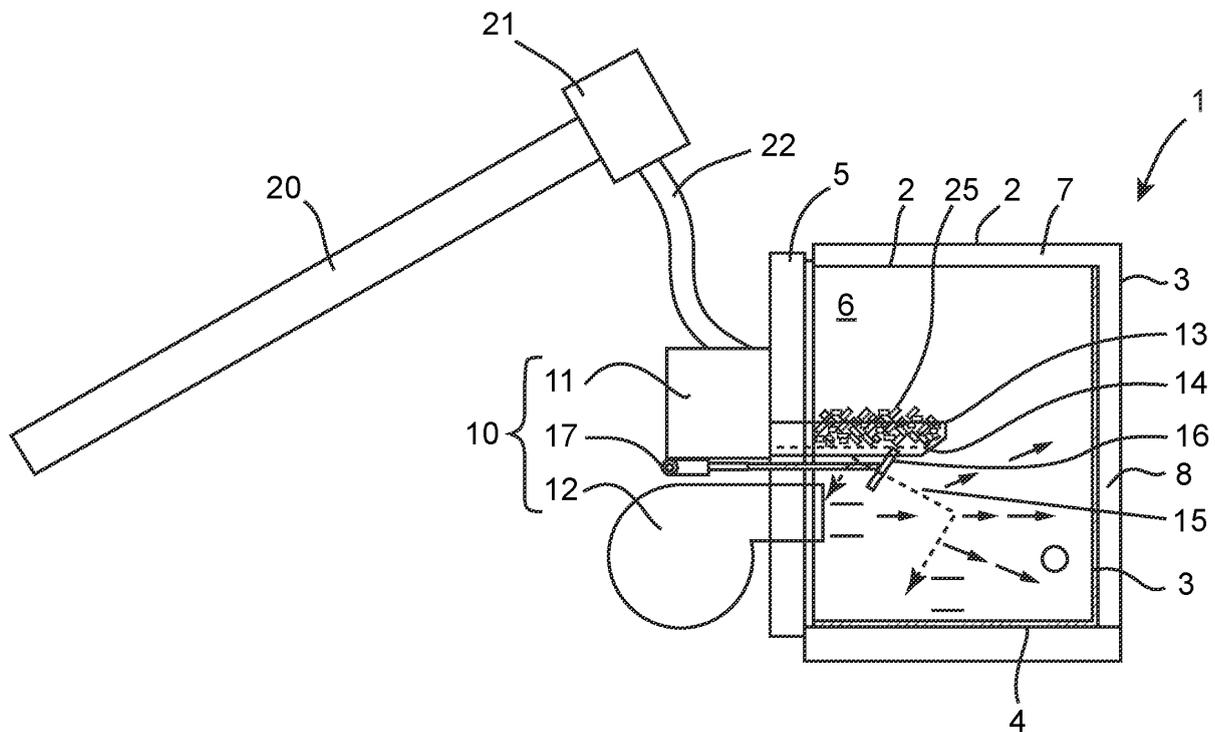


Fig. 2

Description

INTRODUCTION

[0001] The present invention relates to a burner assembly for an enclosed water heating boiler for burning solid fuel of the type comprising: walls forming a combustion chamber enclosure, hollow heat exchangers arranged for carrying water to be heated from by at least portion of the walls, and the boiler assembly comprising two burners namely a granular fuel burner of the type comprising a brazier fed with the granular fuel and a fluid fired burner **characterised in that** the fluid fired burner is mounted remote from the brazier whereby the flame generated by the fluid fired burner is directed beside and substantially away from the brazier and in which a flame transfer device is provided to direct some of the flame generated by the fluid fired burner as a concentrated jet against portion of the granulated fuel to ignite the granular fuel.

[0002] In this specification the term "granular fuel" is used to include not only granular fuel such as wood pellets, but also other solid materials such as ground or semi-shredded husks of maize and similar products together with particles of combustible waste material and other recognised fuels such as coal, peat and similar materials. Further, the term "fluid fired burner" is used to include not alone burners that burn liquids such as bio-fuels, for example, bio-diesel, bio-kerosene or simply kerosene and diesel, but also gas fired burners.

[0003] Generally granular fuel boilers to date have simply included one burner, namely a burner for the granular fuel, which granular fuel is lit by some element. The granular fuel is on a brazier and an electric element is used to heat the granular fuel, very often wood pellets, until the wood or other granular fuel spontaneously ignites. There are problems with this. Firstly, it takes some considerable time, indeed somewhere in the order of ten minutes, before the boiler proceeds to operate. Then it takes some time before the granular fuel is ignited and the boiler starts working at capacity. Indeed, as the boiler is starting up, there is a considerable amount of unwanted gasses produced, particularly carbon monoxide (CO).

[0004] Japanese Patent Specification No. JP 2005009768A (Yamamoto) describes a wood pellet burner which has an electrical heating element which is moved against the wood pellets for ignition.

[0005] Japanese Patent Specification No. JP 58008907A (Gotou Shinsaku) describes a solid fuel burner which burns waste material such as used tyres or the like, but also wood and coal and has a liquid fuel burner for kerosene or gas fuel for starting the burner. It also describes that if the solid fuel is not available, it is acceptable to use only the liquid fuel. Similarly, it states that the liquid fuel burner may be replaced by a gas fuel burner.

[0006] It is thus being proposed to use an additional fluid fired burner in the boiler, particularly for start up and

indeed as a back up when there is no granular fuel available. These dual burner assemblies are provided with the oil burner usually above the granular fuel bed which is formed by a brazier having a plurality of holes like any solid fuel grate such as to encourage combustion. The problem is that the fluid fired boiler does not deliver the flame as it is formed directly onto the granular fuel, but is directed across the granular fuel in the brazier such that all of the fuel is initially heated and it takes some considerable time again to achieve optimum working conditions though much quicker than with electric elements. During this period there is a substantial amount of CO generated which is undesirable. A further problem that has been noted is that there is very often insufficient air causing further CO to be formed. The problem seems to be that almost the whole bed is ignited at the one time.

[0007] A further problem with all such boilers and, in particular, with boilers having granular burners, is that they seem to take longer to get up to sufficient heat than, for example, with the conventional fluid fired burner. It has also been noted that in many instances there is a need for additional heat from the boilers over short periods of time.

[0008] Further, it has to be noted that in the past, for example, in GB Patent Specification No. 502192A (Rouse), there is described a gas burner to light a coal or coke fire.

[0009] Similarly, GB Patent Specification No. 278554A (Camelon) describes a further gas burner used to light a solid fire, as does GB Patent Specification No. 281461A (Russell).

[0010] These obviously work very well, for example, with open fires or the like but are totally unsuitable for an enclosed boiler burning granular fuel in accordance with this invention.

[0011] The present invention is directed towards overcoming the problems referred to above in relation to the present construction of burner assemblies and also boilers fitted with such burner assemblies. It is also directed at providing a more efficient method of using such burner assemblies and operating such boilers.

STATEMENTS OF INVENTION

[0012] According to the invention there is provided a burner assembly for an enclosed water heating boiler for burning solid fuel of the type comprising: walls forming a combustion chamber enclosure, hollow heat exchangers arranged for carrying water to be heated from by at least portion of the walls, and the burner assembly comprising two burners namely a granular fuel burner of the type comprising a brazier fed with the granular fuel and a fluid fired burner **characterised in that** the fluid fired burner is mounted remote from the brazier whereby the flame generated by the fluid fired burner is directed beside and substantially away from the brazier and in which a flame transfer device is provided to direct some of the flame generated by the fluid fired burner as a concentrated jet

against portion of the granular fuel to ignite the granular fuel. This allows for extremely efficient ignition and a substantial reduction in CO generation.

[0013] In one embodiment the fluid fired burner is mounted below the brazier which allows for very efficient operation. In another embodiment the flame transfer device is a tube having an entrance projecting into the path of the flame and an exit directed onto a concentrated area of the brazier. Alternatively, the flame transfer device comprises a diverter flap mounted on the brazier. Such a flap may be formed from a curved scoop-like plate to concentrate flame from the fluid fired burner against the granular fuel.

[0014] Ideally, the flame transfer device is movable from a position to lie within the flame exiting from the fluid fired burner and a position remote from the flame. This may be carried out by a solenoid valve and associated pneumatic ram.

[0015] A method of operating a burner assembly of the type described above is provided in which, on start up of the burner assembly, the granular fuel combustion air feed is initiated at low volume as the fluid fuel fired burner is starting to ignite the granular fuel and is increased to optimum volume as the fluid fired burner is switched off.

[0016] In this method the fluid fired burner and the granular fuel may be burned in parallel to provide a boost in combustion capacity of the boiler.

DETAILED DESCRIPTION OF THE INVENTION

[0017] The invention will be more clearly understood from the following description of some embodiments thereof given by way of example only with reference to the accompanying drawings in which:

Fig. 1 is a side diagrammatic view of a burner assembly according to the invention fitted to an enclosed water heating boiler showing the boiler operating as a granular fuel boiler,

Fig. 2 is a view similar to Fig. 1 showing the boiler at start up,

Fig. 3 a sectional view along the lines III-III of Fig. 2,

Fig. 4 is a view showing the boiler operating using a fluid fired burner only,

Fig. 5 is a view of an alternative construction of burner assembly running as a granular fuel boiler,

Fig. 6 is a view showing the boiler of Fig. 5 on start up, and

Fig. 7 is a view of the boiler of Fig. 6 showing the boiler operating solely with a fluid fired burner.

[0018] Referring to the drawings and initially to Figs. 1

to 4 thereof, there is provided an enclosed water heating boiler indicated generally by the reference numeral 1, having a plurality of walls, namely a top wall 2, side walls 3, base wall 4 and front wall formed by a door 5 forming a combustion chamber enclosure 6. As illustrated, the walls 2 and 3 form hollow water carrying heat exchangers 7 and 8 respectively. Details of these are not included because they are all conventional. There may be other hollow heat exchangers mounted in the combustion chamber 6.

[0019] Mounted in the door 5 is a boiler assembly indicated generally by the reference numeral 10 comprising a granular fuel burner, namely, a wood pellet burner 11 and a fluid fired burner, namely, an oil fired burner 12. The wood pellet burner 11 is a specific type of granular fuel burner and other granular fuel burners could be used. The wood pellet burner 11 includes a brazier 13 having a perforated floor 14 and mounting a flame transfer device indicated generally by the reference numeral 15 which flame transfer device 15 comprises a diverter flap 16 pivotally mounted on the brazier 13 adjacent to the perforated floor 14. The flame transfer device 15 is in the form of a curved scoop-like plate 16 as illustrated in Fig. 3. The plate 16 is, in turn, connected to a solenoid valve and associated pneumatic ram 17. There is further illustrated an auger 20 operated by a motor 21 feeding a flexible hose 22 to deliver wood pellets from a wood pellet storage (not shown) to the wood pellet burner 11. The wood pellets are identified by the reference numeral 25.

[0020] The oil burner 12 is a conventional oil burner, but could be any fluid fired burner such as a gas burner. Conventional controls, thermostats etc provided and are not shown.

[0021] In operation, there is illustrated in Fig. 1 the burner assembly operating as a wood pellet burner only and heating the combustion chamber enclosure 6, the flame or hot combustion gases being represented by the arrows. Fig. 2 illustrates the position at start up. The oil burner 12 is operated and the flap 16 is pivoted downwards by the pneumatic ram 17 such that it projects within the flame emanating from the oil fired burner 12. This would not be necessarily the hottest part of the flame, but would be flame somewhere in the order of 800°C. The flame is then directed in a concentrated manner up the scoop-like flap 16 through some of the apertures 13 of the brazier 12. Thus, a small amount of the wood pellets are quickly burned and ignited. Then the ignited wood pellets quickly burn the rest of the wood pellets and this combustion is formed with relatively little formation of CO. Further, it is envisaged that a certain amount of air will be directed beneath the brazier 12 by starting the fan which is usually fitted to such boilers thus ensuring that there will be sufficient air for combustion of the wood pellets while only a small amount of the wood pellets are initially ignited. This greatly reduces the CO formation and the amount of time it takes for the wood pellets to burn at the optimum rate. Then the oil burner is switched off and the boiler operates as illustrated in Fig. 1. Fig. 4

shows the boiler operating simply with the oil burner 12 being used and the granular fuel burner not in operation. It will be noted that the oil fired burner flame is directed substantially beside and away from the brazier 13.

[0022] It will be appreciated that if an additional heat is required for some reason, then both the oil fired burner and the wood pellet burner can both operate in tandem, further increasing the capacity of the boiler, somewhat equivalent to those boilers sold under the term or designation "Combi". Thus, it would be possible to provide relatively small boilers and high heat output.

[0023] Referring to Figs. 5 to 7 inclusive in which parts similar to those described in the previous drawings are identified by the same reference numerals, there is illustrated a boiler 1 and burner assembly 10 as heretofore. The only difference between the burner assembly as illustrated is that instead of the pivoting flap 16 there is provided a transfer device, again, for clarity, identified generally by the reference numeral 15, which heat transfer device 15 comprises a fixed tube 31 having open ends forming an entrance 32 and an exit 33 and mounted beneath the apertures 14 of the brazier 13. Now, on start up, the flame is diverted up the fixed tube 31, again in a concentrated manner to a small amount of the fuel in the brazier 12 and it operates in substantially the same manner as heretofore. It is envisaged that the fixed tube 31 may also be pivoted and operated by a ram or other means as appropriate.

[0024] In the specification the terms "comprise, comprises, comprised and comprising" or any variation thereof and the terms "include, includes, included and including" or any variation thereof are considered to be totally interchangeable and they should all be afforded the widest possible interpretation and vice versa.

[0025] The invention is not limited to the embodiments hereinbefore described which may be varied in both construction and detail.

Claims

1. A burner assembly (10) for an enclosed water heating boiler (1) for burning solid fuel of the type comprising: walls (2, 3, 4, 5) forming a combustion chamber enclosure (6), hollow heat exchangers (7, 8) arranged for carrying water to be heated from by at least portion of the walls (2, 3), and the burner assembly (10) comprising two burners namely a granular fuel burner (11) of the type comprising a brazier (13) fed with the granular fuel (25) and a fluid fired burner (12) **characterised in that** the fluid fired burner (12) is mounted remote from the brazier (13) whereby the flame generated by the fluid fired burner (12) is directed beside and substantially away from the brazier (13) and in which a flame transfer device (15) is provided to direct some of the flame generated by the fluid fired burner (12) as a concentrated jet against portion of the granular fuel (25) to ignite the granular fuel (25).
2. A burner assembly (10) as claimed in claim 1 in which the fluid fired burner (12) is mounted below the brazier (13).
3. A burner assembly (10) as claimed in claim 1 or 2 in which the flame transfer device (15) is a tube (31) having an entrance (32) projecting into the path of the flame and an exit (33) directed onto a concentrated area of the brazier (13).
4. A burner assembly (10) as claimed in claim 1 or 2 in which the flame transfer device (15) comprises a diverter flap (16) mounted on the brazier (13).
5. A burner assembly (10) as claimed in claim 4 in which the diverter flap (16) is formed from a curved scoop-like plate to concentrate flame from the fluid fired burner (12) against the granular fuel (25).
6. A burner assembly (10) as claimed in any preceding claim in which the flame transfer device (15) is movable from a position to lie within the flame exiting from the fluid fired burner (12) and a position remote from the flame.
7. A burner assembly (10) as claimed in claim 6 in which the flame transfer device (15) is operated by a solenoid valve and associated pneumatic ram (17).
8. A method of operating a burner assembly (10) as claimed in any preceding claim in which, on start up of the burner assembly (10), the granular fuel combustion air feed is initiated at low volume as the fluid fuel fired burner (12) is starting to ignite the granular fuel (25) and is increased to optimum volume as the fluid fired burner (12) is switched off.
9. A method as claimed in claim 8 in which the fluid fired burner (12) and the granular fuel burner (11) are operated in parallel to provide a boost in combustion capacity of the boiler (1).

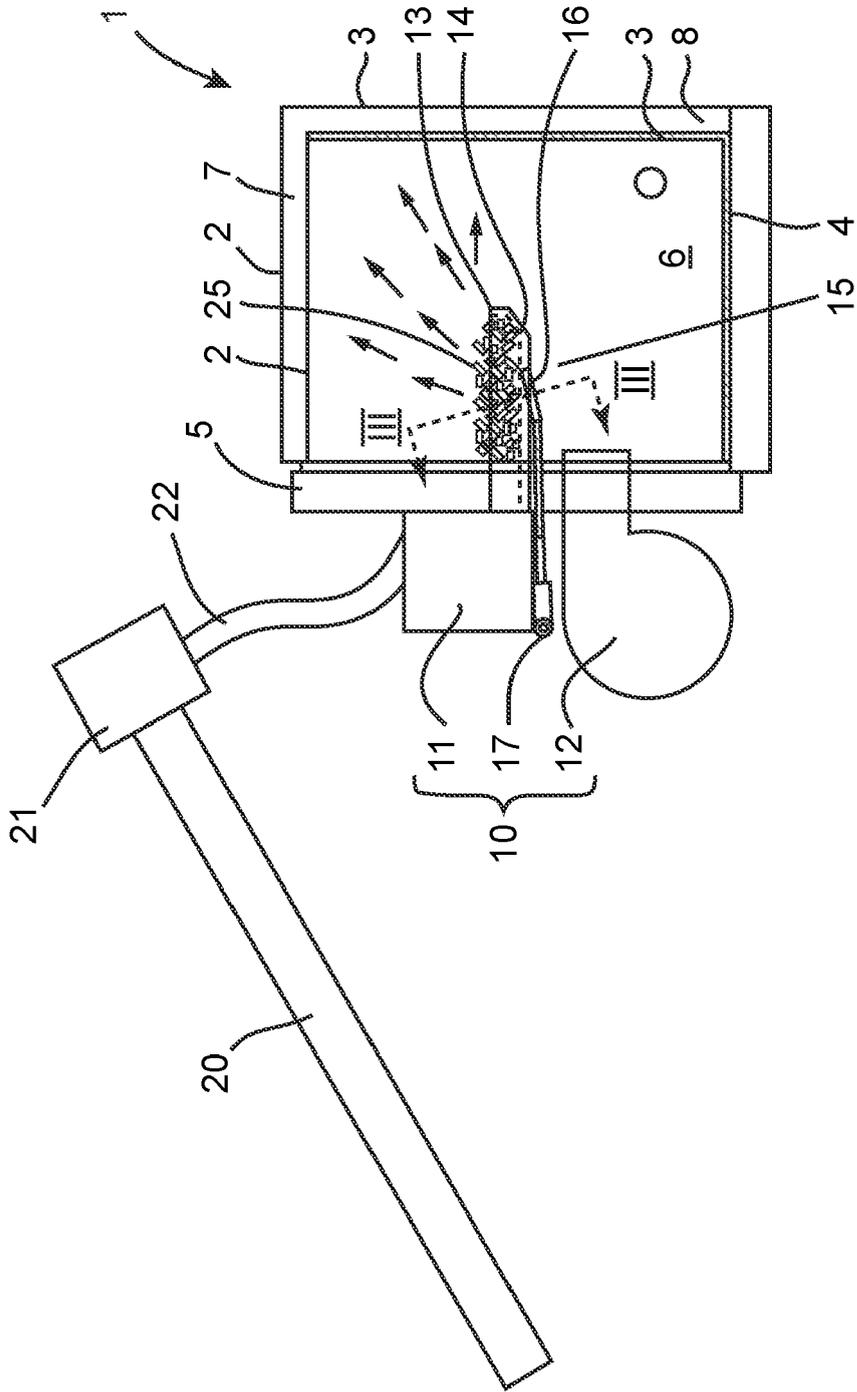


Fig. 1

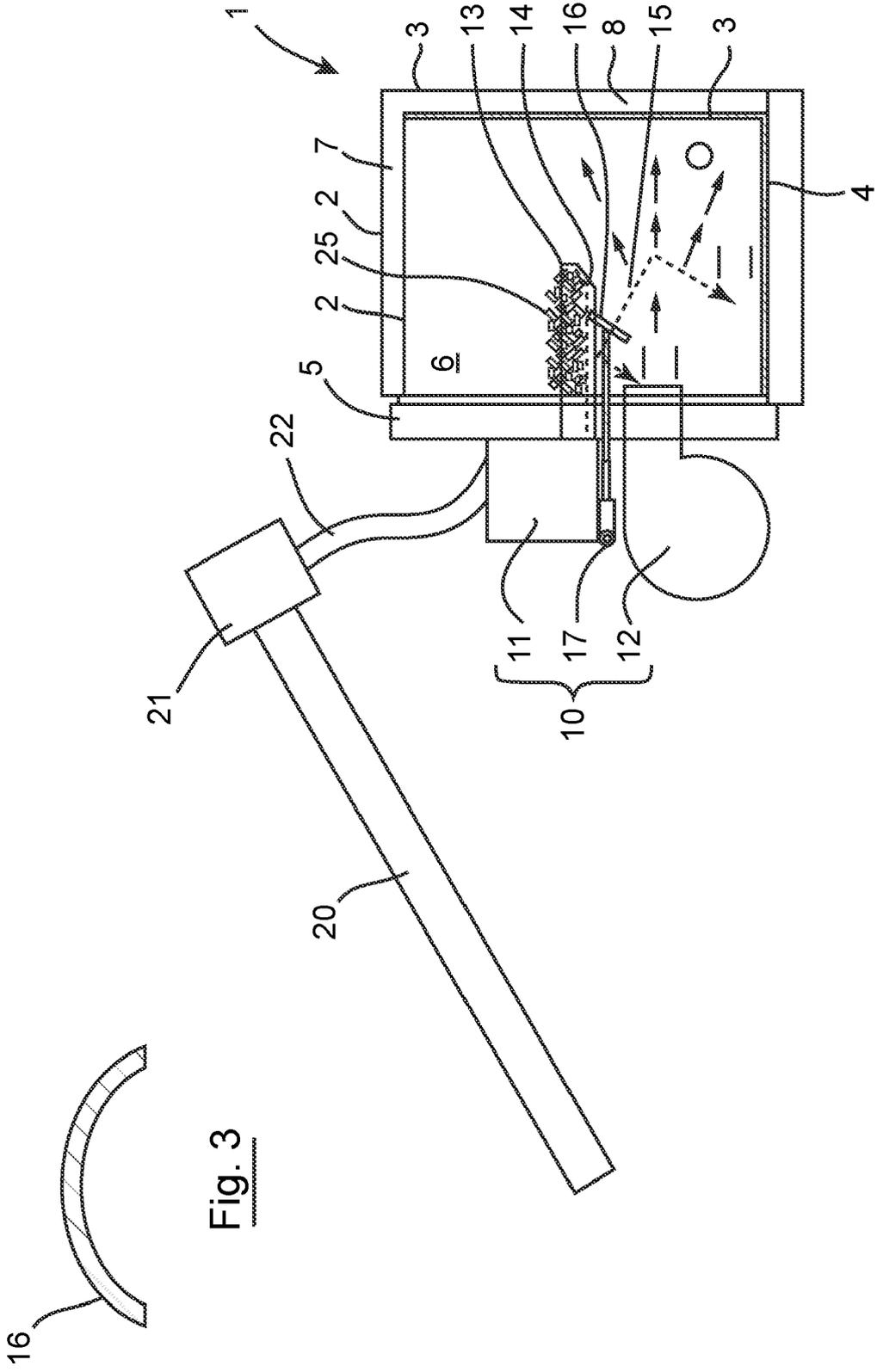


Fig. 2

Fig. 3

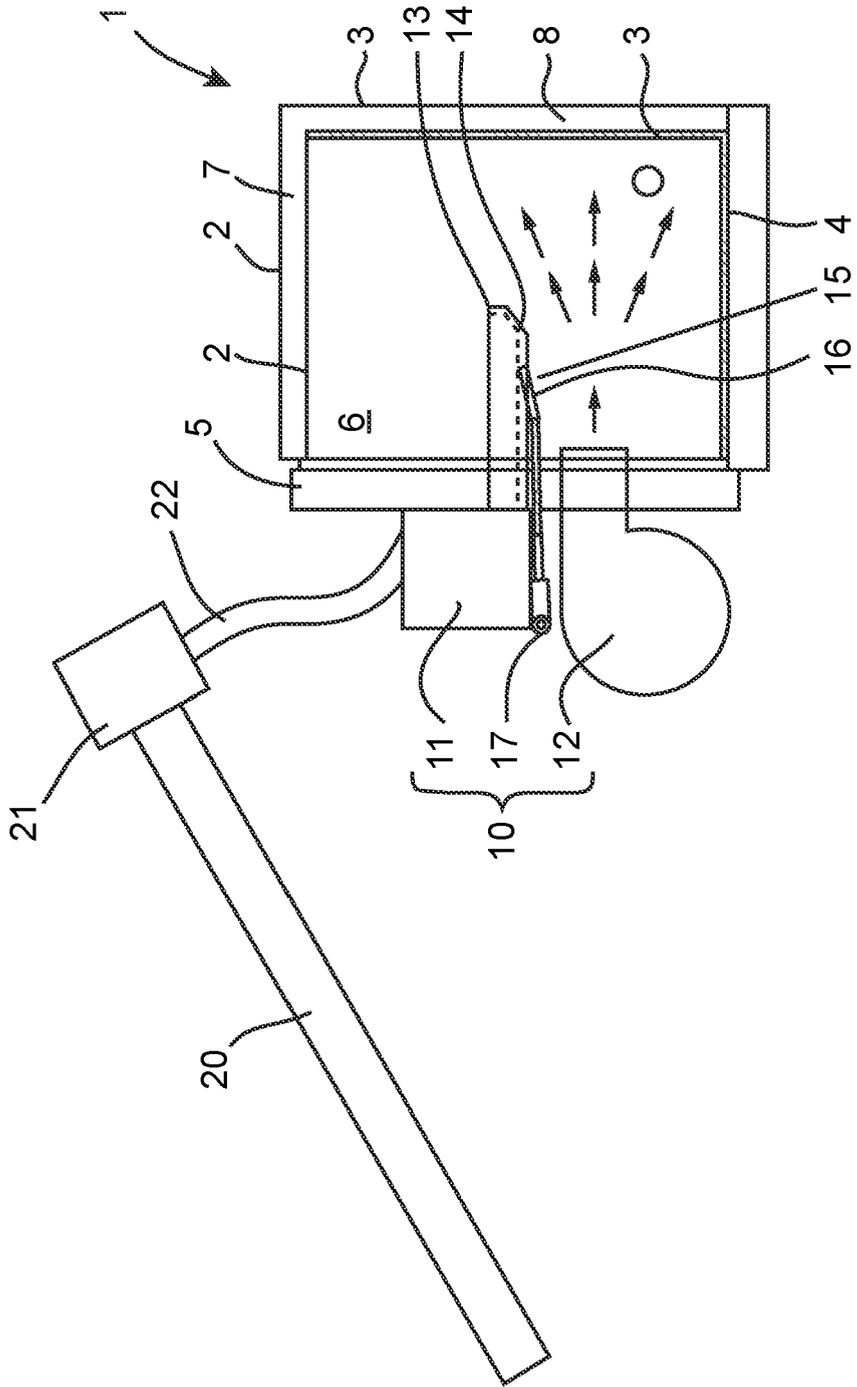


Fig. 4

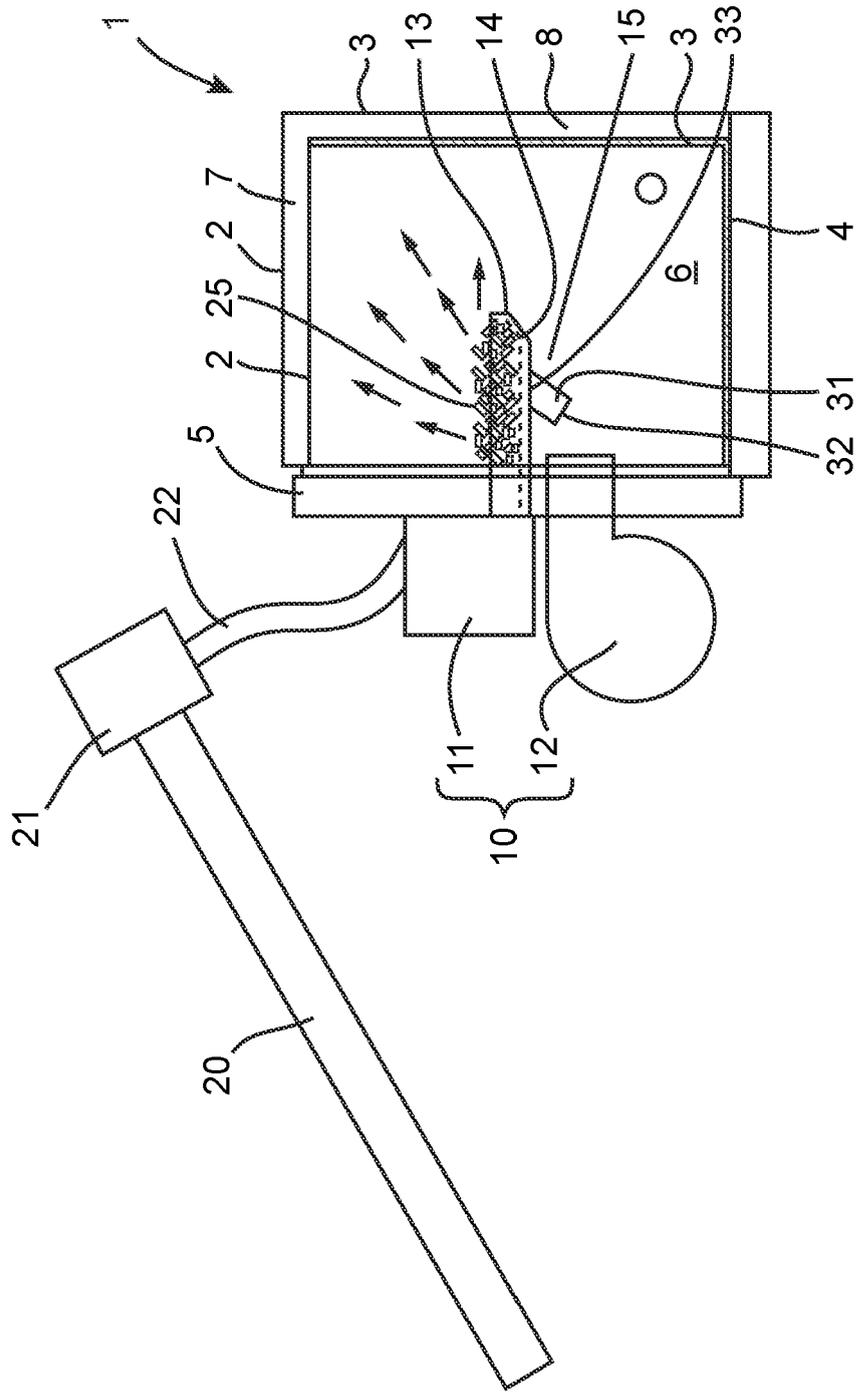


Fig. 5

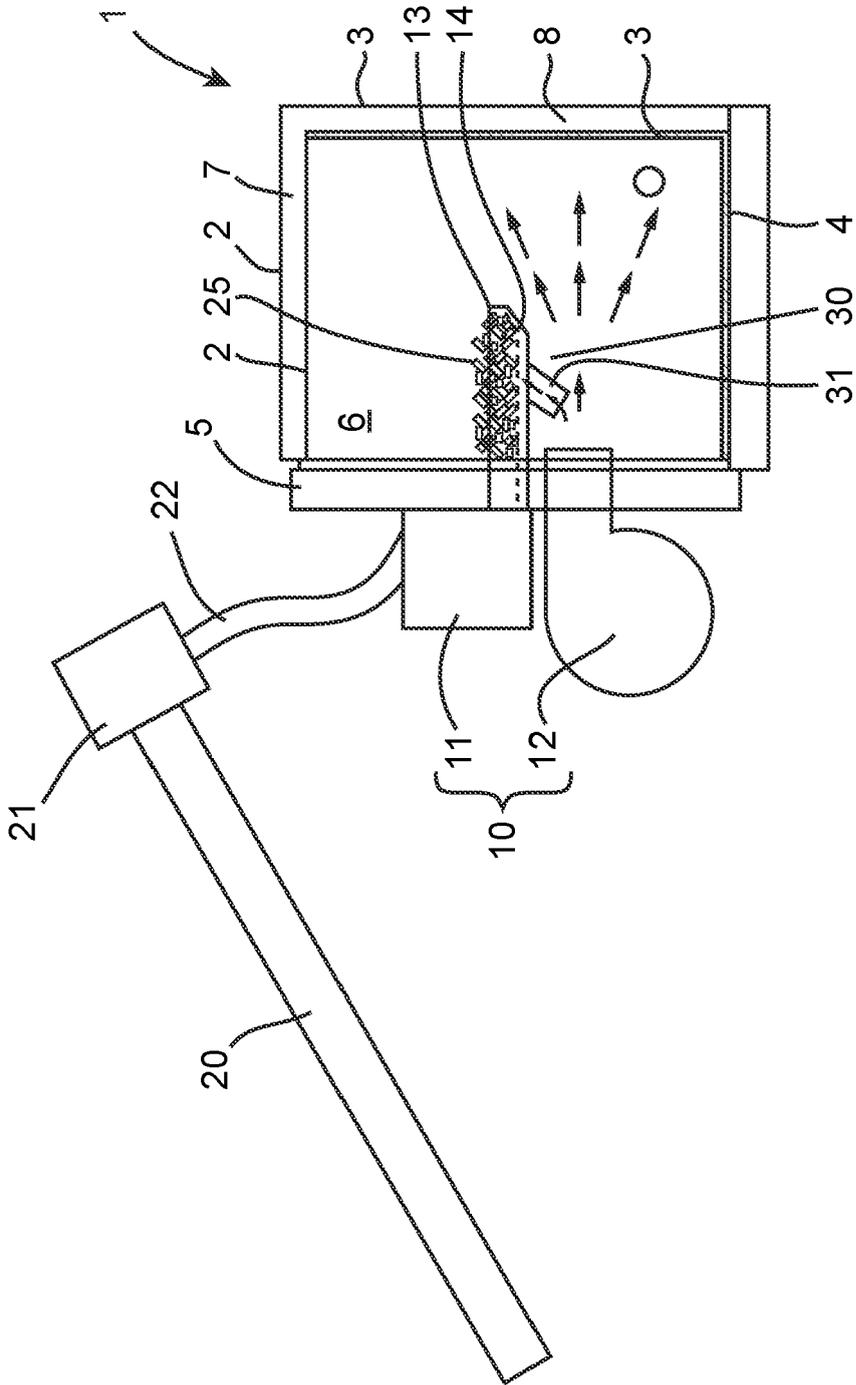


Fig. 6

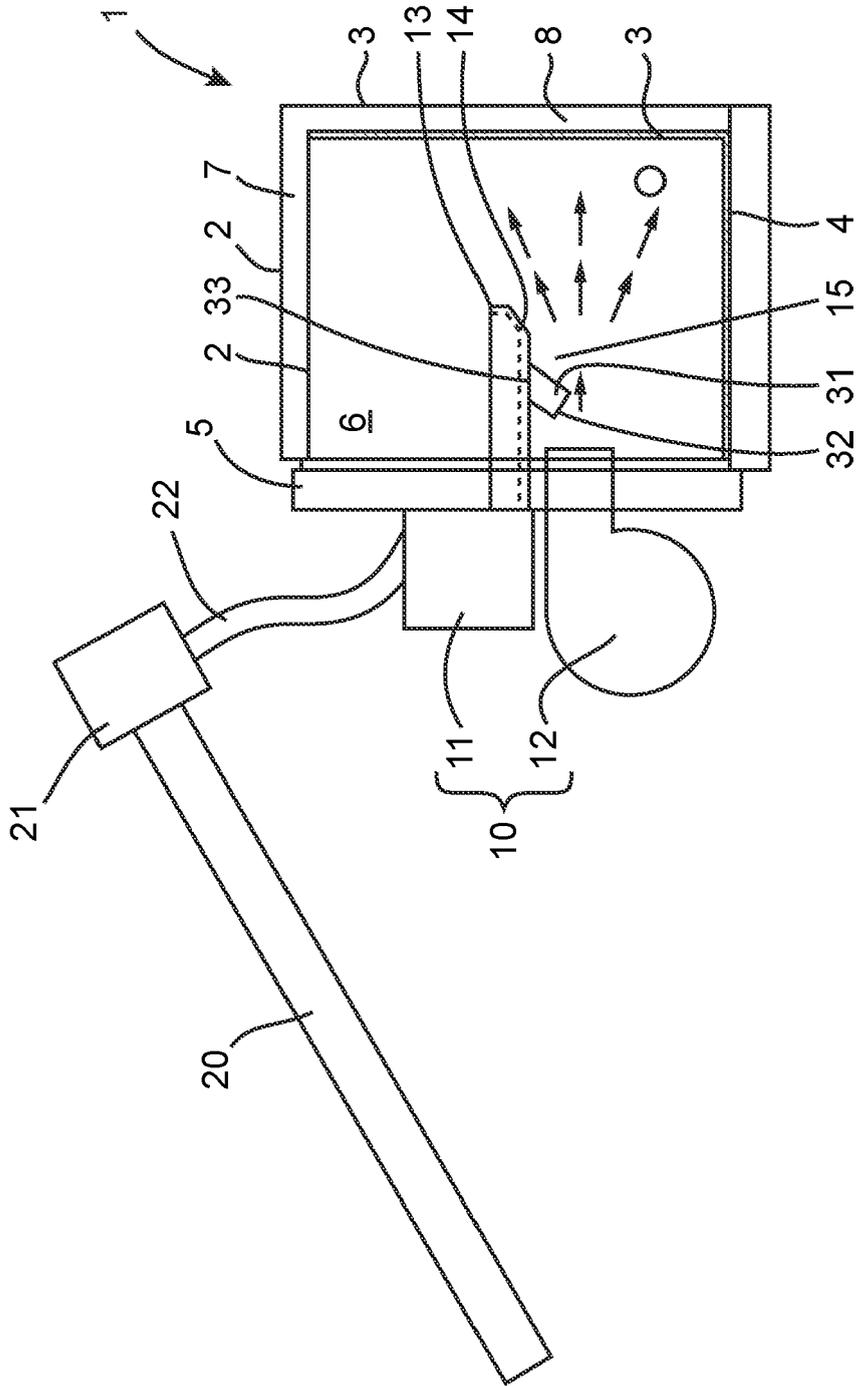


Fig. 7



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The present search report has been drawn up for all claims			
1	Place of search Munich	Date of completion of the search 10 September 2008	Examiner Gavriliu, Costin
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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