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(54) **THERMAL POWER PLANT FOR NON-PELLETIZED GRAPE POMACE BIOMASS**

(57) The thermal power plant uses non-pelletized biomass from grape pomace to heat generation and hot water production . It can burn just as well as wood chips or pellets, but the main purpose of the invention was to use the very large quantities of pomace from the vineyards of the world that are currently not well used profitably and to protect the environment at the same time.

The thermal plant is made up of the following main components:

-A the rotary burner with self-cleaning which is a constructive and functional innovation;

-B the body of the power plant (boiler) in wich the burner is mounted and contains a pipe system and a water cooling jacke - represents a constructive innovation;

-C heat recuperator ;

-D battery cyclone-oenofilter and which is a novelty of the filter material;

-E ash disposal system.

-a Pogrammable Logic Controller unit (PLC) ensures the control of a complete combustion cycle.

The biomass burning takes place in a metal cylinder able to resist to high temperatures called the rotary burner basket where temperatures of 600-800 degrees C are reached.

The rotary burner basket has thickness of 6-8 mm and holes of 5-6 mm and a cut-out portion (a) the mouth of the basket burner. This can be rotated by 6 π in respect to the the cleanser (10) to be filled with biomass at the beginning of the combustion cycle and empty of ash at the end.

The burner can also be used separately from this type of boiler. It is designed to be adapted to other types of thermal plants that used before : wood , pellets, natural gas, diesel etc.It is mounted on wheels together with the PLC and can be adjusted in height to fit ftheir feeding gates.

A stainless steel coil (9) heats the air and blows it through the air nozzles in the double walls of the cleaner. The hot air nozzles surround the biomass and increase the efficiency of the process.

A feeding auger (2) driven by a gear motor (19) takes the biomass from a tank (1) and transports it to the basket burner (3), The burning of the biomass takes place in a compartment (27) and the hot gases are directed through the water jacket from the boiler body (B) and discharged through the heat recovery pipes (C).

The gases cooled to a temperature below 80 degrees C, are discharged by an exhauster with adjustable flow (37) through a cyclone-filter battery (D).This consist of a cyclone (35) and a filter (36) filled of biomass residues resulting from the processing of grapes.

Ash evacuation is carried out automatically with the help of a flexible auger (44).

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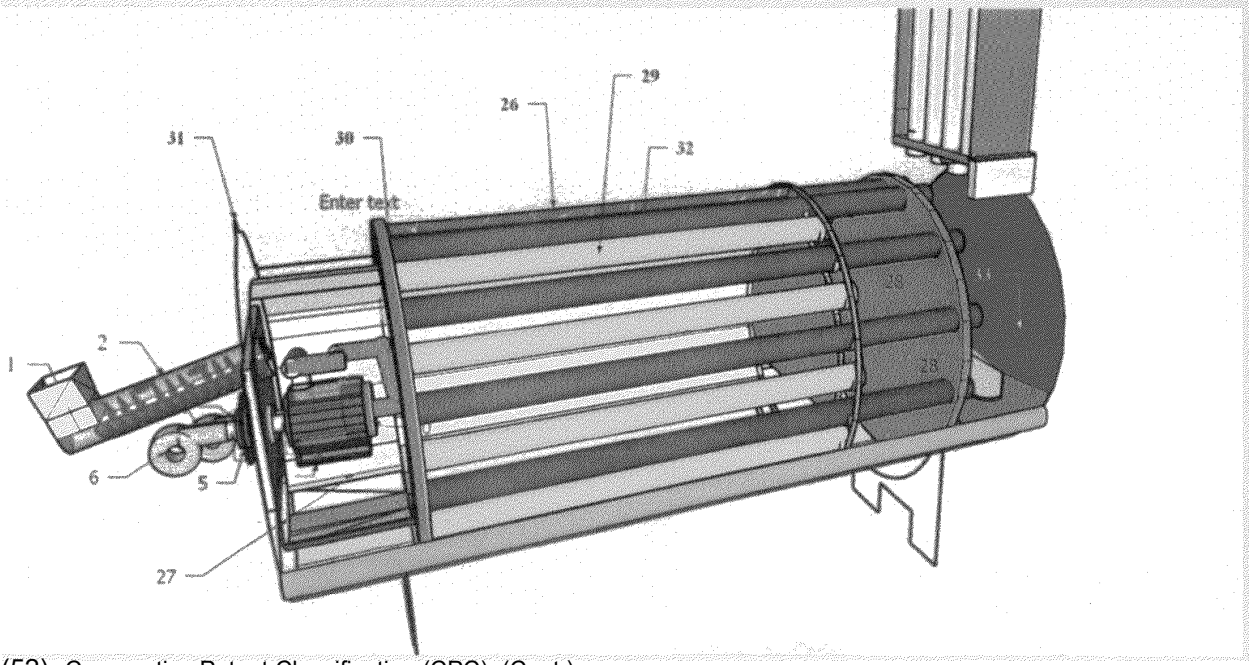
10 b -sections through thermal plant



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Description

[0001] The thermal power plant invention for non-pelletized grape pomace biomass is used for heat generation and hot water production for both individual and industrial consumers. Winegrowers and single or multi-family housing units, guesthouses and companies in wine-growing areas are the first categories of beneficiaries targeted by this invention due to the existence of cheap and large quantities of grape pomace biomass. Also among the possible beneficiaries are the owners of greenhouses and solariums who will be able to heat large volumes of air with low costs and an almost zero carbon footprint.

[0002] Currently, there are a number of thermal power plants with burners that utilize biomass in the form of pellets and a relatively small number of thermal plants that can use non-pelletized biomass, but none that can burn this biomass in optimal yield conditions and with minimal pollution in an almost raw, non-pelleted state, respectively the grape pomace.

[0003] Although the existing thermal plants can also burn pellets or wood chips very well, the main challenge, namely to be able to use the abundant and very cheap biomass represented by pomace, remained unsolved.

[0004] A thermal power plant is currently known Patent of invention no. RO 134 445 which refers to a thermal power plant and how to obtain and use thermal energy, by burning solid fuels and biomass for the purpose of heating domestic, commercial, production spaces, holiday homes, greenhouses and animal care spaces . The power plant, according to the invention, uses water or air as a heating agent and consists of a main body in which combustion takes place and a secondary body in which heat is exchanged, arranged in a common enclosure surrounded by a jacket through which it circulates the heating agent. The main body has a combustion chamber that features a telescopic mount at the top, a fuel supply door and a combustion disc that rests on the burned fuel, an air intake fan that forces air into the firebox through a connection that transfers the hot fumes from the combustion chamber to the secondary body. It features a flue gas collector and a hot gas recuperator equipped with a coil, making the water supply. The collected fumes are evacuated by an exhaust fan, the circulation of the thermal agent is ensured by a pipe and the return by another pipe.

[0005] A peasant thermal power plant for greenhouses is also known, invention patent no. RO133992 (A2), which produces hot thermal agents, water and air, but also household water, intended for rural households, being used for heating surfaces with solariums/greenhouses, as well as shelters on farms for raising animals, but also for household utilities The power plant according to the invention consists of a lower floor, equipped with a combustion tank into which an air pipe enters, and with a solid fuel supply door. Some heating sub-assemblies are connected to this lower floor, above which is axially positioned a middle floor, in which there is a baffled sub-assembly, which is provided with a tubular space delimited by an outer jacket and an inner jacket, and connected with a tubular space of the lower floor. Above them, a last upper floor is mounted, whose enclosures, a domestic water tank and a tubular enclosure with rock salt, are heated by the hot air that rises from the middle floor through some pipes, and the combustion tank is made up of a cylindrical pot, the access for cleaning the ash from it is through a sliding door .

[0006] A solid fuel thermal power plant is also known, invention patent no. RO133520 (A2), which consists of a vertical sheet steel heat exchanger, a secondary steel heat exchanger, a chamotte vertical wall, a fuel inlet, a metallurgical cement insulation. A base plate with a grate, an ashtray provided with an access hole and a door with a draft adjustment slot, an enclosure with a connection for secondary intake air, a primary intake air duct from the ash, a duct secondary intake air path from the premises, a flow connection, a return connection, a connection for draining water from the central unit, a smoke chamber with an inspection door. Constructively, a thermal reaction loop is created which has the effect of triggering two processes: the drying of the solid fuel, this allowing the power plant to be fed with wood with high humidity, even 50%, and the self-heating of the solid fuel until reaching the gasification temperature of at least 300 degrees°C, the process continuing to self-generate through the thermal reaction loop, from its own energy resulting during combustion until the fuel is exhausted.

[0007] All thermal power plants presented above have the disadvantage that they cannot ensure the efficient combustion of the pomace biomass, which has a great calorific value of approx. 5.8 KWh/kg (dry beech wood, usually taken as a benchmark, has 5 kWh/kg, and category I pellets have 5.5 kwh/kg). As of now, it is very difficult to start the ignition of the pomace, its combustion is difficult to control, and the residual pollutant emissions are difficult to maintain within the limits provided by the European regulations in force.

[0008] This invention solves the above technical problem by designing a thermal plant with a **rotary burner** equipped with a stainless-steel coil and self-cleaning for the burning of non-pelletized biomass made of grape pomace resulting from the industrial pressing of grapes. This rotary burner can generate a temperature of 600-800 degrees C at which the biomass self-ignites and burns almost completely and uniformly.

[0009] The cylindrical shape of the burner and the automatic cleaning mode engaged by rotating the basket burner by 6π with respect to the fixed cleanser make it possible for the plant to break the lumps of silicates formed due to high temperatures and to empty impurities, gravel or metals which would prevent the combustion of biomass.

[0010] The smoke circuits as well as the compartments of the thermal plant have been designed to maximize the surface and the contact time between the hot exhaust

gases and the water in the jacket of the plant. This design maximizes the heat transfer and minimizes the temperature of the exhaust gases which does not exceed 80 degrees C

[0011] To reduce the number of polluting particles, the emission gases are filtered through a filter loaded with biomass of different granulations, coming from the same source - the vine.

[0012] The constructive solution contains a Programmable Logic Controller (PLC) that controls the complete combustion cycle of the plant.

[0013] Combustion takes place in a self-cleaning burner - a metal cylinder that can stand high temperatures and has a thickness of 6-8 mm with holes of 5-6 mm as well as a cut-out portion - the mouth of filling. The rotation of the burner basket by 6π with respect to the fixed cleanser is done by an electric motor-reducer which, by means of a pinion chain, drives a metal tube that tilts the burner basket. Inside this tube, which rotates together with the with glow plugs and airburner basket, there is another fixed metal tube, attached to the cleanser, which contains the glow plugs at one end and a fan at the other end, that blows the primary combustion air over the glow plugs. The other end of the cleanser is welded to one end of the stainless-steel coil that sits in the flame and preheats the secondary combustion air.

[0014] A second fan blows air through this coil into the double-walled cleanser with 3-5 mm holes which combustion air is provided from all directions. As the coil heats up to 600-800 degrees C the hot air now becomes the main air that provides combustion and re-ignites the biomass without the need for glow plugs. The air blown through the cooled glow plugs now reduces and becomes secondary air.

[0015] A feed auger driven by a gear motor takes the biomass from a vat and transports it to the burner basket with glow plugs and air holes. The hot gases are directed through the body of the plant to a metal cover that returns them through a system of pipes that pass through a water-cooling jacket. When they reach the end of the pipes, the hot gases reach another metal cover and are returned again through other pipes parallel to the first ones that again pass through the jacket with cooling water, once again giving up part of the caloric energy to the water in the plant.

[0016] Finally, the gases are discharged and cooled through the heat recovery unit to a temperature lower than 80 degrees C.Finnaly, a cyclone-filter battery from where a variable flow exhauster, takes them purified and discharging them into the atmosphere.

[0017] The filter has three layers of filter materials formed from biomass residues resulting from the processing of grapes: the first layer, providing coarse filtration is located in a cylinder of stamped sheet and consists of dried and chopped bunch residues up to a maximum of 20 mm. The second medium filtration layer is located in a sheet metal cylinder welded to the extension of the cluster screen and is made of 2-15 mm granulated pomace. The cylinder filled with filter material has a ring welded to the upper part with a sealing gasket that isolates another ring welded to the inside of the filter housing. The last very fine filter layer contains a layer of 5-10 cm thick mineral or welding wool. The degree of clogging is measured by a vacuum sensor that sends the information through 4-20 V currents to the PLC that adjust the exhaust gases draft.

[0018] The door of the thermal power plant is made of thermally insulated metal, and has some holes drilled for mounting the burner and the variable flow fans that blow air through the coil and through the air tube containing the glow plugs. A metallic threaded rod is fixed to the pinion and its free end periodically arrives near the proximity sensor that regulates the position of the basket's feed opening. The filling of the vat with biomass is switched on/off using another motor-reducer controlled by a level sensor.

The invention presents the following advantages:

[0019]

1. There are larger vineyards with numerous wine producers worldwide and where large amounts of pomace are found that are difficult to reintegrate into the environment and neutralize. They can be observed all year-round decomposing under the open sky. Only in Romania, for example, approx. 70,000 tons of pomace/year are produced with an energy potential of 440 GWh, i.e. approx. 0.7 KWh for each liter of wine that is produced. The thermal plant according to the invention can utilize this biomass.
2. The construction of the thermal power plant ensures optimal yield combustion with minimal pollution of the pomace-type biomass in an almost raw, non-pelletized state.
3. This thermal plant effectively solves all these drawbacks with a near-zero C footprint.

[0020] An embodiment of the invention is given next in connection with figures 1 to 12, which represent:

- fig 1 - general drawing of the thermal plant;
- fig. 2a, 2b - rotary burner assembly drawings;
- fig. 3 - feeding auger drawing;
- fig. 4 - burner basket image;
- fig. 5 - metallic coil image;
- fig.6 - cleanser with glow plugs and air holes drawing;
- fig. 7 - proximity sensor;
- fig. 8 - motor -reducer;
- fig. 9 - water flow sensor;
- fig. 10 a and 10 b - sections through the thermal plant;
- fig. 11 - diaphragm working positions drawing;
- fig. 12 - filter drawing
- fig. 13 - ash discharge system

[0021] The thermal plant is made up of the following

main components according to (fig. 1):

- A the rotary burner with self-cleaning which is a constructive and functional innovation (see more fig. 2a,2b,);
- **B** the body of the power plant which represents a constructive innovation;
- **C** heat recuperator ;
- **D** battery cyclone-oenofilter and which is a novelty of the filter material;
- **E** ash disposal system.

[0022] The cylindrical shape of the burner basket and the automatic cleaning mode by rotating it by 6π with respect to the fixed cleanser make it possible to break the lumps of silicates formed due to high temperatures and to empty impurities, gravel or metals that prevent the combustion of biomass.

[0023] The smoke circuits as well as the compartments of the thermal plant have been designed to maximize the surface and the contact time between the hot exhaust gases and the water in the plant jacket, which maximizes the heat transfer as well as an minimizes exhaust gas temperature in the atmosphere of maximum 80 degrees C.

[0024] C-through the heat recuperator, the fans that ensure combustion take hot air from the recuperator, increase the efficiency of the plant, lower the temperature of the gases discharged into the atmosphere and bring in air from outside the technical room. The concentration of CO2 inside the technical room will not increase, unlike most biomass thermal power plants because in this plant the combustion is done with air from outside.

[0025] **D**-battery cyclone filter carries out exhaust gas filtration in two steps -a) the cyclone makes a gravitational separation of the solid particles in suspension in the burnt gases

- b) the filter cleans the gases coming out of the cyclone by passing them through the filter material. The filter material is also composed of biomass. It is efficient, cheap, ubiquitous in vineyards, with a minimal impact on the environment and consists of successive layers of bunches of grapes and pomace. It can also be used as a standalone filter for air or other gases. It has been successfully experimented with filtering the syn-gas used in internal combustion engines, in which case a layer of ceramic wool is added to protect the engine valves. This filter can also be used to filter the air introduced from the outside inside the living spaces by adding in the final layer filter plates that are common and cheap in the wine industry and can go up to a grain size of 0.45 mm, that is to say it can be obtained pure, almost sterile air.

Description of the component parts of the burner (fig. 2).

[0026] The construction of the burner is made of a metal biomass vat (1) in which the pomace is stored for distribution to the burner basket. A feeding auger (2) takes the biomass from the vat (1) and transports it to the burner basket (3). The burner basket (3) is a metal cylinder resistant to high temperatures with a thickness of 6-8 mm and holes of 5-6 mm with a cut-out portion of the mouth of the basket ("a" in fig. 4), through which the biomass supply is made at the beginning of the cycle when the mouth of the basket "a" is positioned upwards as well as the discharge of ash and lumps of silicates by repeatedly rotating the mouth of the basket "a" downwards.

[0027] The rotation of the burner basket (3) is done by the metal tube (14) which is rotated by means of the pinion (5) by an electric motor-reducer (8).

[0028] An air blower (6) provides primary air by blowing air through the glow plugs (7) during the ignition phase, but which provides secondary air during the burning phase.

[0029] In the overall construction of the burner there is also a stainless steel coil (9), a cleaner (10), air nozzles (11), an access door to the burner chimney (12), an air blower (13).

[0030] The glow plugs (7) that initially ignite the biomass are mounted inside the tube (4).

[0031] The stainless-steel coil (9) secures and heats the combustion air supplied by the fan (13) by directing it through the holes of the cleaner (10) into the basket of the burner (3).

[0032] The cleanser (detail fig. 6) is a fixed metal part with double walls and with air holes (11) which has a triple role:

1- clean the basket of the burner(3) from the inside when it rotates,
2- distribute the hot combustion air
3- maintaining the flame and re-igniting the biomass after the cleaning cycle without the intervention of glow plugs .

[0033] The air nozzles (11) are holes made in the inner lining of the cleaner with a diameter of 3-5 mm arranged around the biomass in the basket burner.

[0034] The access door to the burner (12) is metallic, thermally insulated and has some holes "c" made for mounting the burner A and the fan (13) with variable flow that blows air through the serpentine (9).

[0035] A metal threaded rod (15) rotates integrally with the pinion (5) fixed to the bearing (16) and its free end periodically actuates the proximity sensor (17), which commands the motor-reducer (8) to stop the bin with its mouth up for the next cycle of filling after counting three spins of it.

[0036] The permanent filling of the tank with biomass (1) is done from an external big buffer tank and is controlled by a level sensor (18).

[0037] The feeding auger (2) is driven by a gear motor (19).

[0038] The temperature in the flue area is measured by a thermocouple (20), and the temperature of the burner basket by another temperature sensor (21).

[0039] The oxygen concentration in the burnt gases to regulate the air flow in order to obtain an efficient combustion is measured with a lambda probe (22).

[0040] The temperature sensor (23) measure the heating agent and controls the rate of biomass supply .

[0041] The commands are provided by an automation box with Programmable Logic Controller (PLC) .

[0042] A water flow sensor (25) - measures the water presure in the pipes and the flame sensor (47) gives an alarm if the flame in the burner is accidentally extinguished. Both sensors can stop the biomasa supply when a fault occurs.

Functional description

[0043] The thermal power plant operates in combustion cycles with parameters constantly adjusted by a PLC unit according to a logic scheme created especially for this kind of burner.

[0044] A complete combustion cycle contains 4 phases: filling, ignition, burning and cleaning.

The filling phase

[0045] The PLC commands the motor-reducer (19) to fill the basket burner (3) with biomass from the tank (1). The basket burner is positioned with the mouth upwards so that it can be filled with biomass. Its position is regulated by the PLC using a proximity sensor (17). Filling time is under 1 min.

The ignition phase

[0046] The PLC turns on the fan (6) and the glow plugs (7) until the biofuel in the stack ignites. The initial ignition time mainly depends on the granulation and moisture of the biomass being 3-5 minutes

Burning phase of the biomass

[0047] After the biomass has been ignited, the PLC commands the glow plugs (7) to be turned off, the fan (13) to be turned on and the biomass basket to be permanently fed. The air in the coil in the flame heats up between 400-800 degrees and is further used as primary combustion air.. The flow rate of the fan (13) and the amount of biomass are controlled by the PLC that processes the information from the sensors. To avoid the formation of large lumps of silicates and other compounds that block combustion, the time of the combustion phase is limited to no more than 17 minutes.

[0048] In the following cycles, thanks to the high temperature of the air in the coil whose thermal inertia has been increased by filling it with ceramic balls, the biomass can also re-ignite by itself, without the need to restart the glow plugs. This fact reduce energy consumption and extending their life.

Emptying/cleaning phase - cleaning

[0049] The programmed burning time is until 17 min. After this time, the PLC stops the fans and the pomace supply, then commands the 6π rotation of the burner basket for cleaning and the gravitational evacuation of ash and other combustion residues, and restarts combustion cycle until the desired temperature of the thermal liquid set by the user in the PLC.

Description of the thermal power plant

[0050] The thermal plant shown in section in fig. 10a and 10b was designed to extract as much heat as possible from the energy produced during the combustion of the biomass by increasing the surface area and contact time between the flame with the hot exhaust gases on the one hand and the water in the cooling jacket (26) on the other part. Biomass burning takes place inside the compartment (27) and the flame and hot gases are directed through the body of the plant to the cover (28) from where they are returned through a pipes system (29) that pass through the water jacket (26) and this part of the heat. After reaching the compartment bounded by the covers (30) and (31), the gases are returned again but through the pipes (32) which are partially immersed in the water jacket (26) and reach the compartment bounded by the covers (28) and (33)) being forced to escape through the pipes of the heat recuperator C .

[0051] For a more complete combustion, the gases are directed by the metal diaphragm with a variable angle in fig. 11 to reach the hot refractory surface (34) on which the ash falls from the burner basket (3) and where the thermal decomposition (pyrolysis) of the last traces of organic matter takes place (especially from the oleaginous seeds present in the pomace), followed by their burning. Before leaving the thermal plant, the gases pass through the heat recovery unit C cooled by the air captured from the outside by the blowers that provide the oxygen necessary for combustion. The gases thus cooled to a temperature lower than 80 degrees C are discharged through a cyclone (35) and a filter (36) (Oeno-filter-cyclone battery fig.12) by an exhauster (37) with adjustable flow also controlled by the PLC.

[0052] For the production of domestic hot water (DHW), the boiler is equipped with an auxiliary recirculation pump that takes a fraction of the hot water from the boiler circuit, heats a coil boiler and then returns the cooled water through the boiler return. Thus, the water cooling jacket of the plant (26) constitutes a caloric en-

ergy buffer from which the DHW boiler can be fed - domestic hot water even during the summer, the process also being directed by the PLC logic unit.

Description of the Oeno-filter

[0053] This filter (36) in fig.12 has as a novelty the composition of the filter material which is made up of biomass residues resulting from grape processing. This fact ensures an extremely low cost but also environmental protection because the filter material is also finally burned in the plant (except for the last layer of mineral wool) and is not constituted as waste.

[0054] The first layer, of coarse filtration, is located in a stamped sheet metal cylinder sieve (38) and consists of remains of dried and chopped bunches up to a maximum of 20 mm that form sinuous smoke channels. This channels cause unburned tars and suspended particles to stop in this labyrinth.

[0055] The amount of filter media depends on the desired filter capacity (36).

[0056] The second layer, of medium filtration, is located in a welded sheet metal cylinder (39) in the extension of the sieve with clusters and is made of pomace with a grain size of 2-15 mm as it results directly from the sorting phase. This being denser than the clusters creates sinuous channels of smaller sections and will retain medium and small particles as well as other volatile substances that have escaped from the burner and the coarse layer of clusters.

[0057] The filter cylinder has a ring (40) with a seal (41) welded at the top which seals to another ring (42) welded to the inside of the filter housing (36).

[0058] Both filter materials, after being loaded with tars and particles that have escaped unburned, are introduced into the plant's burner and burned together with the current biomass, so they do not constitute waste

[0059] In order to obtain a last very fine filter layer, but also for a quick visual control of the degree of retention of pollutants by the filtering biomass, a layer of approx. 5-10 cm thick mineral or ceramic wool is placed. The degree of clogging is measured by a vacuum sensor (43) that sends the information via 4-20 V currents to the PLC for draft regulation. A battery of two filters can be used that can be alternately changed without having to turn off the boiler, in which case the vacuum sensor (43) is mounted on the common filter gas supply pipe.

[0060] The filter can also be used for the air in habitable rooms of medium and large volumes, having also been tested for industrial gases such as syn-gas produced from the same biomass described above.

Ash disposal system

[0061] The evacuation of the ash is realized with the help of a flexible metal auger (44) operated by an electric motor-reducer which transports it into a closed metal collector 45 as schematically illustrated in fig.13.

- Oenology is the science that deals with the study of vines and wine and their by-products, that's why we considered it appropriate to introduce the prefix oeno considering that grape pomace and filter material come directly from this field.
- • The energy consumption for the production of one liter of wine from the reception of the grapes to bottling is calculated by the author to be about 0.04 KWh, from which it follows that the winemaking of grapes can be transformed from an energy-intensive process (17 GWh in 2023 only in Romania and over 1000 GWh worldwide) in an energy-generating process.
- • The grape pomace contains several types of combustible substances that contribute to a high energy value of approx. 5.8 KWh/kg, namely cellulose, lignin, oil, sugar, traces of alcohol, etc.
- • the pomace must be prepared for energy recovery - a stage that consists in drying and sorting the biomass (which already results in granulated form from the process of pressing the grapes in pneumatic presses). For a maximum yield, biomass with dimensions of no more than 15 mm and humidity of no more than 10% is burned. Drying can be done in dryers or, in the case of small and medium consumers, simply in the sun on concrete platforms (approx. 30 tons/ 1000 m^2 x season).

Claims

1. **Thermal power plant for non-pelletized grape pomace biomass** consisting of a main body, having a combustion chamber in which the combustion is carried out and a secondary body in which the heat exchange is carried out, **characterized by** the fact that a unit Programmable Logic Controller (PLC) ensures control of a complete combustion cycle of the thermal power plant made of a self-cleaning burner (A), in which a stainless steel coil (9) enters to heat the primary combustion air supplied by a fan (13) directing it through some nozzless of a fixed cleaner (10) into the basket (3) of the burner in the form of a metal cylinder able to stand high temperatures with a thickness of 6-8 mm and holes of 5-6 mm and with a cut-out portion (a) the mouth of the basket, which can be rotated with 6π with respect to the fixed cleaner (10), a feed auger (2) driven by a gearmotor (19) takes the biomass from a tank (1) and transports it to the burner basket (3), the burning of the biomass is done in a compartment (27) and the flame and hot gases are directed through the boiler body (B) to a cover (28) from where through a system of pipes (29) they pass through a water cooling jacket (26), reach a compartment bordered by some covers (30) and (31) are directed through some pipes (32) which are also immersed in the water cooling jacket (26), arrive in the compartment delimited by the covers (28) and

(33) being discharged through the pipes of the heat recovery unit (C), the cooled gases at a temperature lower than 80 degrees C are discharged through a cyclone (35) and a filter (36) which has three layers of filter material formed from biomass residues resulting from the processing of grapes, by an exhauster (37) with adjustable flow, the ash evacuation is realized with the help of an flexible auger (44).

2. Thermal plant for non-pelletized grape pomace biomass according to claim no. 1, **characterized by** the fact that the tilting of the basket burner (3) is done by the motor-reducer (8) which drives the pinion (5) which rotates the metal tube (14) through a chain into which the basket burner and a fan (6) blows the main air through two glow plugs (7) during the ignition phase, the cleanser (10) is a fixed metal piece with double walls and air nozzles (11), with 3-5 mm holes made into the inner wall, and arranged around the biomass contained in the basket burner (3), the central door of the thermal plant (12) is thermally insulated and has some holes (c) practiced for mounting the burner (A) and the variable flow fans (13) that blow air through the coil (9), the glow plug air tube (4) is a fixed metal pipe that enters the metal tube (14) and contains the glow plugs (7) of ignition which guides the hot ignition air to the basket burner (3), a metal threaded rod (15) is fixed to the pinion (5) through the free end that periodically comes close to the proximity sensor (17) which regulates the position of the feed mouth of the basket, stopping/starting the filling of the vat (1) with biomass is controlled by a level sensor (18).

3. Thermal plant for non-pelletized grape pomace biomass according to claim no. 1, **characterized in that** the filter (36) has as a filtering element for a composition of biomass residues resulting from the processing of grapes, the first layer of coarse filtration is located in a cylinder (38) of a stamped sheet metal and consists of dry bunch residues chopped up to a maximum of 20 mm, the second, medium filtration layer is in a sheet metal cylinder (39) welded into the extension of the bunch sieve and is made of pomace with a grain size of 2-15 mm, the filter material cylinder has a ring (40) welded to the top with a sealing gasket (41) that seals another ring (42) welded to the inside of the filter housing (36), a last very fine filter layer contains a layer of approx. 5-10 cm thick mineral wool, the degree of clogging is measured by a vacuum sensor (43) which sends the information using electrical currents of 4-20 V to the PLC for regulating the draft.

fig.1-Thermal power plant assembly drawing

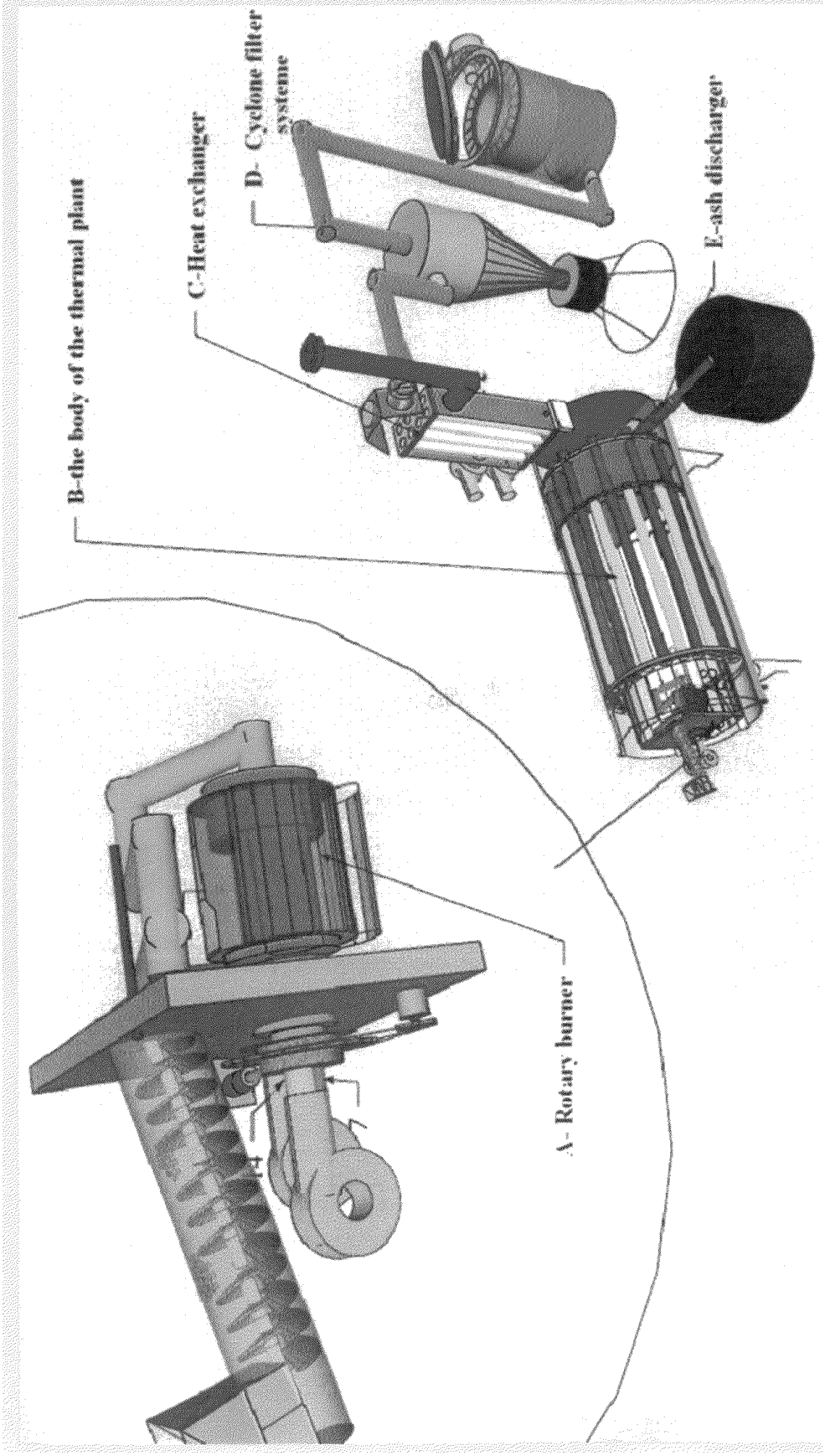


fig.2a-burner right view

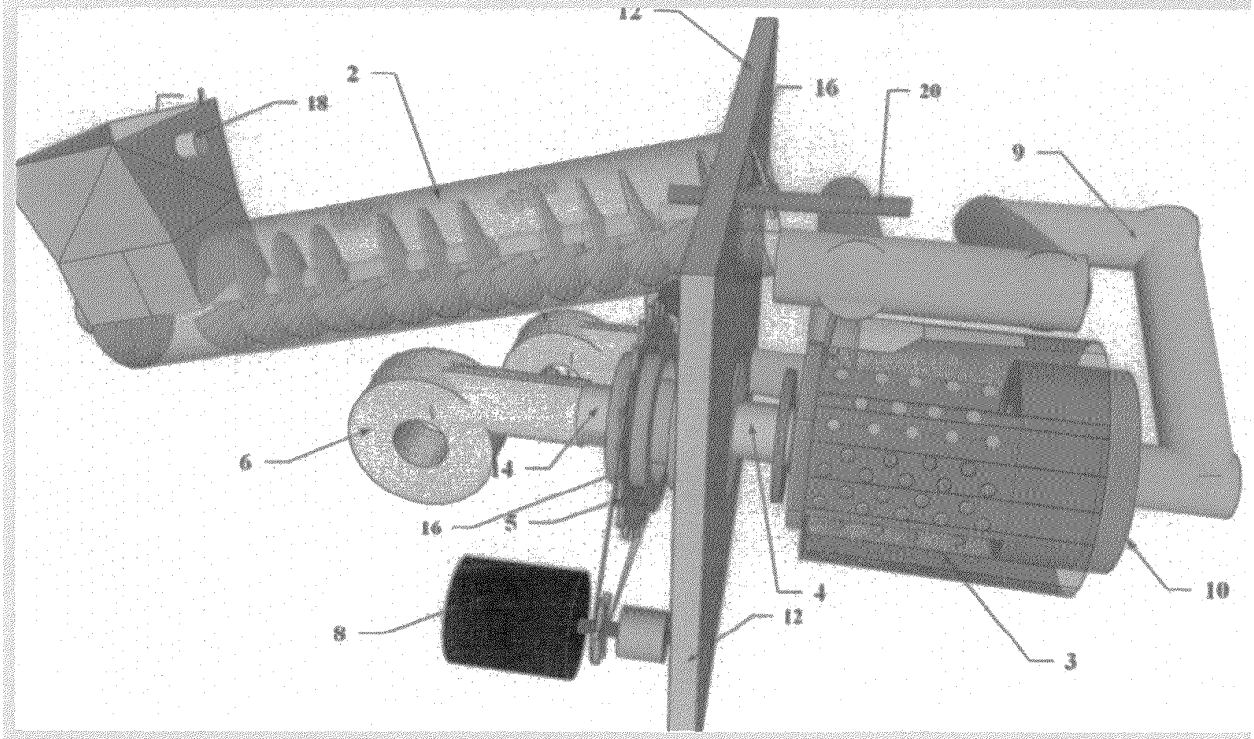


Fig. 2b burner left view

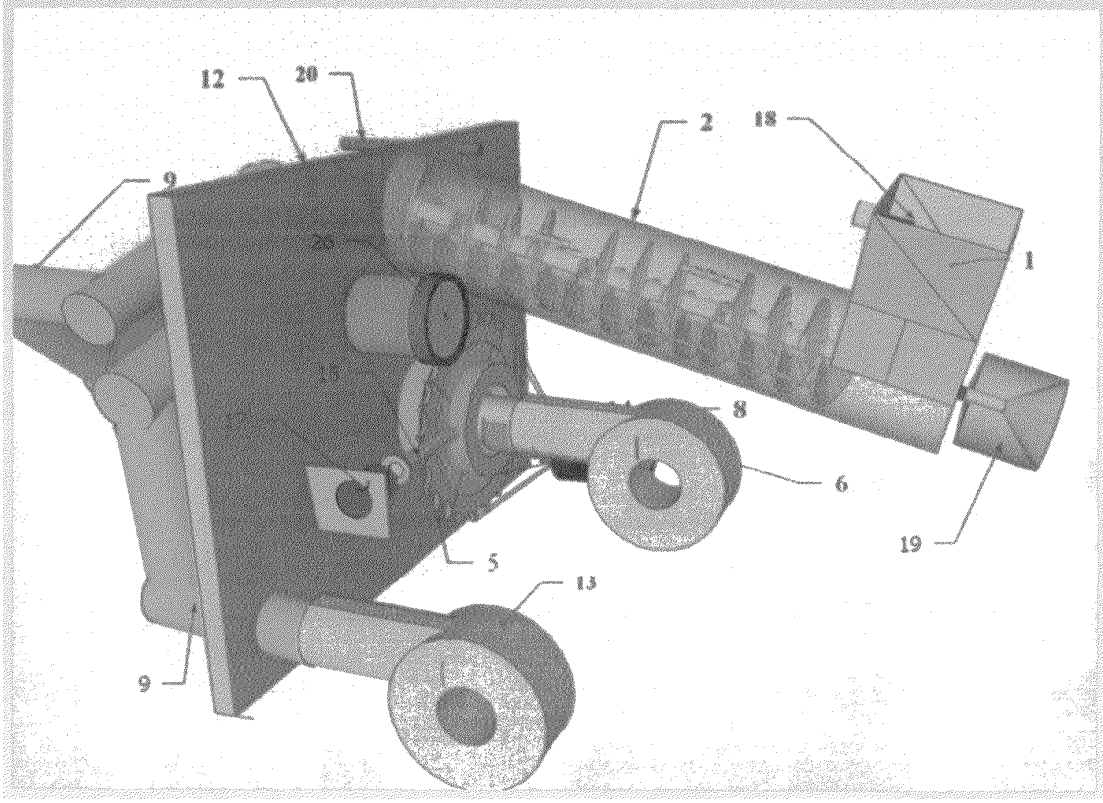


Fig.3 -biomass filling auger

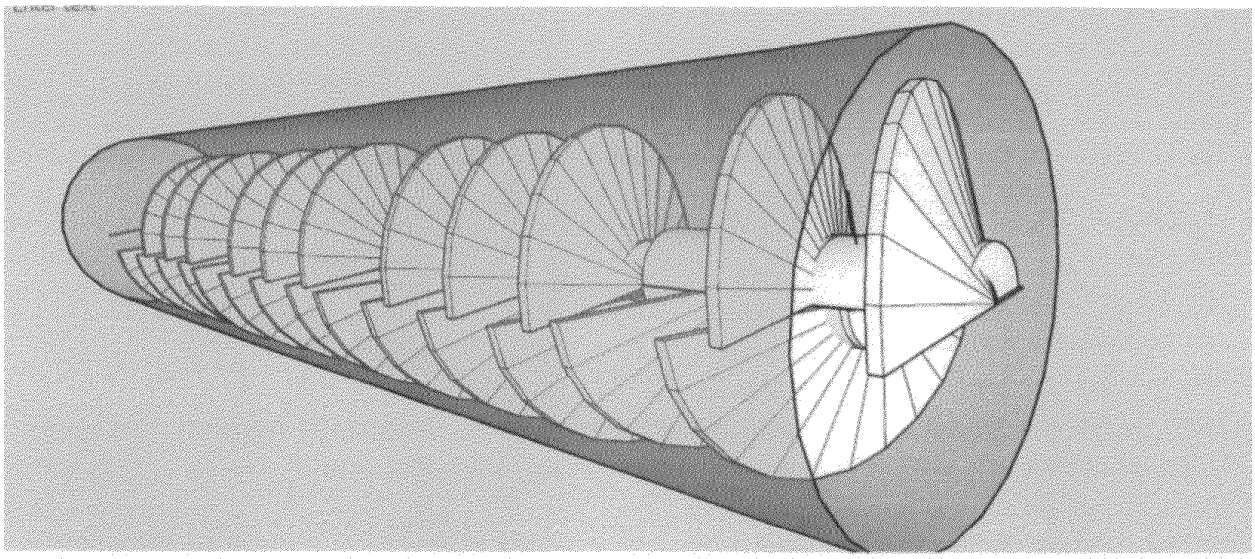


fig.4 – burner basket dimensions in mm

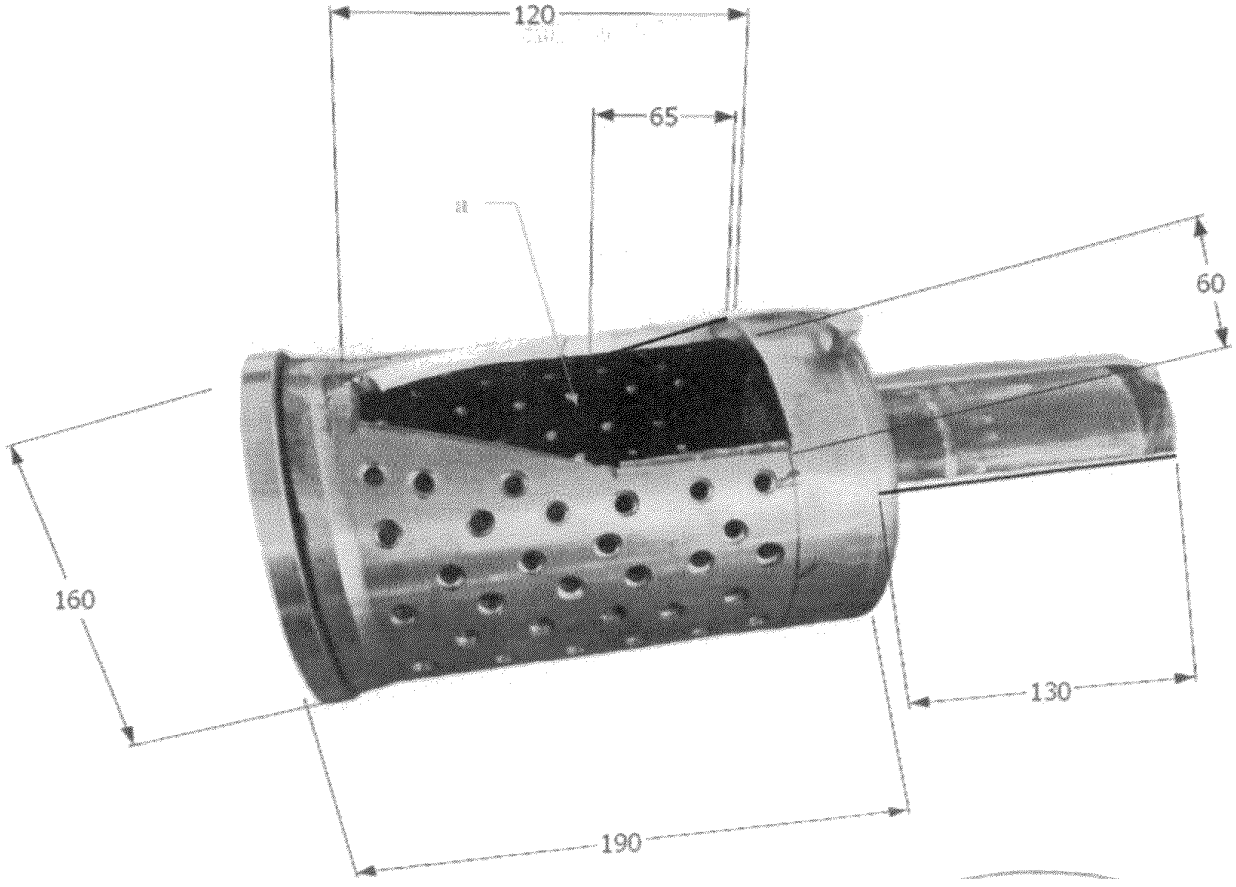


fig.5 -stainless steel coil and burner basket

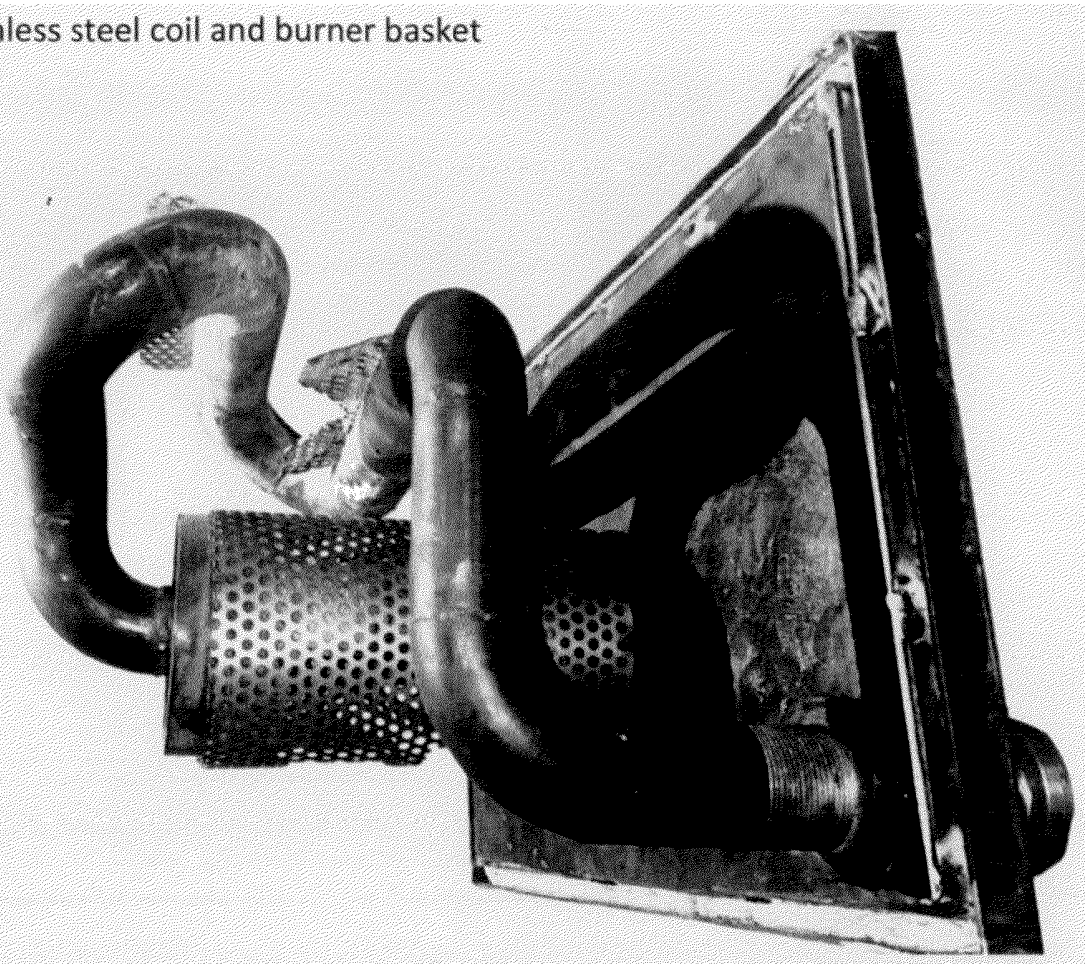


fig.6-cleanser with glow plugs and air holes drawing

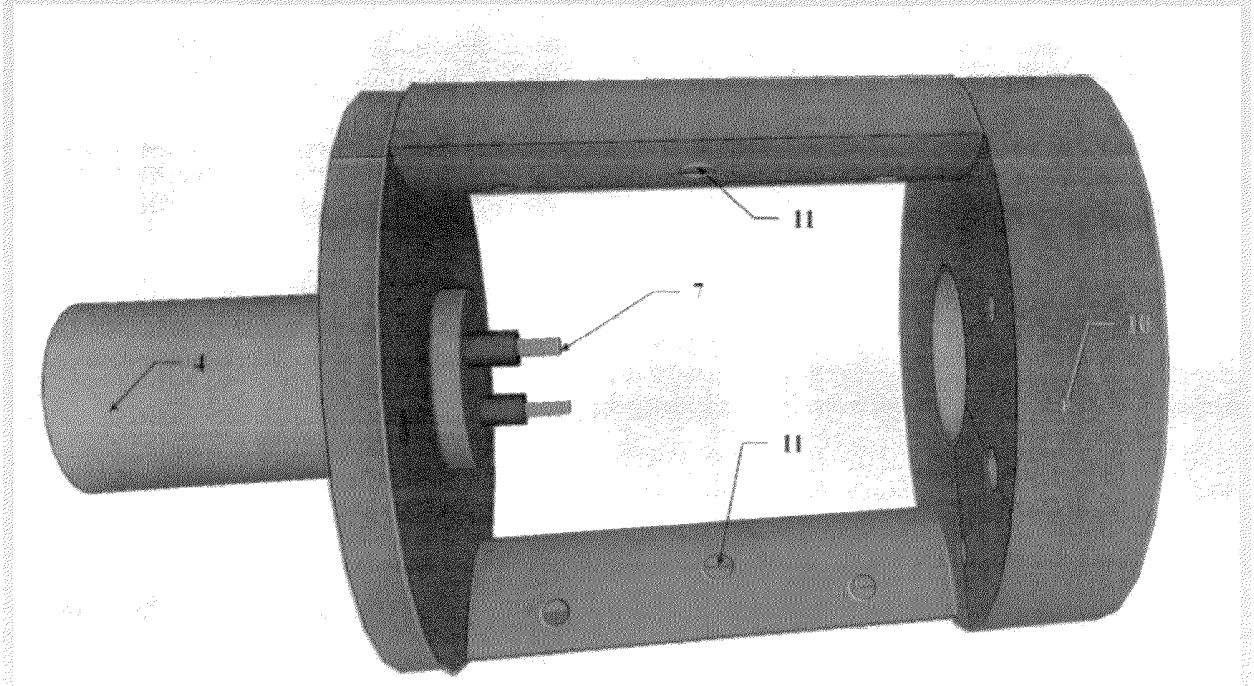


fig.7-proximity sensor

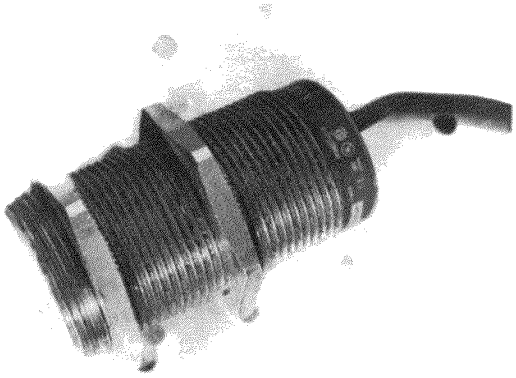


fig.9-Water flow sensor

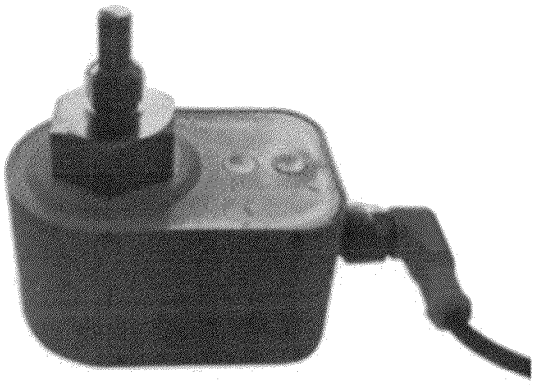


Fig.8 motor-reducer

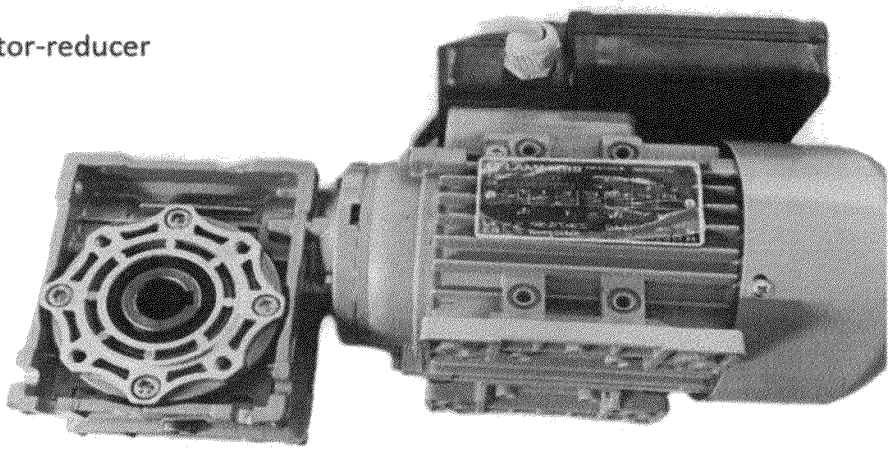
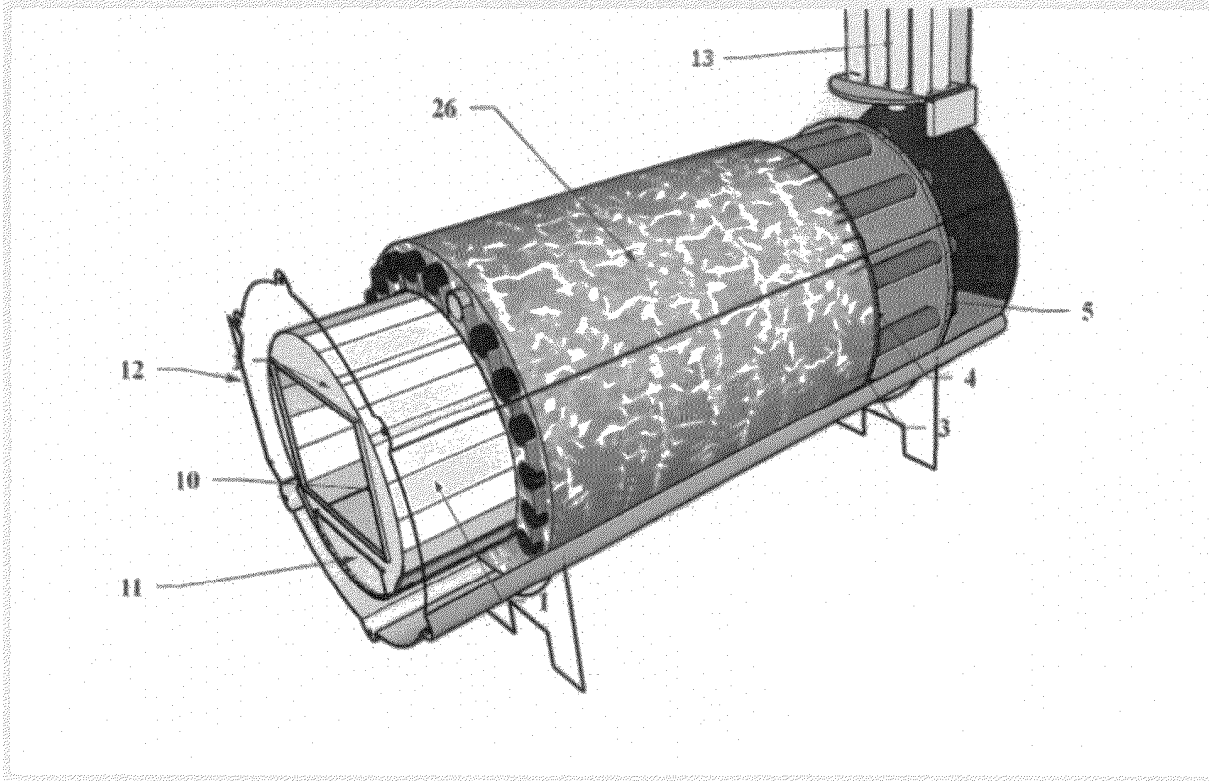


fig.10 a și 10 b -sections through thermal plant



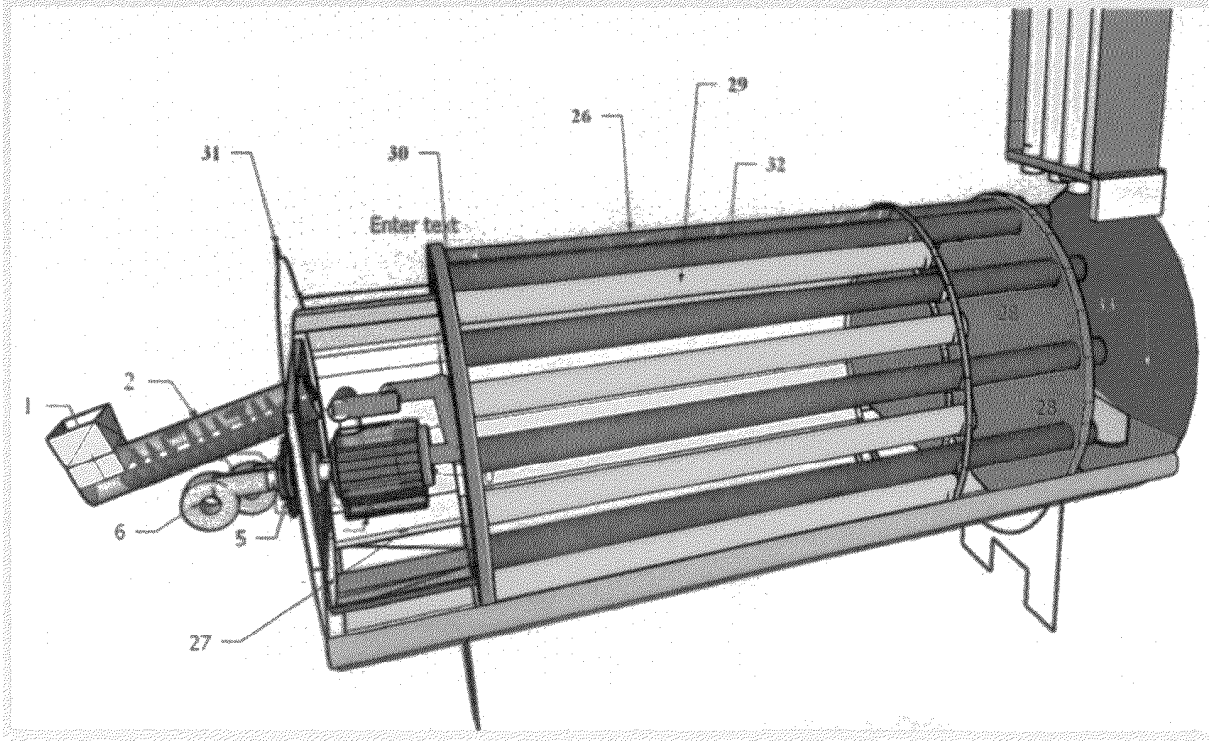


fig.11 -diaphragm working positions

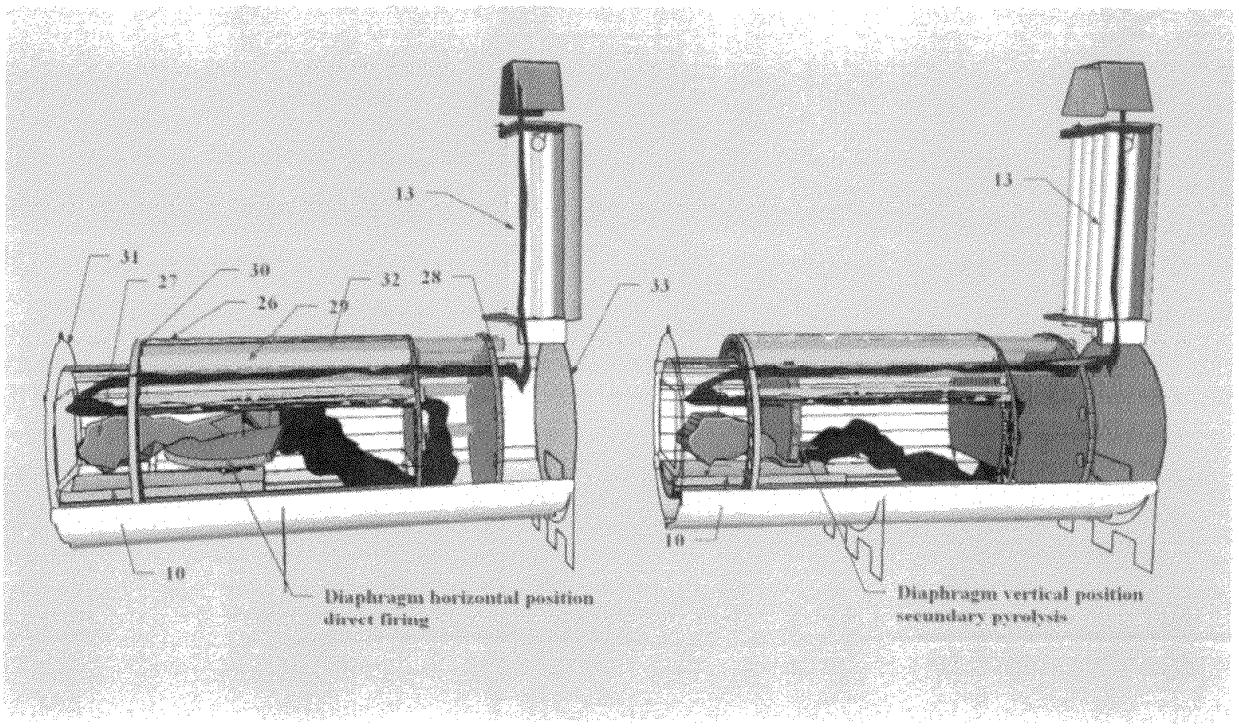


fig.12a -filtering system drawing

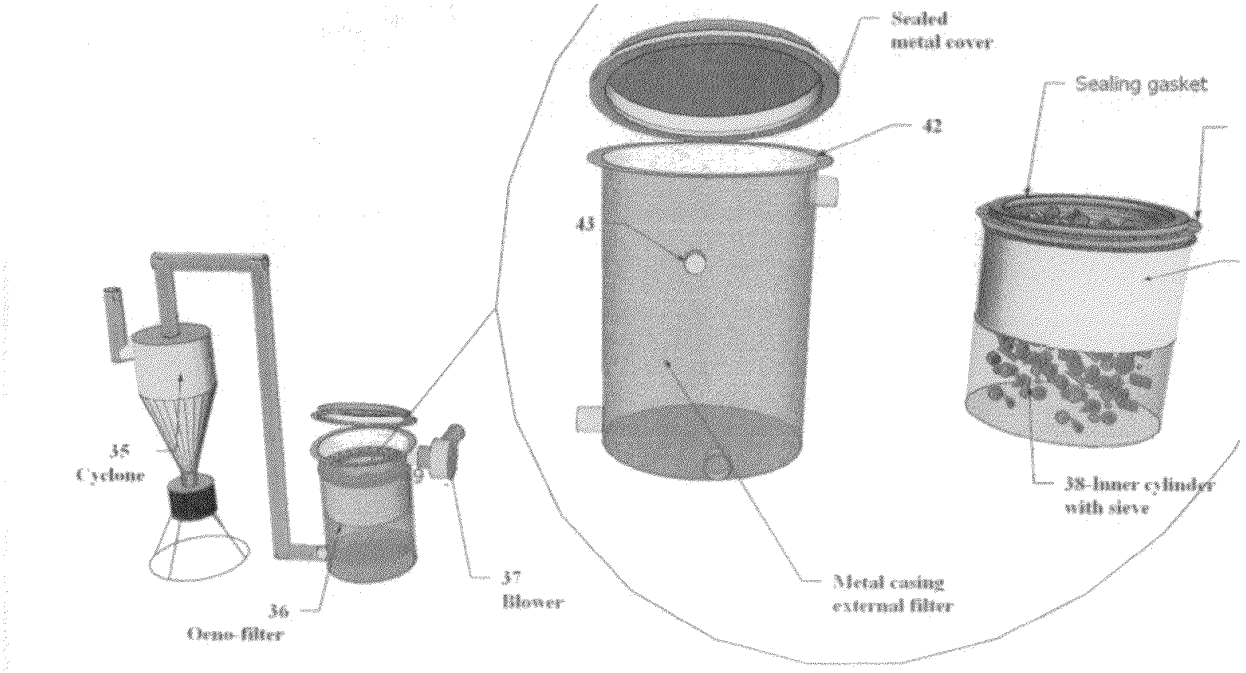


fig.12b -filtering system foto

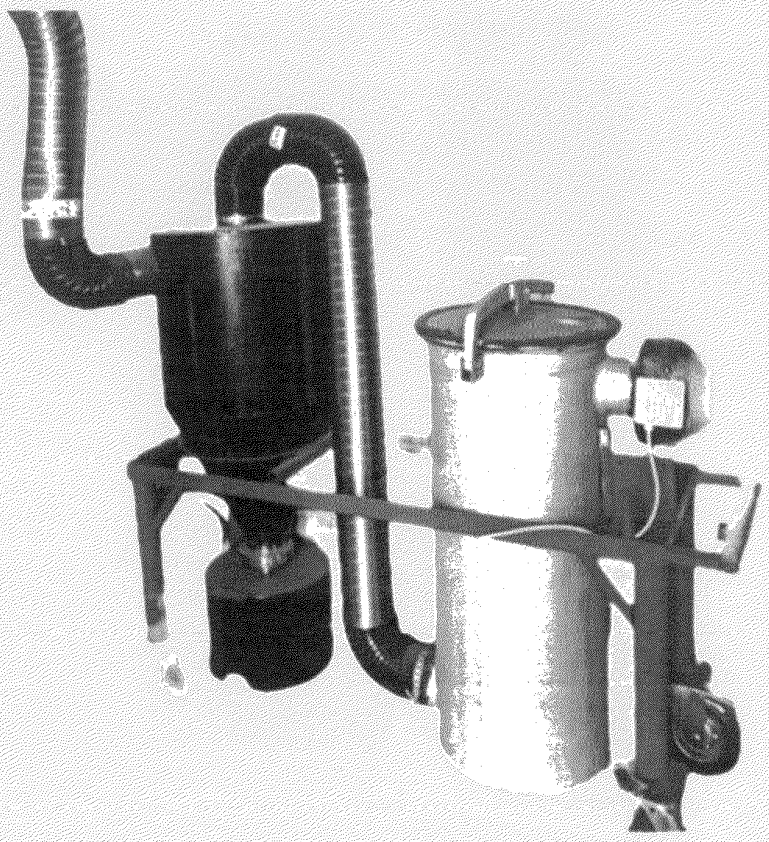
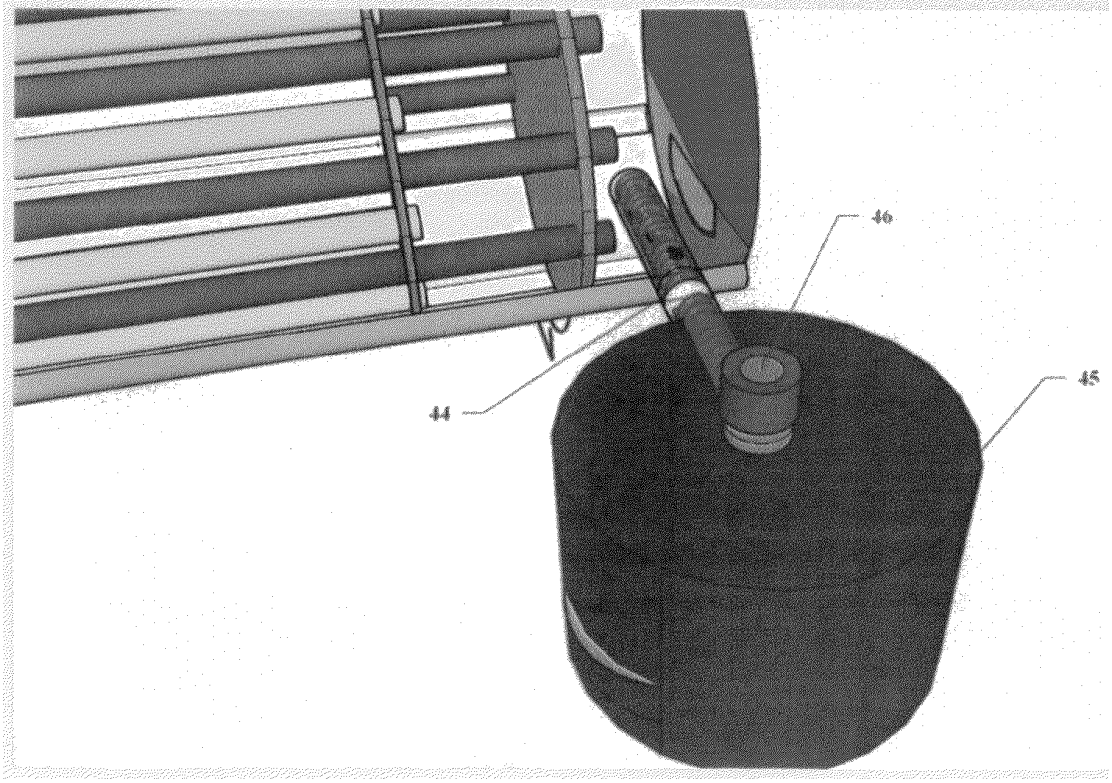


Fig.13-Ash discharger system drawing



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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
Munich	17 October 2025	Vogl, Paul

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