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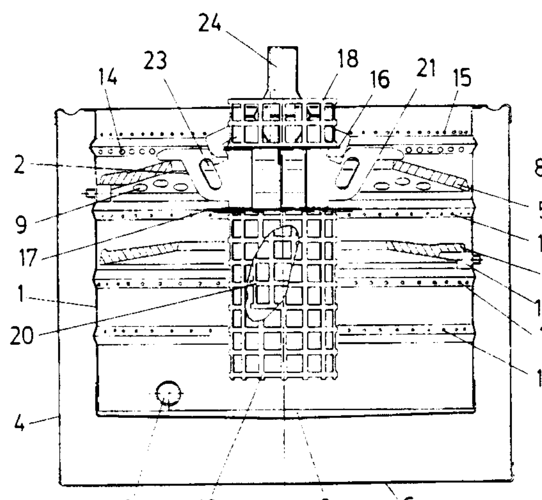
(54) Domestic exothermic reactor for the combustion of gas oil gases.

(57) **THE DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** incorporates two chambers. A cylindrical inner chamber formed by an element 1 and an outer chamber formed by such element 1 and the housing 4. The fuel arrives to the inner chamber and backs up at a concave bottom 2 where it evaporates due to the heat therefore producing an ascending flow which is interfered by two deflector rings 7 and 8. The upper ring supports a central element formed by two perforated plates 16 and 17, which in turn support the reticulated tubular elements 18, 19 and 20 ending on a head 24 and which warm the evaporating gases which initiate their combustion by means of the air supply to the outer chamber through an orifice 6 and which reaches the inner part of the reactor through rows of orifices 11, 12, 13, 14 and 15. The invention can be applied to industrial and domestic stoves.



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PURPOSE OF THE INVENTION

The object of the invention is a domestic exothermic reactor for the combustion of gas oil gases. The gas oil evaporates at room temperature by adding hot air until a perfect combustion is achieved within the reactor where the evaporation cycle, the mixture of fuel and comburent and the combustion take place on a continuous basis with the purpose of delivering the temperature outside to heat an area by radiation and thermal convection.

The reactor which is the object of the invention cannot be defined as a burner since its purpose, instead, is not to initiate a mere combustion which takes from the atmosphere the necessary air to burn leaving - along with the flame - unburnt gases which become environmentally dangerous smokes and noxious for living creatures due to their poisonous nature.

In accordance with the invention, a tank stores at room temperature the gas oil which is spilled under control by means of a feeder. The temperature increases by hundred per cent when the gas oil reaches the feeder and such temperature increases further in the reactor thus evaporating the gas oil staggeredly and burning as it evaporates so that when the threshold temperature is reached a greater gasification and simultaneous combustion occurs while the gases ascend through the reactor and, once they are completely burnt, disappear providing the desired heat.

BACKGROUND OF THE INVENTION

The inventor is not in possession of the technical literature related to the previous state-of-the-art but he is aware of the prior technology and the problems it poses as a consequence of an incomplete combustion, since it is based on simple burners which do even need an asbestos roving where the flame is directly set. The roving is fed by capillarity and determines the kind of combustion which only produces flames with the most volatile gases wasting the energetic power of the gas oil along with the carbon and sulphur compounds to finally obtain a temperature around 200° to 300° C, i.e. well below the real capacities of gas oil.

An evidence of the rudimentary technique applied until now is the fact that where a gas oil stove used there is no need to verify whether it is lighted or not. It suffices to smell because an incomplete combustion transfers polluting compounds to the detriment of the atmosphere.

Obviously, there are different burners available in the market due to the fact that there also is an offer of feeders based on different principles although the most widely used are those incorporating a vertical slot, i.e. those manufactured by the Swiss corporation GLUTZ AG, SOLOTHURN. The needle feeders are more accurate but they are extremely sensitive to the gas oil impurities and they become clogged easily interrupting the supply.

The burners available in the market are aimed to achieve a fast combustion and do not offer a controlled evaporation with a progressive combustion from an initial temperature until they reach 850° C at the reactor outlet - as is the case claimed in this invention. Therefore, it is not possible to make reference to any commercially available devices because they do not exist according to the principle of the invention.

DESCRIPTION OF THE INVENTION

The first step of the invention are to concentric chambers. The inner chamber is cylindrical and is the place where the reaction and the combustion take place. The second chamber which is ring-shaped is in charge of the distribution of the comburent, of its thermal conditioning so that when mixed with hotter gases these latter ones do not get cool and of its dosing so that the fuel-comburent ration is always kept within an optimal range.

The ring-shaped chamber is sealed on its upper part while the bottom one - which presents a cylindrical tranche - incorporates an inlet orifice for the atmosphere air which is subject to acceleration when the exothermic reaction produces a depressurization in the hot air outlet upraise which can exceed 0.2 millibar when the reactor is operating at full load.

The inner chamber wall incorporates protruding, peripheral and dihedral recesses which enable to obtain certain turbulences which regulate the flow of atmosphere air through calibrated orifices which, in general terms, are always located at one of the two sides of the protruding recess.

The inner chamber of the reactor presents a slightly concave bottom where the gas oil is distributed and backed up at a constant flow rate thus maintaining an adequate level to ensure that the volume of gases obtained from the exothermic reaction is achieved.

The six to seven ratio between height and diameter determines an optimal ratio in the reactor to govern its inner chamber. The necessary distance between the walls of the ring-shaped chamber is one tenth of the diameter of the inner chamber of the reactor and the distance between the bottom of the inner chamber and the outer chamber is double than the side distance between both walls irrespective of the concavity of the chamber bottom.

These volumetric ratios are of a paramount importance since they determine the quantity of comburent supplied and even if they vary they cannot exceed such narrow margins - as will be explained later on - the reactor is based on an accurate balance between different variables.

The gases produced by the gas oil evaporation cannot freely ascend but should be accumulated and re-heated so that those that require a higher ignition temperature equal those with an optimal combustion temperature and are able to burn when used with the adequate comburent.

As already mentioned above, there are air transfer orifices. Therefore, a pre-heated air inlet has been foreseen at the lowest evaporation level and at the upper side of the inclined side of the lower peripheral dihedrical recess which is located approximately at a distance of half the radius of the inner chamber from the bottom. The pre-heated air inlet is able to burn the first gases increasing the gas oil temperature. The gas oil subsequent evaporation is partially retained by a first deflector of cast iron which accumulates heat and, in fact, can even reach a cherry-hot temperature (400° - 600° C).

However, this partial retention allows that the flow of the reaction reaches a second deflector which, in turn, reaches a higher temperature and which incorporates orifices to transfer heat to the flow to be mixed with air in a final combustion at more than 500° C.

The distance between the first and the second deflector is almost equal to that of the second one to the orifice of the inner chamber of the reactor and both deflectors are supported by inner heads. The deflectors are formed by trunco-conical cast rings. They are not identical. The lower one has an inner diameter slightly smaller than the higher one - one tenth of its diameter - and a less acute conicity with a mass slightly bigger than the upper one which incorporates concentric orifices of different sizes and radial orbits, the radial difference of which is doubled between the outer and intermediate mass, and the intermediate mass and the inner one so that the total number of orifices decreases the volume of the upper deflector one tenth when compared with the lower one enabling the transfer of ascendent gases which is more than double the transfer allowed by the lower one which, since not affected by the orifices, only incorporates the central transfer or opening.

Under the lower ring, at the peripheral recess located under it and at the lower inclined side of such recess there is a plurality of partially-hot air inlet orifices. Such air is mixed with the turbulence created by the gas under the ring, combusting and increasing the temperature as explained above. The section of the first air inlet, i.e. the lower row, is smaller than that located immediately underneath the lower deflector ring. The lower row is fifty times smaller than the suction orifice located at the bottom of the outer wall. However, immediately underneath the upper ring there is an air inlet also located at the lower dihedron of the peripheral recess which is equal to the first air inlet as far as the section is concerned.

This way, an ascendent upraise is achieved in the central part of the reactor. This upraise causes an acceleration of gases that takes temperature, mixes with the air outside the reactor and, if uncontrolled, leaves the reaction uncompleted allowing the exhaustion of unburnt gases. This ascendent and fast flow is stopped thanks to the invention by two disk-shaped elements, one larger than the other. The bigger one is located between the first and the second ring while the other one is located between the second ring and the reactor orifice.

The diameter of the smaller disk-shaped element is two thirds of the diameter of the larger one and both are perforated so that at the lower, larger disk orifices affect to one fifth of its section as it happens in the upper disk.

The ratio between the disk diameter is of paramount significance as well as the transfer of gases left. Both disks reach a cherry-hot temperature close to 800° C and maintain their position with the help of three separators formed by brackets where a lateral arm acts as support for the assembly on the upper ring where they are centred, since the edge of the brackets is inclined towards the orifice of the reactor.

The disk-shaped elements represent a significant retention for the ascendent column of accelerated gases formed at the central upraise of the reactor but they do not sufficiently heat the flow although they create a turbulence which favours the close and homogeneous mixture with the comburent which penetrates through the orifices under the rings of the reactor at an average temperature between 350° and 500° C.

It has proven to be necessary to further heat the gases in this area. For this purpose, a central tubular reticulated element, concentric to the upraise and, therefore, to the reactor, is used. Such element has a diameter which is slightly smaller than the upper disk-shaped element and is located under the lower disk-shaped element so that it is half way between the first peripheral protrusion and the bottom. The diameter is critical as well as the total mass within the lateral surface offered by it. Otherwise it would drawn the ascendent flow and interrupt the reaction as it requires an air head.

The side of the mesh is one centimetre long, its height is approximately equal to the diameter of the air inlet orifice of the ring-shaped chamber and the diameter half the inner diameter of the lower cast deflector while the lower tubular element has seven reticulated rows.

In order to achieve a perfect homogenization of the fuel-comburent mixture in this area, as well as a temperature rise to generate a gasification to prepare the combustion, a new tubular element concentric to the previous one is installed. This second tubular element also has a mesh of one centimetre long, while its height is half the height of the outer element and its diameter is slightly larger than half of the diameter of such outer element.

Over the upper deflector ring, and at the same level than the upper disk-shaped element, air is injected at a temperature over 500 °C and the disk-shaped element reaches a temperature above the cherry-hot temperature. However, there is a still an ascendent suction of flame in the central part. This suction is guided through a tubular element of the same diameter that the lower external one, is of the same type, has the same number of meshes but a height which only accepts two mesh rows.

A central plate core emerges concentrically to the upper tubular element above the orifice of the reactor close to the edge of which a row of orifices carries out the last hot air injection thus obtaining a complete combustion. The diameter of these orifices is equal to the diameter of the orifices located at the lower level but the number of such orifices is more than double; the air inlet is accelerated and at the highest temperature that can be reached inside the ring chamber; this air injection burns the last residues of gas and, subsequently a flame involution phenomenon occurs at the edges of the reactor where blue-coloured flames can be appreciated at each orifice pointing towards the central part of central flow conditioner the metallic hot mass of which and the distribution of transfers produces an intermediate suction that bends the flames downwards and towards the central part without producing flames in such central part.

According to the feeder that supplies the gas oil, the reactor works at a rate between 5 and 19 cm^3 flow per hour and the reaction temperature at a maximum flow rate exceeds 850° C as evidences the colour of the metallic parts which need to be heated to achieve a complete combustion.

As usually, the reactor is placed within the elements of the walls of the stove of different shapes and subject to the fashion trends. Then, a radiation effect is achieved which gives rise to a convection through the displacements of ascendent hot air masses leaving room to other which are cooler.

In fact, the stove incorporates an air outlet similar to an upraise through which the hot air surrounding the reactor and which has formed part of the reaction is freed up hot.

When the combustion is incomplete it suffices to place a CO_2 analyzer at the air outlet to find out the combustion conditions. From an initial gas oil with a density of 850, at an initial temperature of 20° C and at full load, a CO_2 level of 0,5% of outlet flow has been obtained, while air temperature at the upraise at 30 cm of the stove outlet is of 250° C. Such outlet was still irradiating to the room where the stove was located and, therefore, it supplied heat to the environment, i.e. at least 600° C out of the 850° C which can be obtained were still available. One meter around the stove 100° C more were irradiated and approximately 70° C or 80° C are lost supplying an equivalent final outlet temperature.

In other words, out of the initial 850° C, approximately 150° C are wasted which represents a loss of around an 18%. Therefore, if 1 l. of gas oil supplies 10.000 K/hour at least 8.000 are obtained. There are no evidences of dry residues and the different fluid samples taken have not stained the filter after carrying out more than twenty tests with the same filter.

The air inlet flow/upraise outlet ratio has reached a minimum value of 0,1 millibar and a maximum of 0,2 millibar and neither alterations in the dry residues nor increases of CO_2 exceeding 0,5% of the volume were found.

There were no residues of acid compounds and the metallic material, the stainless steel plate of which the reactor is made has not been affected and neither corrosion was found in the cast iron or steel rings. The presence of non-desirable elements has not been detected through the usual means and it is necessary to have recourse to a precision analysis to find out by means of spectography any other data which are not relevant when assessing the performance of the reactor.

DESCRIPTION OF DRAWINGS

A drawing sheet is attached to this invention report where a section of the reactor's front view has been represented. This section does not affect to the central part which accumulates the temperature and which actuates as flow heater and feeder. Such flow ascends through the central part of the reactor. The central element shows a partial view of the part of the lower tubular element which enables to see the inner tubular element through it.

PREFERRED EXECUTION OF THE INVENTION

In accordance with the above and based on the terms of reference of the attached drawing, there is a cylindrical inner chamber determined by a metallic, stainless element 1 the bottom of which 2 presents a concavity to backup the fuel coming through the orifice 3 from a feeder connected to a tank. The tank and the feeder are not shown because they are not relevant and for the sake of simplicity of the drawings.

The cylindrical inner chamber determined by the element 1 is surrounded by an outer housing 4 the orifice of which bends and is connected to the orifice of the element 1 thus forming two chambers: an inner one where the reaction and combustion takes places, and an outer one 5 through which the atmosphere air penetrates through the orifice 6.

The inner chamber incorporates two deflector elements 7 and 8 which are trunco-conical, ring-shaped and made of cast iron or steel.

The lower deflector ring 7 has an inner or orifice diameter smaller than the upper deflector 8. Unlikely, this presents an arrangement of orifices 9 in three different orbits and a decreasing number per orbit.

The supporting heads 10 secure the rings in an operating position. Each ring has a different conicity. Such conicity is more acute on the upper ring 8 than on the other one. The ring 7 is located half way from the bottom of the inner chamber.

The drawing also shows that the element 1 presents 4 protruding recesses (10) the walls of which are dihedral and equidistant every two leaving a somewhat broader central fringe. The distance between the upper recess 10 and the orifice is half the distance between the lower orifice and the concave bottom 2.

A row of orifices 11 located at the upper side of the lower recess 10 connects the ring-shaped chamber or outer chamber 5 with the inner part of the reactor. The row of orifices 12 located at the immediately upper recess 10 performs the same function. These orifices 12 have a larger diameter and the same number and provide an additional one fourth of section or air transfer to the reactor, at the same flow rate.

Underneath the upper deflector ring 8, a row of orifices 13 appear at the edge or lower side of the dihedron which forms the protrusion 10. The number of orifices and the section are the same to the row of orifices 11. On the contrary, row 13 located over the deflector ring 8 and at the lower side of the protrusion 10 presents orifices with a larger diameter and number which represent five times the total section of all orifices of the row 11.

Above the protrusion formed by the upper recess 10, a row of orifices 15 supplies a final air injection. The section is the same as the section of the orifices 11 but the number is larger so that the total section is more than double.

The central element where the axis is located and where the previously mentioned ascendent turbulence comprises three self-centring supports 15, a perforated upper disk-shaped plate 16, a perforated lower disk-shaped plate 17, a reticulated upper tubular element 18, a reticulated tubular lower element 19 and a reticulated inner lower element 20.

It should be noted that the self-centring supports 15 that secure the disk-shaped plates 16 y 17 present a securing arm 21 on the upper ring 8 and the outer edge 22 is slightly inclined outwards. Opening 23 facilitates the gas flow.

A head which is the central core 24 emerges above the orifice of the reactor, appearing at the centre of the upper central tubular element 18 and is formed by bent metallic bands. It should also be noted that according to the drawing such head is formed by four parts, similar every two, which are placed in an orthogonal position. The bands are bent at their central part forming two branches and then are also bent outwards to form perpendicular crossed wings which are connected to each other. It forms an upper almost tubular, quadrangular and blind tranche which is essential to prevent the leakage of unburnt gases.

The lower side of the bands has an inverted trapezoidal section and incorporate wings to connect them with the upper section.

In accordance with the above, the orifice 3 through the relevant connection receives the feeder outlet which can be of a slot or a needle type. A feeding rate of 18 cm^3 has proven to be satisfactory and offers a highly efficient thermal performance, above 80% with an approximate consumption of around 1 l. per hour.

When the stove where the reactor is going to be installed is a domestic one, less than 10 cm^3 will be enough. However, if it is intended to warm a room of 20 to 40 m^2, a consumption of 7 to 8 cm^3/m. after an initial temperature rising period will be enough provided that the thermal insulation of the room is appropriate.

Therefore, it can be said that the reactor offers large savings since when operating under normal conditions 1 l. of gas oil lasts 2 hours and offers a total of 16.000 Kcal., i.e. 8.000 Kcal/h. which is the equivalent to 2.000 cal/sec.

This performance is based on a gas oil of 850 gr/l. with a heating capacity of 10.000 cal/l. which the reactor once in operation transforms into 800 at least, excluding losses.

Once the gas oil is backed up at the bottom 2 of the element 1 and the combustion has been initiated through ancillary means and the thermal stabilization has been achieved, the gases ascend and warm. A first air injection though the row of orifices 11 produces a first fuel-comburent mixture and burns the more flammable gases at between 200° and 350° C. The upraising of the remaining gases accelerates and they come into contact with the tubular elements 19 and 20 while they gather under the deflector formed by the ring 7. This accumulation, the air injection 12 and the impossibility to form an upraising turbulence contributes to the transfer of heat from the ring 17 and the lower part of the central element to the gases.

The air injection through the row of orifices 13 accelerates the turbulence located at the ring 18 and the disk-shaped elements 16 and 17 which are of more than a cherry-hot temperature, i.e. close to red-hot temperature of 800° - 900° C.

The transfer through the orifices 9 facilitates the flow but also warms the turbulence. The same happens to the central flows ascending through the reticulated elements 19 and 20 flowing through the orifices of the disk-shaped elements to finally encounter the inner tubular element 18 and the core 24. An involutive counterflow is formed which goes towards a central vortex and the flames that generate due to the hot air coming through the rows of orifices 14 and 15 are bent inwards and depict an imaginary doroid shape which can be physically seen.

In all tests, an exhaust pipe of 120 mm diameter has been used which is one fifth larger than the diameter of the inlet orifice of atmosphere air which has resulted in a suction of 0,2 millibar at full consumption and of 0,1 millibar at minimum consumption, i.e. between 5 and 8 cm^3/m of gas oil. This ratio is of paramount significance to ensure the air head and the fuel-comburent balance since any alteration would vary the operation of the reactor.

Claims

1. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** which incorporates two chambers; one reaction inner chamber and one outer chamber which supplies atmosphere air to the inner chamber receiving the fuel from the feeder. It is characterized because the inner chamber incorporates two deflector elements formed by two trunco-conical rings of which the upper one supports and secures a central element which interferes the ascending flow and distributes it radially towards the wall of the reactor which presents four protruding peripheral recesses of a dihedral shape and incorporate orifices communicating the outer and the inner chamber. Orifices have also been foreseen outside the protruding recesses located between the recess closer to the orifice of the inner chamber and the orifice of the chamber.

2. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with claim one characterized because the inner chamber has a six to seven ratio between the height and the diameter and between the inner chamber wall and the outer chamber wall. From a lateral point of view, there is a distance of one tenth of the diameter of the inner chamber while the distance between the bottom of both chambers is twice the distance between the walls.

3. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with claim one characterized because the deflector elements are formed by cast trunco-conical rings and one of them, the one closer to the orifice, incorporates orifices that perforate such ring in radial orbits with a difference between the outer one and the intermediate one double to the difference between the intermediate one and the inner one so that the number of orifices reduces the mass of the deflector or upper ring by one tenth compared with the lower one leaving between the central ring opening and the orifices a gas flow which is more than double that the one allowed by the lower deflector ring.

4. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with claim one and three characterized because the lower deflector has an inner diameter smaller than the upper one and a less acute conicity and because such ring is half way between the orifice and the bottom of the inner chamber.

5. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with claim one characterized because in the inner chamber there are four peripheral dihedral and protruding recesses equidistant every two leaving a broad central fringe. The distance between the upper recess and the orifice is half the distance between the lower recess and the bottom of the inner chamber.

6. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with the previous claims characterized because the upper deflector ring is located above the middle point between the lower deflector ring and the orifice of the inner chamber. Such ring is located between the two protruding upper recesses while the lower one is above the second recess of the two lower recesses.

7. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with the previous claims characterized because the upper deflector ring is located between two rows of orifices which keep the same distance between them and placed peripherally so that both rows affect the lower side of the dihedron formed by each of the protruding recesses.

8. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with the previous claims characterized because the orifices of the upper row have a larger diameter than those located at the row below the upper ring and there are more orifices so that the

total section is five times that of the orifices located below the ring.

9. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with the previous claims characterized because above the row of orifices with a larger diameter there is a last row of orifices, outside the recess, which have the same diameter than those located underneath the under ring but there are more and the total section is double.

10. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with the previous claims characterized because each one of the lower peripheral recesses incorporates on the sides which are closer to the dihedrons, a row of orifices of which the upper one, of a larger diameter, has a section which is an additional one fourth larger than the total section of the lower orifices.

11. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with the previous claims characterized because in the upraise that form the deflector rings there is a central element formed by two perforated disk-shaped plates which are secured by means of self-centring brackets through an inclined edge and which support the assembly by means of arms located on the upper ring. Underneath the lower disk-shaped plate there are two concentric tubular elements while above the upper disk-shaped plate which has a smaller diameter, there is an upper tubular concentric element through which emerges the head.

12. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with the previous claims characterized because of the disk-shaped plates that with the larger diameter is located between the first and the second ring and coplanar to the edge of the dihedron which forms the lower protruding recess of the first upper two while the edge of the first protruding recess is slightly above the upper disk-shaped plate.

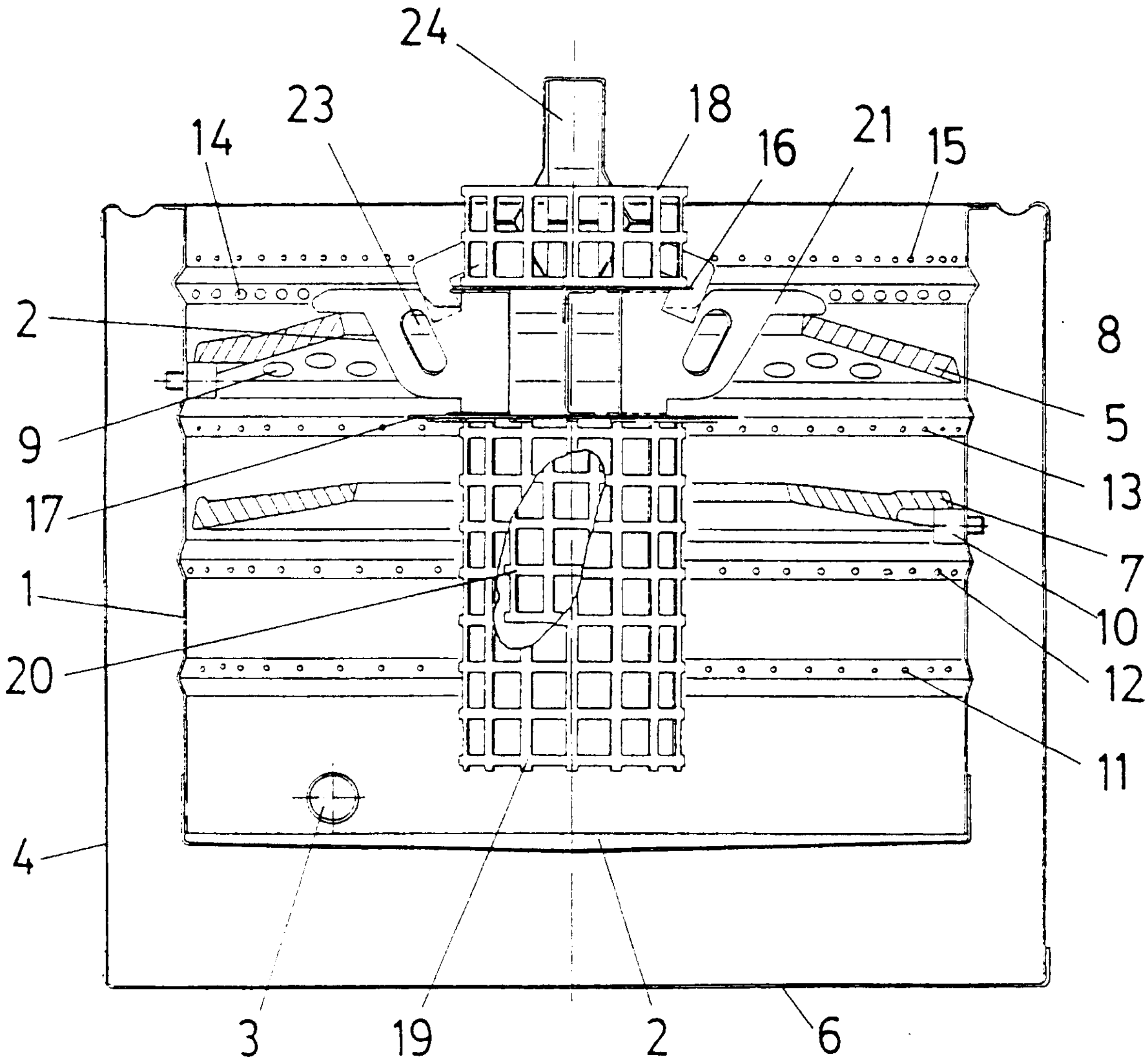
13. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with the previous claim characterized because both plates are perforated, such perforations affecting one fifth of the total section of both disk-shaped plates.

14. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with the previous claims characterized because underneath the lower disk-shaped plate there is a tubular element - the side wall of which is affected by square perforations that form a mesh - of a diameter smaller than the supporting plate and which is located at half the distance between the first protruding recess and the bottom of the inner chamber.

15. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with the previous claims characterized because the side of the mesh of the tubular elements is one sixth of the inner diameter of the lower tubular element which presents seven rows of meshes.

16. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with the previous claims characterized because the inner lower tubular element with a mesh similar to the other ones has four rows of meshes and the difference between its radius and that of the element that contains it is one fifth of the diameter of the outer tubular element.

17. **DOMESTIC EXOTHERMIC REACTOR FOR THE COMBUSTION OF GAS OIL GASES** in accordance with the previous claims characterized because the upper tubular body has two rows of meshes and from its central part emerges a head formed by bands bent forming two branches which are also bent outwards to form perpendicular crossed wings which are connected to each other. It forms an upper quadrangular and tranche blind at its end while the lower side connecting to the plate presents an inverted trapezoid section.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EUROPEAN SEARCH REPORT

Application Number
EP 94 11 4854

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	FR-A-2 104 567 (ARMATURENWERK NIEBERSCHELD) * the whole document *	1	F23C1/00 F23D5/04 F23D5/12
Y	FR-A-1 532 452 (AIRFLAM) * the whole document *	1,2	
Y	FR-A-1 486 727 (ARMATURENWERK NIEDERSCHELD) * the whole document *	1,2	
A		4-10	
A	DE-A-35 44 494 (ZIDORN) * the whole document *	3	
A	BE-A-886 055 (FRANK'SCHE EISENWERKE) * the whole document *	1	
A	FR-A-2 465 157 (BARRAUD)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
F23D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24 January 1995	Coli, E

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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