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(71) Applicant : **Esteban Yague, Jose Eugenio**
P.I. Valdonaire,
Nave 574
E-28960 Humanes de Madrid (Madrid) (ES)

(72) Inventor : **Esteban Yague, Jose Eugenio**
P.I. Valdonaire,
Nave 574
E-28960 Humanes de Madrid (Madrid) (ES)

(74) Representative : **Alonso Langle, Emilio**
C. Explanada, 8
E-28040 Madrid (ES)

(54) Thermic generator.

(57) The present invention refers to a heat and vapour generator with a structure based on a tubular horizontal unit (1) that defines a seal chamber filled with water to be heated, inside which there is a combustion chamber (5) off-centred sidewards and a series of conduits (6,7,8) arranged longitudinally along the tubular unit (1), grouped in different chambers defined in the front and back door (9,10) by partitions, presenting different arrangements depending on the form of these partitions (11) that determine the direction and sense of the run of the fumes. In the case of a closed combustion chamber and with a different arrangement of the conduits it will operate as a vapour generator.

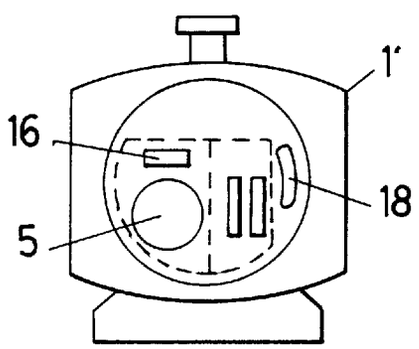

FIG. 8

EP 0 635 686 A1

OBJECT OF THE INVENTION

The present invention refers to a heat and vapour generator that can be used as heating boiler, hot water or vapour generator, with structural characteristics that provide, together with the advantages from the functional point of view, a very simple structure and a considerable prolongation of the life span, almost without any maintenance.

ANTECEDENTS OF THE INVENTION

In the field of heat generators of this kind, one of the most advanced solutions is a structure based on a tubular unit, cylindrical, horizontal, opened at the ends, where there are two doors, and with interior cross partitions that define with the two doors two chambers corresponding to the fumes circulation circuit, and a chamber between the two partitions, bigger in size, filled with water to be heated.

In the lower part of this water chamber there is a furnace, isolated from the two fumes chambers mentioned above, connected through an axial prolongation neck directly to one of the end doors where there is a burner just in front of the furnace, while at the other end it is connected to another chamber independent from the fumes chamber through an interior door, eccentric with respect to the furnace and located slightly upwards; in this sector there is a first bank of tubes that communicate this chamber with the fumes chamber at the other end of the tubular unit of the generator, at the same time that between this fumes chamber situated in the door where the burner is placed and the other external fumes chamber with the interior door there is another bank of tubes that communicates both chambers and completes the passage of the fumes that from this last external chamber go outside, the two banks of tubes immersed in the water that fills the intermediate chamber.

There are two other solutions for heat generators of this kind, less advanced, but all have in common the maze of the banks of tubes for the passage of fumes, as mentioned above.

The main problem of this kind of generators is the presence of these banks of tubes, that can be more than a hundred, and particularly in two aspects: on one hand, the high costs for the installation of such a great number of tubes, and on the other hand the effects of the corrosion produced in them that shortens considerably the life span of the generator as a consequence of the sweating produced in these tubes, to such extent that in heating boilers and other cases in which the operation of the generator is interrupted, the life span can be reduced to six or seven years, making it necessary to carry out periodical inspections to change some of these tubes.

The steam generators usually have a great number of circulation tubes arranged in different chambers defined by doors at the ends, as well as a chamber filled with vaporization water that exchanges heat with the banks of tubes in contact with it.

The maze of these banks of tubes usually create problems in the cranked ends, since the high temperatures reached in these points produce a premature erosion of the conduits. The problems of corrosion that affect a great number of tubes are also considerable, hence the necessity to carry out a regular maintenance with the resulting costs.

DESCRIPTION OF THE INVENTION

The heat generator proposed by the invention has been structured so that the problems mentioned above can be solved, offering a maximum simplicity and long life span, without any maintenance needed except for the burner of the generator.

This generator is based on the traditional horizontal tubular unit, closed at the ends, that constitutes the chamber filled with water to be heated, but with the particularity that the closing elements at both ends of the tubular unit are two plates welded to the openings; between these plates and inside the tubular unit there are a series of conduits of a considerable diameter, one of them cylindrical which constitutes the furnace and placed slightly downwards and sidewards, closed at the back end and opened at the front end, connected to the burner placed in the front or back door.

The other conduits constitute the chimneys that form the maze for the fumes, but with the particularity that this run is much bigger than the one in the conventional generators, substituting the traditional banks of tubes by a sole tube of a bigger diameter, that can become optionally a group of two, three or more tubes with the aim of increasing the surface of heat exchange.

Depending on the number of conduits grouped in different chambers, their situation inside the generator, and the steps to be taken by the fumes, there are a certain thermic conditions along the run that produce a simple heating of the water or the production of steam.

Therefore there are several possible ways of realization of the same idea, consisting in grouping the conduits in different chambers defined by a series of partitions arranged in the front and back door.

In the first way of realization, the front door is provided with a seal partition in the interior that separates the furnace and the conduit or group of conduits placed above this chamber from the other two groups of conduits placed on the sides, while in the back door there is another seal partition that separates the group of conduits that occupies the upper position in front of the furnace, in order to connect it to the corresponding evacuation chimney.

According to this structure, the fumes produced by the burner run longitudinally and axially through the furnace, collide with the wall situated at the bottom of the furnace, return until they find the front door, which is connected to the upper group of conduits, through which the fumes run again along the tubular unit as far as the back end, where the back door is connected to the side-lower conduits through which the fumes return again to the front end of the unit, passing to the group of conduits that are in contact with the evacuation chimney, through which they go outside.

In this way the fumes make a total run with four steps longitudinally along the tubular unit of the generator through the conduits of big diameter which are easier to install and without hardly any problem of obstruction for long periods of time, more than three times longer than in a traditional heat generator of this kind.

In another way of realization the combustion chamber is opened at the back end and has four groups of conduits in different chambers in the front and back sections depending on the arrangement of the interior partitions of both doors.

In this case the front door has a vertical partition between the two groups of conduits, separating a sector with the side and central conduits from another sector with the combustion chamber, a group of central conduits on one side of the chamber and another group of conduits above the chamber.

The back door has a series of partitions that separate the group formed by the chamber and the upper group of conduits from the central group of conduits, both separated at the same time from the side conduits which are connected with the evacuation chimney.

The fumes generated in the combustion chamber run this chamber until they go outside through the back end connected to the upper group of conduits contained in the same sector, running through them to the opposite end and returning to the back part through the central group of conduits near the combustion chamber. Then the fumes return to the front end through the other column of the central group, running into the evacuation chimney through the side conduits.

DESCRIPTION OF THE DRAWINGS.

In order to complete this description and to provide a better explanation of the characteristics of the invention, there is a set of drawings attached to this document, where the following is represented with an illustrative and not limitative purpose:

Figure 1: Schematic view of the plant of a heat generator according to the object of the present invention.

Figure 2: Axial view of the unit of the generator from the front end, the dotted line representing the position of the partitions of the front door in closed position.

Figure 3: Interior view of the front door.

Figure 4: Axial view of the unit of the generator from the back end, the dotted line representing the position of the partitions of the back door in closed position.

Figure 5: Interior view of the back door.

Figure 6: In another realization, elevation of the unit of the generator from the front end, the dotted line representing the position of the partitions of the front door in closed position.

Figure 7:In another realization, interior view of the front door.

Figure 8: In other realization, elevation of the back end of the generator, the dotted line representing the position of the partitions of the back door in closed position.

Figure 9: In another realization, interior view of the back door.

DESCRIPTION OF A WAY OF REALIZATION

In view of these figures it can be observed that the structure of the heat generator is based on a tubular unit (1), horizontal, that in the way of realization represented in the figures has a cylindrical shape, but that can have any other shape, such tubular unit (1) with two parallel plates (2, 2') at the ends, welded to the openings of the tubular unit (1), constituting a seal and defining a chamber to be filled with water, with access to this chamber through the corresponding circuit (3).

In the front plate (2) and on the side-lower level there is a circular window of access to the furnace or combustion chamber (5), the back plate (2') without any equivalent window, that is to say, so that the furnace (5) is closed at the back end.

In both plates, the front plate (2) and the back plate (2'), there are three groups of conduits of big section (6,7,8), each group formed by two, three or more conduits and adopting any configuration.

The whole unit has two doors (9, 10) with a dished shape, as can be observed in Figure 1, which form a seal over the plates (2, 2') that close the tubular unit, the front door (9) having a cross partition (11) that isolates hermetically the side sector where the furnace (5) and the side-upper conduits (6) are located from the other sector with the side-upper conduits (7) and the side-lower conduits (8), such door (9) provided with a hole (12) for the installation of the burner, that has to be obviously placed axially with respect to the furnace (5).

On the other hand, in the back door (10) provided with a hole (13) there is another seal partition (14), in this case with a cranked configuration, that separates the upper conduits (6) and the side-lower conduits (8)

from the side-upper conduits (7), and at the same time limits the hole or window (15) that serves as fumes outlet.

According to this structure, the fumes produced by the burner placed in the hole (12) of the front door run axially through the furnace (5), collide with the bottom of this combustion chamber and return to the zone of the door (9) defined by the seal partition that communicates the combustion chamber (5) with the conduits (6) situated above it, through which the fumes reach the back door (10) and through the chamber defined by the seal partition (14) they pass to the side-lower conduits (8) and through them to the front end of the generator, but now to the other side of the seal partition (14), that only communicates with the side-upper conduits (7), through which the fumes run longitudinally along the generator as far as the fumes outlet (15), limited by the seal partition (14) in the back door (10).

According to this structure the pressurization and therefore the efficiency of the generator increases, and from a temperature of 1.600 °C to 1.800 °C in the furnace (5) usual in this kind of generators, the conduits (6) of the second longitudinal run reach the 500 °C, in the third run the conduits (8) reach 350 °C, and finally in the fourth run the conduits (7) reach temperatures of 200 °C more or less. These temperatures prevent sweating in the conduits and therefore the problems of corrosion derived from it.

Anyway, the lack of bank tubes determines a considerable enlargement of the life span of the generator.

In another realization of the generator with other groups of conduits depending on a different configuration of the internal partitions of the front and back doors the temperatures reached are higher, thus obtaining water vapour.

In this other way of realization the vapour generator presents a combustion chamber (5) opened at the back end, and a series of groups of conduits consisting of an upper group of conduits (16), a central group (17) divided into two subgroups (17a, 17b) and a group of side conduits (18).

The front door (19) presents a vertical partition that divides it into two chambers, so that one side in the sector (19b) a window (5) is communicated with the upper group of conduits (16) and with the central conduits (17a), and on the other side in the sector (19a) the central column (17a) is communicated with the side conduits (18).

In the back part the conduits are also communicated in different sectors through the partitions of the back door (20). On one side, in the chamber (20a) the circular window (5) is grouped with the upper group of conduits (16), while on the other chamber (20b) are the central conduits (17), and in the third chamber (20c), defined between the border of the two previous chambers and the exterior circular partition, are the side conduits (18).

The gases generated by the burner placed in hole (12) of the front door (19) circulate through the combustion chamber (5) until they reach the chamber (20a), running through the upper conduits (16) to the chamber (19b) and from there into the central column (17a). The fumes reach the chamber (20b) of the back door (20), and then through the central conduits (17b) they reach the front sector (19a), running from there the last stretch through the side conduits (18) until they reach the chimney.

It is not considered necessary to make any further explanation for any expert in the matter to understand the significance and advantages of the invention.

The materials, shape, size and arrangement of the elements can be varied, provided that the essence of the invention is not altered.

The terms used in this description must be taken in a wide and not limitative sense.

Claims

1. Thermic generator with a structure based on a tubular horizontal unit that defines a seal chamber filled with water to be heated, with a furnace or combustion chamber with the corresponding burner, provided with a series of conduits for the combustion fumes connected to an evacuation chimney, characterised because the furnace or combustion chamber (5) adopts an off-centred position both sidewards and downwards inside the tubular unit (1), presenting the bottom opened or closed.

2. Thermic generator according to previous claim characterised because in the combustion chamber with the bottom closed the combustion fumes collide with the bottom and return to the front opening, with the particularity that between the two plates, front plate (2) and back plate (2') joined hermetically to the openings of the tubular unit (1), there are conduits of big diameter (6,7,8) that together with the furnace (5) determine a run for the fumes with four longitudinal stretches along the tubular unit (1) of the generator before reaching the final outlet (15).

3. Thermic generator according to previous claims characterised because one of the plates (2) that close the openings of the tubular unit (1) is provided with a window (4) for access to the furnace (5) for the burner, the other plate (2') serving as closing device for the back end of the furnace (5), while in both plates (2, 2') there are groups of conduits (6,7,8).

4. Thermic generator, according to previous claims, characterised because the doors (9, 10) that close the ends of the tubular unit (1) and provide a seal over both plates (2,2'), with a dished shape, present in the front door (9) a hole (12) for the installation of the burner and a seal partition (11) that separates the furnace (5) and the pair of conduits (6) place just above it from the other two groups of conduits (7,8), while the back door (10) is provided with another seal partition (14) that separates the conduits (6) situated just above the furnace (5) and the side-lower conduits (8) from the conduits (7) situated just above them, connecting them with the fumes outlet (15), so that the fumes that return from the bottom of the furnace (5) pass through the back door (9) to the upper conduits (6), running along the tubular unit and into the lower conduits (8), then running again to the front door (9) and finally through the last stretch they reach the definitive fumes outlet (15).

5. Thermic generator characterised because the furnace or combustion chamber has the bottom opened, so that the burned fumes run longitudinally through the conduits (16, 17, 18) inside different chambers defined by the partitions of both doors (19,20), determining a five stretch run across the tubular unit of the generator.

6. Thermic generator according to previous claim characterised because the front door (19) presents a vertical partition that divides it into two chambers, so that the opening of the combustion chamber (5), the upper conduits (16) and one of the columns (17a) of the group of central conduits are in chamber (19b), the side conduits (17) and the other column of central conduits (17b) are in chamber (19a), and the back door (20) is provided with a series of partitions that define two chambers (20a, 20b), the chamber (20a) comprising the upper conduits (16) and the combustion chamber (5), and chamber (20b) the central conduits (17), these two chambers (20a, 20b) independent from the group of side conduits (18), so that the fumes coming from the back part of the combustion chamber reach chamber (20a) and run through the upper conduits (16) into chamber (19b), then through the central conduits (17a) to the chamber (20b) or the back door (20), and then through the central conduits (17b) to the front chamber (19a), passing finally through the side conduits (18) and reaching the fumes outlet.

7. Thermic generator according to previous claims characterised because each step or longitudinal run of the gases inside the tubular unit (1) can be defined by a single conduit, a pair or more conduits, in any case a small number, and these conduits can have any section or arrangement, as well as the tubular unit.

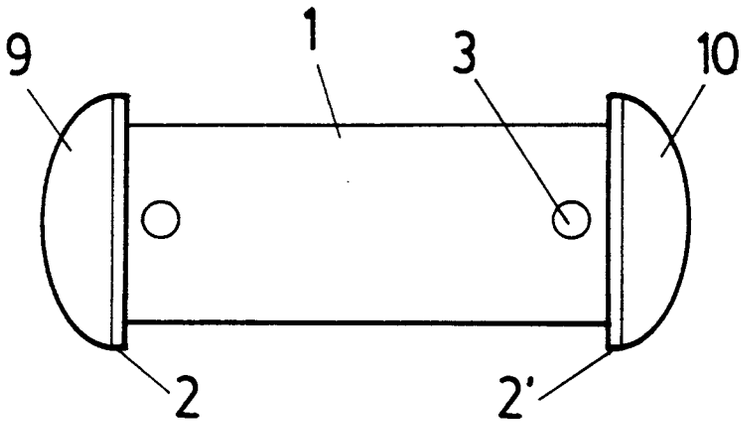

FIG. 1

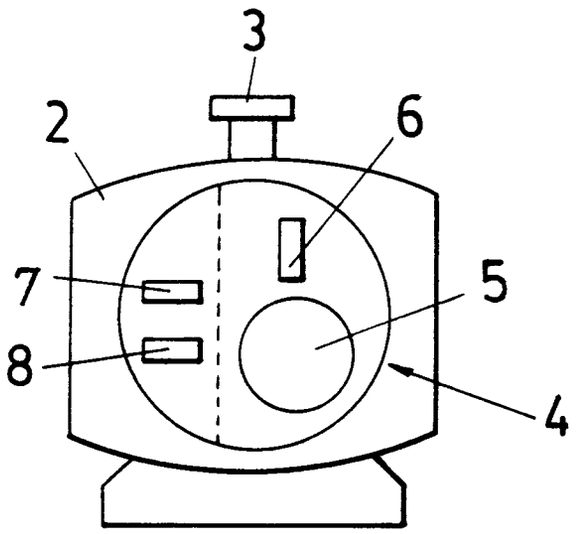

FIG. 2

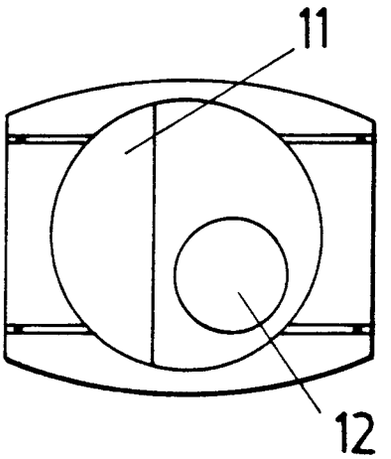

FIG. 3

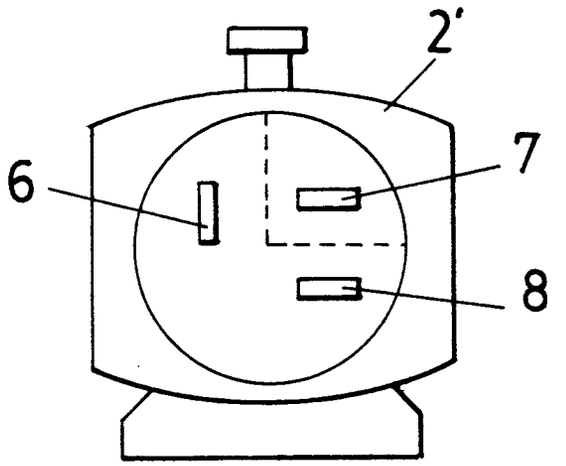

FIG. 4

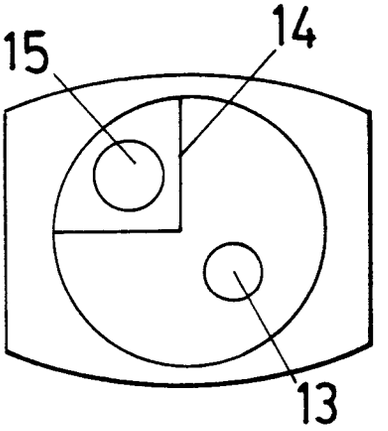

FIG. 5

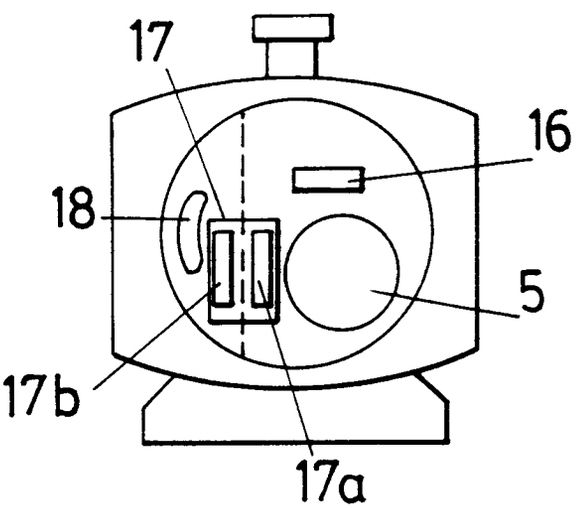

FIG. 6

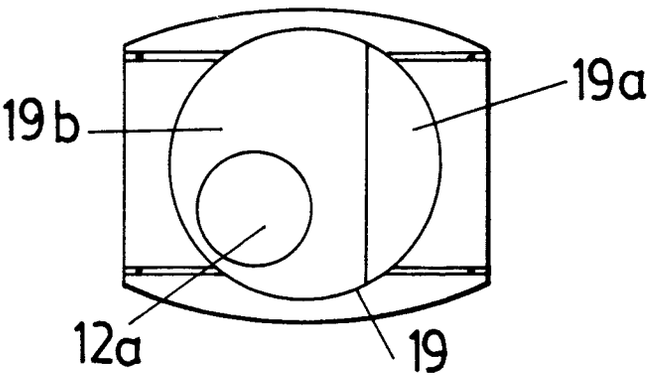

FIG. 7

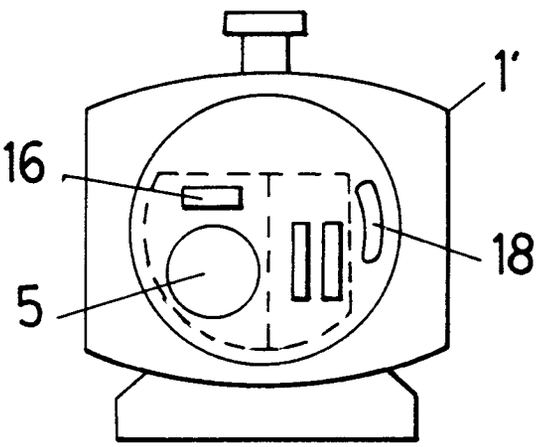

FIG. 8

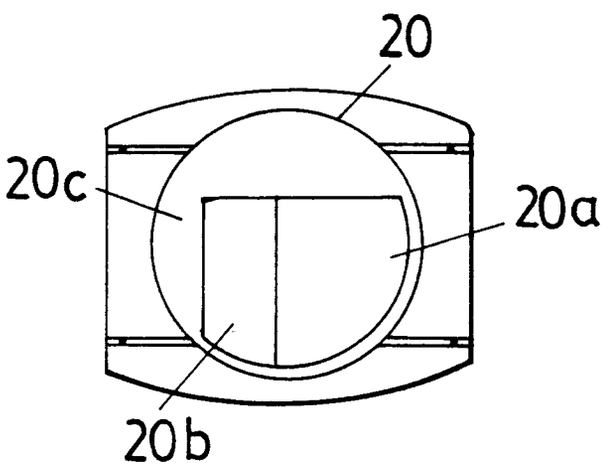

FIG.9

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EUROPEAN SEARCH REPORT

Application Number
EP 94 50 0113

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	NL-A-279 673 (THOMPSON) * figures *	1	F24H1/28
A	GB-A-811 534 (CLEAVER-BROOKS COMPANY) * page 2, line 21 - page 2, line 44; figures *	2,5	
A	GB-A-1 284 450 (JONES) * figures *	2	
A	GB-A-220 101 (NAYLOR) * figures *	2	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F24H
F22B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	7 November 1994	Van Gestel, H

CATEGORY OF CITED DOCUMENTS

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