COMMONWEALTH OF AUSTRALIA

Patents Act 1952

CONVENTION APPLICATION FOR A STANDARD PATENT

WE, GEROFINA S.A., a company organized under the laws of Great Duchy of Luxemburg, Allee Marconi 16, Luxembourg, Great Duchy of Luxemburg hereby apply for the grant of a Standard Patent for an invention entitled:

HEARTH COMPRISING A DEVICE FOR HEAT RECUPERATION

which is described in the accompanying complete specification.

This application is made under the provision of Part XVI of the Patents Act 1952 and is based on an application for a patent or similar protection made

in Belgium on 6 November 1987
No. (08701258)

My/Our address for service is:

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Dated this 28th day of October 1988
GEROFINA S.A.

Registered Patent Attorney

To: The Commissioner of Patents

COMMONWEALTH OF AUSTRALIA
Commonwealth of Australia
The Patents Act 1952

DECLARATION IN SUPPORT

In support of the [Convention] Application made by: GEROFINA S.A.
Allée Marconi 16, Luxembourg, Great Duchy of Luxemburg

for a patent for an invention entitled:
"Hearth comprising a device for heat recuperation"

I, Paul LUTGEN
of and care of the applicant company do solemnly and sincerely declare as follows:

a) [I am (W] an applicant(s) for the patent

b) I am [I am] authorised by the applicant(s) for the patent to make this declaration on its behalf.

The basic application(s) as defined by section 141 (142) of the Act was (were) made
on November 6, 1987 in Belgium

by GEROFINA S.A.

The basic application(s) referred to in this paragraph is (were) the first application(s) made in
a Convention country in respect of the invention the subject of the application.

b) Albert LAMBERT
Le Val 18,
5290 Clavier,
Belgium

is (are) the actual inventor(s) of the invention and the facts upon which
the applicant company
is (are) entitled to make the application are as follows:

The applicant is the assignee of the invention from the said actual inventor.

Declared at Luxembourg this 2nd day of November 1988

Signed

Declarant's Name Paul LUTGEN
Director

F. B. RICE & CO PATENT ATTORNEYS
This form is suitable for any type of Patent Application. No legalisation required.
Figure 1 shows a hearth, given by way of example only, which comprises side walls 1, a back wall, which can not be seen in the drawing, and a front wall 2 having an entrance 3 for inputting a fuel. Beside the fact that the hearth according to the invention comprises also important details which will be considered hereafter, it has to be considered that the main improvements tending to obtain an as total as possible recuperation of the heat comprised in the flue gas, consist in providing a set of pipes which collect the flue gas in the neighbourhood of the back wall of the hearth. In fact, the device comprises two pipes 4', 5' each having a flue gas input aperture 6, 7 which is situated at the upper and back side of the enclosure of the hearth. Both pipes comprise a first part 4', 5' extending towards the under side and show then a horizontal second part 4'', 5'' which is directed towards the front of the hearth and communicates with a third part 4''', 5''' which is vertically disposed and which issues forth at its top in a horizontal chamber 8 extending nearly over the whole upper surface of the enclosure. That chamber 8 communicates with a chimney 9.

It can thus be seen that the flue gas exhausted by the combustion inside the enclosure is forced to circulate along the longest possible track inside that enclosure.

The object of the device is to take away the largest possible part of the calories which are produced by any kind of combus-
tion and by conserving the minimal temperature for the flue gas, either or not filtered, at its entry into the chimney thus avoiding the well known condensation phenomenon.

In an embodiment which is formally claimed, the set of pipes 4, 5 can be replaced by a set of deflectors which lead the flue gas starting from an input towards an output which puts that set of deflectors into communication with the horizontal chamber 8. In that case, the hot gas circulates laterally over large surfaces, which is an object of the invention.

In figure 2 it can be seen that the vertical pipes 4', 5' are fixed at a wall 10 which is part of the device and which extends until a sole 11 which can be constituted of a refractory material or of a metal sheet.

The hearth according to the invention comprises at its under and front part an input aperture 12 through which the ambient air penetrates. That aperture 12 creates, under the sole 11, a space 13 which communicates, by means of the vertical space situated beyond the wall 10, with a second horizontal chamber 14 situated at the upper part of the device. That second horizontal chamber 14 comprises an aperture 15 through which the heated air escapes. It will be evident that the ambient air circulation in that second circuit can be realised by a fan sucking or driving back the air destined to circulate in that circuit.

1. A hearth comprising a device for recuperation of heat contained in flue gas generated by combustion of a fuel such as for example, but non-exclusively, wood, said recuperation device being disposed inside an enclosure formed i.a. of two side walls, a back wall and a front wall comprising an entrance for inputting said fuel, characterized in that said recuperation device comprises a set of pipes collecting the flue gas in the neighbourhood of the back wall and in an upper part of said enclosure in order to lead the flue gas to said front wall and to lead it thereafter to an upper part of said enclosure in order to penetrate into a horizontal chamber situated in the upper part of the enclosure from which the flue gas is evacuated by means of a socket coupling to a chimney.

2. A hearth as claimed in claim 1, characterized in that said set of pipes consists of two pipes each having an input aperture for inputting said flue gas and wherein each pipe comprises at an upper part a first pipe, said first pipe
being thereafter extended by a second pipe which cross said enclosure starting from the back wall and extending towards the front wall for extending thereafter towards the upper part by means of a third pipe and penetrating into said horizontal chamber.
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Related Art :

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Complete Specification for the invention entitled:
HEARTH COMPRISING A DEVICE FOR HEAT RECUPERATION

The following statement is a full description of this invention
including the best method of performing it known to us:-
The present invention relates to a hearth comprising a device for recuperation of heat contained in flue gas generated by combustion of a fuel such as for example, but non-exclusively, wood, said recuperation device being disposed inside an enclosure formed i.a. of two side walls, a back wall and a front wall comprising an entrance for inputting said fuel.

Several attempts have already been made for recuperating heat comprised in the flue gas generated by a hearth. So primitive concepts and highly sophisticated solutions have been elaborated which unfortunately did not provide a satisfactory solution.

The old stoves are for example known, of which the exhaust pipe crossed, nearly horizontally, the room to be heated. This allows a good dispersion, by simple convection, of the calories contained in the flue gas. It is good to mention that this use has disappeared for aesthetical and security reasons. The use of wood, as such, for fuel presented a certain danger due to the fact of a tarry creosote settling in the conduct or exhaust pipe. That tarry creasote settling is nowadays still the reason of a lot of chimney fires and results from two well known situations: on the one hand an insufficiently high input temperature of the flue gas into the chimney (the ideal temperature would be approximately 200°C), and on the other hand, a flue gas which is too much charged with creosote resulting from an insufficient combustion due to a lack of primary air necessary to the combustion. In the latest case, where those two phenomena are combined, there is a condensation in the chimney conducts and thus a settling of tarry creosote in the conducts.

An improved realization wherein an attempt is made in order to recover the calories, is provided by the so-called stoves with a recuperator which comprise, above the heating body,
closed spaces, with diminishing dimensions or not, in such a manner that the flue gas is brought to travel through the longest possible way in order to abandon the calories it comprises into the room to be heated. The drawback of that system, beside the cumbersomeness it supposes, is that the draught (or suction of the smoke) is often insufficient and that the slip-stream created into those "calories recuperation boxes" leads to the same drawbacks caused by said tarry creosote settlings which have already been mentioned hereabove.

A lot of other systems, called "turbo" or "catalytic" are also known. Another already tested out solution consists of the mounting at the back side of the heating body of a combustion stage provided for burning the combustion elements still contained in the flue gas, by bringing them into contact with oxygen heated before and to which a chemical catalytic agent has been added. The combustion realised at such a place has for consequence that the flue gas which are rid of most of their creosote, travels a way of some then centimeters (in function of the circumstances) before they flow into the chimney. That recuperation principle has to be considered as being more safely and as being the most performant at the present time.

An object of the invention is to cope with the drawbacks of which the principles have been mentioned hereabove and to provide a perfectly acceptable solution to the problems caused by the recuperation of flue gas in hearths of the considered type.

According to the invention that object is achieved in that said recuperation device comprises a set of pipes collecting the flue gas in the neighbourhood of the back wall and in an upperpart of said enclosure in order to lead the flue gas to said front wall and to lead it thereafter to an upperpart of said enclosure in order to penetrate into a horizontal chamber situated in the upperpart of the enclosure from which the flue gas is evacuated by means of a socket coupling to a chimney.

In a first embodiment, said set of pipes consists of two pipes each having an input aperture for inputting said flue gas and wherein each pipe comprises at an upperpart a first pipe,
said first pipe being thereafter extended by a second pipe which cross
said enclosure starting from the back wall and extending towards
the front wall for extending thereafter towards the upper part by
means of a third pipe and penetrating into said horizontal chamber.

In another embodiment which can be considered
as an alternatif solution, said set of pipes consists of a set of deflec-
tors which direct the flue gas between two lateral walls starting
from an input aperture of the flue gas, which aperture is disposed
at the upper part of said pipes, said deflectors issue forth at their
upper part in said horizontal chamber.

According to a remarkable characteristic of the
invention, said enclosure which is provided for receiving said device
comprises at its under part a first aperture for inputting ambient
air and, at its upper part, a second aperture, provided in a further
horizontal chamber of said hearth and through which the air heated
between the walls of the enclosure and the back wall of said device
is returned outside said hearth.

Other details and advantages of the invention will
become clear from the description which will be given hereafter
and which relates to a hearth comprising a recuperation device for
recuperating the heat contained in the flue gas.

The description is only given by way of an example
and does not limit the invention. The references relates to the accom-
pang drawings.

Figure 1 is a perspective view of a hearth according
to the invention, showing partially the recuperation device according
to the invention.

Figure 2 is an analogous view to the one given
in figure 1, but showing only the device for recuperating the heat
comprised in the flue gas generated by the combustion of a fuel.

Figure 1 shows a hearth, given by way of example
only, which comprises side walls 1, a back wall, which can not be
seen in the drawing, and a front wall 2 having an entrance 3 for
inputting a fuel. Beside the fact that the hearth according to the
invention comprises also important details which will be considered
hereafter, it has to be considered that the main improvements tending to obtain an as total as possible recuperation of the heat comprised in the flue gas, consist in providing a set of pipes which collect the flue gas in the neighbourhood of the back wall of the hearth. In fact, the device comprises two pipes $4'$, $5'$ each having a flue gas input aperture $6$, $7$ which is situated at the upper and back side of the enclosure of the hearth. Both pipes comprise a first part $4'$, $5'$ extending towards the under side and show then a horizontal second part $4''$, $5''$ which is directed towards the front of the hearth and communicates with a third part $4'''$, $5'''$ which is vertically disposed and which issues forth at its top in a horizontal chamber $8$ extending nearly over the whole upper surface of the enclosure. That chamber $8$ communicates with a chimney $9$.

It can thus be seen that the flue gas exhausted by the combustion inside the enclosure is forced to circulate along the longest possible track inside that enclosure.

The object of the device is to take away the largest possible part of the calories which are produced by any kind of combustion and by conserving the minimal temperature for the flue gas, either or not filtered, at its entry into the chimney thus avoiding the well known condensation phenomenon.

In an embodiment which is formally claimed, the set of pipes $4$, $5$ can be replaced by a set of deflectors which lead the flue gas starting from an input towards an output which puts that set of deflectors into communication with the horizontal chamber $8$. In that case, the hot gas circulates lateraly over large surfaces, which is an object of the invention.

In figure 2 it can be seen that the vertical pipes $4'$, $5'$ are fixed at a wall $10$ which is part of the device and which extends until a sole $11$ which can be constituted of a refractory material or of a metal sheet.

The hearth according to the invention comprises at its under and front part an input aperture $12$ through which the ambient air penetrates. That aperture $12$ creates, under the sole $11$, a space $13$ which communicates, by means of the vertical space...
situated beyond the wall 10, with a second horizontal chamber 14 situated at the upper part of the device. That second horizontal chamber 14 comprises an aperture 15 through which the heated air escapes. It will be evident that the ambient air circulation in that second circuit can be realised by a fan sucking or driving back the air destined to circulate in that circuit.

From the description of a hearth comprising a recuperation device according to the invention clearly results that the set of pipes 4, 5 constitutes the longest possible way that can be imposed on the flue gas of which the calories has to be recuperated. A very big advantage has to be seen in the fact that the parts which are the most exposed to a high heating are situated at the back of the hearth in such a manner that one has no longer to be afraid from an excessif heating of the front wall and of the loading input of the hearth. This is indeed a very important object of the invention.

It will also be clear that all other modifications of the profile of the pipes can be provided in order to give them a path which is as long as possible and in order to recuperate a maximum of calories thereof.

It is of course also possible to modify the path to which the ambient air is subjected when it is passing through the hearth, but it also clear that the choice of the components as described in the present application constitutes an optimal solution to the problems mentioned in the preamble.
CLAIMS
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A hearth comprising a device for recuperation of heat contained in flue gas generated by combustion of a fuel such as for example, but non-exclusively, wood, said recuperation device being disposed inside an enclosure formed i.a. of two side walls, a back wall and a front wall comprising an entrance for inputting said fuel, characterized in that said recuperation device comprises a set of pipes collecting the flue gas in the neighbourhood of the back wall and in an upper part of said enclosure in order to lead the flue gas to said front wall and to lead it thereafter to an upper part of said enclosure in order to penetrate into a horizontal chamber situated in the upper part of the enclosure from which the flue gas is evacuated by means of a socket coupling to a chimney.

2. A hearth as claimed in claim 1, characterized in that said set of pipes consists of two pipes, each having an input aperture for inputting said flue gas and wherein each pipe comprises at an upper part a first pipe, said first pipe being thereafter extended by a second pipe which cross said enclosure starting from the back wall and extending towards the front wall for extending thereafter towards the upper part by means of a third pipe and penetrating into said horizontal chamber.

3. A hearth as claimed in claim 1, characterized in that said set of pipes consists of a set of deflectors which direct the flue gas between two lateral walls starting from an input aperture of the flue gas, which input aperture is disposed at the upper part of said pipes, said deflectors issue forth at their upper part in said horizontal chamber.

4. A hearth as claimed in one of the claims 1-3, characterized in that said enclosure which is provided for receiving said device comprises at its under part a first aperture for inputting ambient air and, at its upper part, a second aperture, provided in a further horizontal chamber of said hearth and through which the air heated between the walls of the enclosure and the back wall of said device is returned outside said hearth.
5. Recuperation device to be used in a hearth as claimed in one of the claims 1-4, characterized in that it comprises a set of pipes.

Dated this 28th day of October 1988

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