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(74) Agent: PIPAN, Marjan; Kotnikova 5, 1000 Ljubljana (SI).

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(71) Applicant (for all designated States except US):
EVROVARTRADE D.O.O. [SI/SI]; Tirna 23, 1282 Sava Pri Litiji (SI).

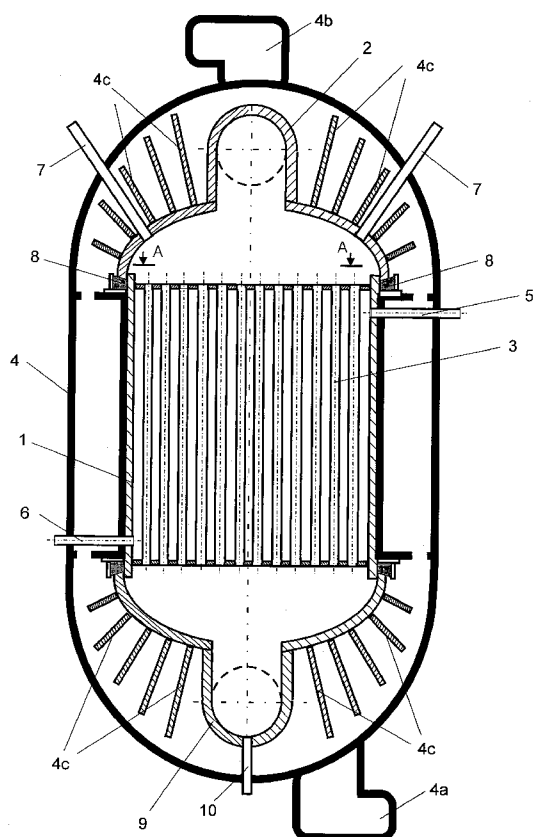
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(72) Inventor; and

(75) Inventor/Applicant (for US only): MOLKA, Zdravko [SI/SI]; Tirna 23, 1282 Sava Pri Litiji (SI).

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(54) Title: COMBINED CONDENSING HEAT EXCHANGER



(57) Abstract: The innovation object is combined condensing heat exchanger that simultaneously serves for pre-heating entering air with combustion plants as also for transferring the temperature of flue-gases to heating medium that enables lowering the temperature of flue-gases at the exit of combustion plant into the chimney. Combined condensing heat exchanger after the invention solves the set technical problem with installation of condensing tube exchanger (3) in the shape of more tubes, installed in parallel, which have in cross-section round or ellipse shape into the flue tube, where in the assembly of condensing heat exchanger after the invention, high-pressure cleaning is enabled with installation of high-pressure cleaning nozzles (7), the exterior housing (4) and fins (4c) on covers (2, 9) enable successful pre-heating of entering air on its way to the fireplace.

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COMBINED CONDENSING HEAT EXCHANGER

The innovation object is combined condensing heat exchanger that
10 simultaneously serves for pre-heating entering air in combustion plants as
also for transferring the temperature of flue-gases to heating medium that
enables lowering the temperature of flue-gases at the exit of combustion
plant into the chimney. Innovation belongs to the class F28D 3/00 of
international patent classification.

15 The technical problem, successfully solved by submitted combined
condensing heat exchanger is a request to additionally improve the
recovery of conversion heat energy of exit flue-gases on transition from
the furnace to the chimney with removal of heat energy or lowering of
temperature of flue-gases with the use of heat exchanger. Besides that,
20 the device should be able to be easily compounded to existing or new
systems for heating the mediums and to combine it also with heat
exchanger and enable easy cleaning of the latter.

The set technical problem that appears with existing systems for
heating the water with different fuels that mainly have comprehensive
25 system of specialized fireplaces and heat transfer to the interior coat in the

fireplace boiler or to the interior system of heat exchanger, is relatively high temperature of flue-gases that appear at the exit of the furnace and at the entry into the chimney. The temperature of flue-gases at the exit from the fireplace or furnace can exceed the temperature of 180°C. It is
5 economical to cool the flue gases of such high temperature, or to lower the exit temperature of flue gases to under 0°C or less. The exit temperature of flue gases can be lowered with heat exchanger, that is with additional pre-heating of heated medium; the rest can be used for additional pre-heating of air, which is needed for burning, supplied into the
10 fireplace.

In the sense of known solutions that cool the flue gases with the transfer of the heat to other medium, e.g. water, the flue tube can be implemented as double-coated tube with water in the centre. Such a solution is e.g. described in the document DE 203 07 054 U. Such a
15 solution does not enable larger recovery; besides, sufficiently long implementation is needed for successful transfer of heat or for successful cooling of temperatures of flue gases. Such an implementation cannot be always spatially successfully adjusted.

The solution as described in Swiss application CH 638 884 exploits flow
20 of hot flue gases over two round flat heat transferors for transfer. Also this implementation does not have a good recovery due to relatively small surfaces for heat usage; besides that the interim spaces between the transferors are small, which consequentially means, that soot can quickly

accumulate there, which lowers the flow of flue gases. Cleaning of such heat transferor is problematic.

Patent document US 2004206485 describes heat exchanger where the exit flue tube is coated with a tube with water, which is as preliminary
5 heated water connected to the exit of hot consumed water from the boiler in the furnace. The solution does not bring good result in the sense of recovery with temperature of flue gases removal, as the coated tube also cools. The temperature of exit flue gases is actually lowered, but the removed heat is not fully exploited and we use it for heating the space
10 around the furnace, which is, in most cases, not wanted.

According to the described implementations a construction solution that would satisfactory solve set technical problem after the efficient conversion of exit flue gases' heat energy with best possible recovery with their further usage, or, that the combination of additional heating of water
15 and air would be successfully used with the purpose of lowering flue gases' temperature, cannot be found.

Combined condensing heat exchanger after the invention solves the set technical problem with installation of condensing tube exchanger in the shape of more tubes, installed in parallel, which have in cross-section
20 round or ellipse shape into the flue tube, where in the assembly of condensing heat exchanger after the invention, high-pressure cleaning is enabled with installation of high-pressure cleaning nozzles, the exterior

housing and the coat around the tube exchanger, implemented out of fins, enables successful pre-heating of entering air on its way to the fireplace.

The invention will be explained in detailed based on implementation case and pertaining pictures, that show:

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Fig. 1 combined condensing heat exchanger after the invention in vertical cross-section;

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Fig. 2 transverse view on combined condensing heat exchanger after the invention in direction A-A with implementation for hot water boiler for burning liquid derivates or gas;

Fig. 3 transverse view on combined condensing heat exchanger after the invention in direction A-A with implementation for hot water boiler for burning biomass.

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Combined condensing heat exchanger after the invention has 1 waterproof installed covers 2 and 9 to the interior housing with suitable tube connections for inflow and outflow of flue gases. The covers 2, 9 are mounted to the housing 1 and suitable sealed with sealing material 8. In housing 1 there is condensing tube exchanger 3 installed, housing 1 with covers 2, 9 is coated with exterior housing 4, in which there are entry connection 4a for inflow of cold air and outflow connection 4b for outflow of heated air towards the fireplace are implemented; fins 4c are installed on covers 2, 9. In cover 2 of inflow part of condensing heat exchanger

after the invention, there are high-pressure cleaning nozzles 7 installed, and in the cover 9 of outflow part of condensing heat exchanger after the invention, that simultaneously represents the trap of condensate, there is outlet hole 10 for outflow of the water for washing the tube of condensing
5 tube exchanger 3.

Condensing tube exchanger 3 has tubes of round or ellipse shape mounted between two carrying plates. The shape of the tube of condensing tube exchanger 3 depends on the fuel used with combustion plant. For combustion of fluid derivatives (fuel oil) or gas, the tubes have
10 round cross-section whether with furnaces to biomass and similar fuels, the tubes can be of combined shapes, as shown in picture 3.

Inflow of fluid medium into the condensing tube exchanger 3 is implemented with the help of tube cowl 6 and the outflow of it through the tube cowl 5.

15 Through suitable flue tube, hot flue gases are flowing into the coat 2. Flue gases flow through inside surface of the tube of condensing tube exchanger 3 and outflow chilled into the cover 9 and through the outflow flue gas further into the chimney. Prompt cleaning of the tube of condensing tube exchanger 3 is enabled with the help of high-pressure
20 cleaning nozzles 7, installed in the wall of coat 2. Cleaning water and eventual condensate is flowed out from the area of coat 8 with the help of drain hole 10.

Inflow of fresh air into the fireplace is implemented through the combined condensing heat exchanger in a way that the entry of fresh air into the outer housing 4 is on the lower side through the entry connection 4a. Air then flows throughout the housing 1 and condensing tube exchanger 3 and passing fins 4c that are installed on the outer part of the covers 2, 9. Heated air is then leaded through exit connection 4b till the fireplace of the furnace.

Combined condensing heat exchanger after the invention successfully solves set technical problem. Large surface of the tube in condensing tube exchanger 3 and additional air heating in outer housing 4 enables efficient cooling of flue gases. Recovery rate depends also on the definition of the lowest temperature of the heat medium that is heated by flue gases and the purpose of its usage. For additional heating of existing device for obtaining heated sanitary water and heating of entry air till the fireplace in the furnace itself, we can lower the temperature up to 20°C, which improves the recovery of combined condensing heat exchanger after the invention itself.

PATENT CLAIMS

1. Combined condensing heat exchanger,

characterized in that,

5 having covers (2, 9) mounted on housing (1), in which there is
condensing tube exchanger (3) installed in a waterproof way with
suitable sealing material (8); the covers are mounted with tube
connectors for inflow and outflow of flue gases and over the housing (1)
and covers (2, 9) there is outer housing (4) implemented with entry
10 connection (4a) and exit connection (4b) where the fins (4c) are
implemented on covers (2, 9).

2. Combined condensing heat exchanger, according to claim 1,

characterized in that,

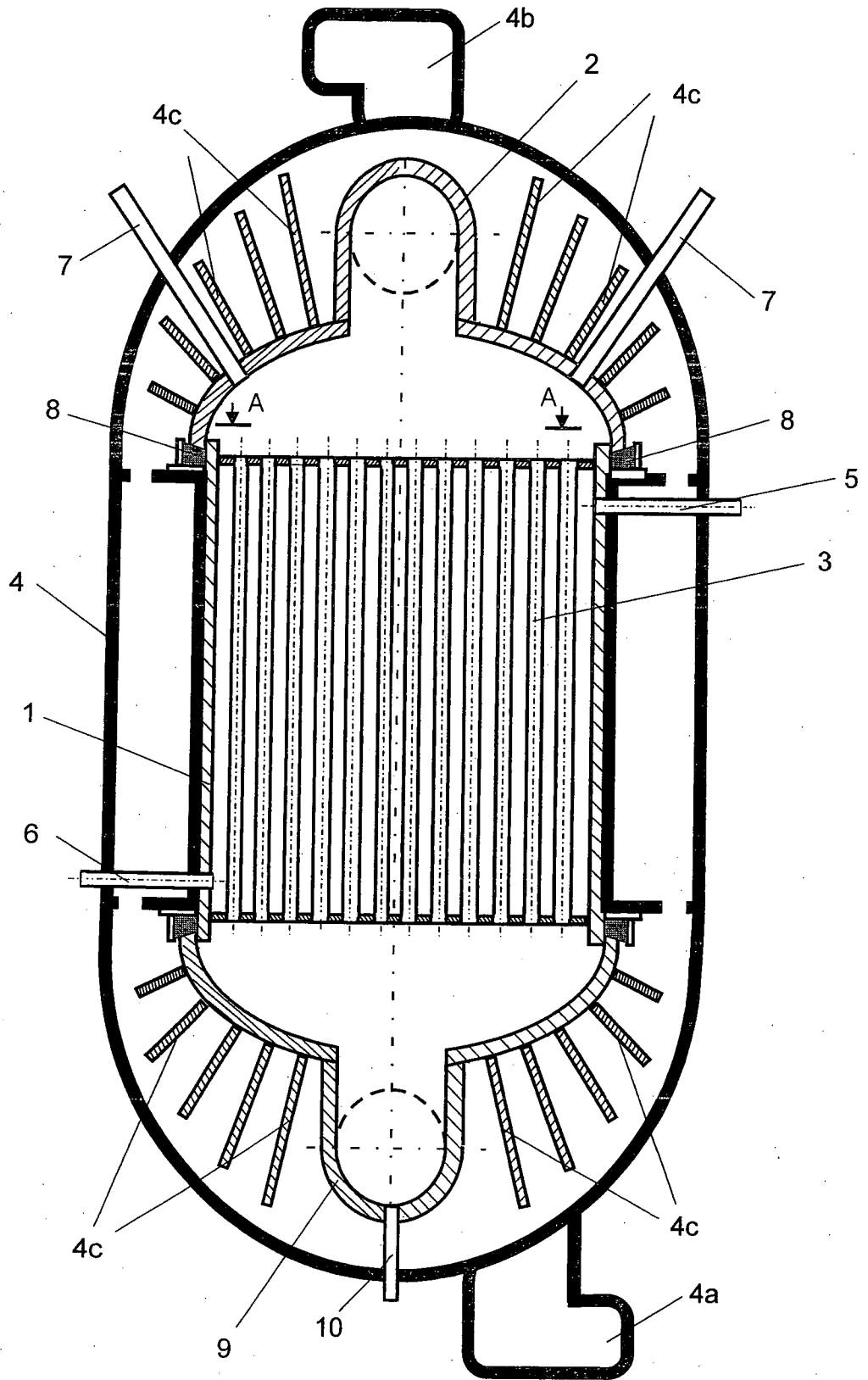
15 having cleaning nozzles (7) installed in coat (2) and drain hole (10) for
outflow of the water for cleaning the tube of condensing tube exchanger
(3) in coat (9).

3. Combined condensing heat exchanger is, according to claims 1 and 2,

20 **characterized in that,**

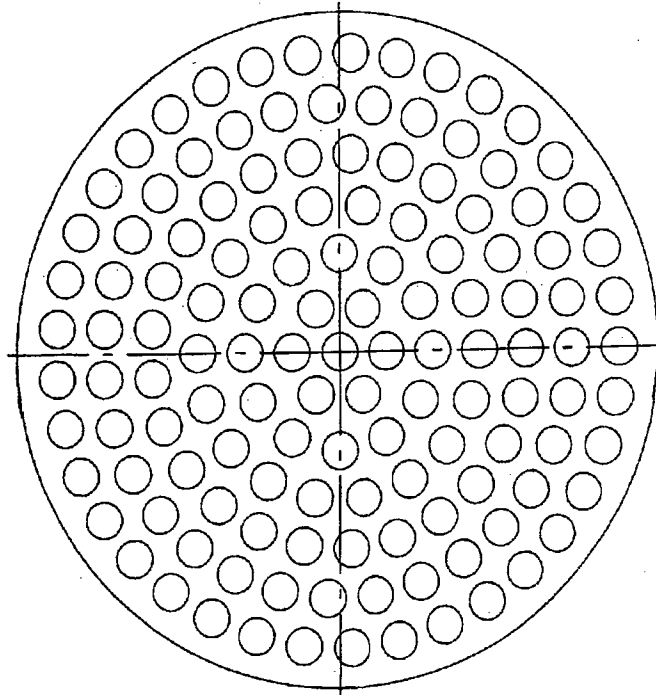
the condensing tube exchanger (3) has tubes mounted between two
carrying plates and tubes are of round or ellipse shape or of
combination of both shapes.

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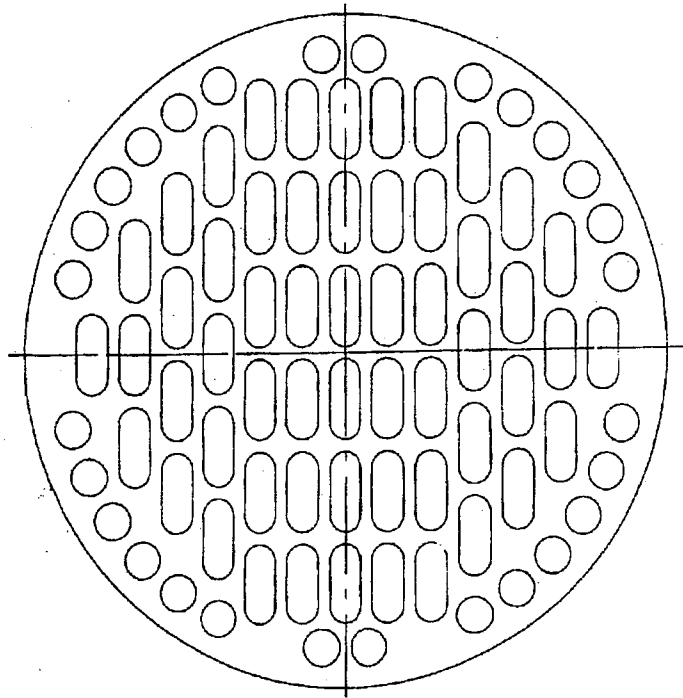
SLIKA 1

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SLIKA 2

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SLIKA 3