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(11) **EP 1 146 294 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
17.10.2001 Bulletin 2001/42

(51) Int Cl.7: **F24H 3/00**

(21) Application number: **00303129.1**

(22) Date of filing: **13.04.2000**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: **Lee, Ha Woo**
Namdong-ku, Inchon (JP)

(74) Representative: **Roberts, Gwilym Vaughan et al**
KILBURN & STRODE,
20 Red Lion Street
London WC1R 4PJ (GB)

(71) Applicant: **Lee, Ha Woo**
Namdong-ku, Inchon (JP)

(54) **Hot-air heating system**

(57) A hot-air heating system is disclosed. The system comprises a case 14 having a warm-air discharge vent hole 10 provided at the upper front part having an air-supply fan 12 at the lower rear part; a plurality of heat

transfer medium pipes 18, 18A having a plurality of radiating fins 32 arranged at the outer surface; and a heat reservoir block 16, 16A where the lower part of the heat transfer medium pipes 18, 18A is connected and an electric heater 20 is installed.

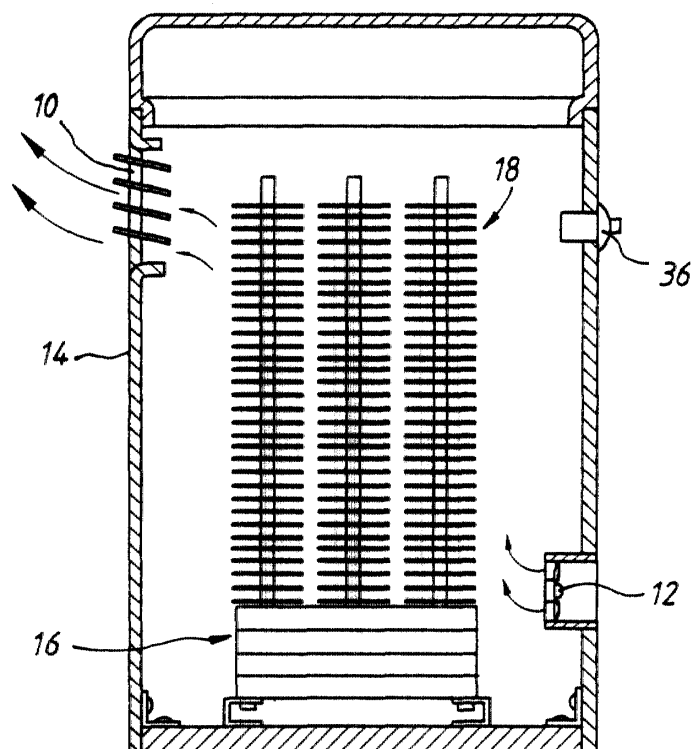


FIG. 2.

Description

[0001] This invention relates to a hot-air heating system and in particular, to the hot-air heating system in which a heat generated from an electric heater as a heat source is emitted through a plurality of radiating pipe where a heat transfer medium is contained, whereby a warm-air heating is made available.

[0002] It has been well known that electric energy is a clean energy without any contaminants. When a heating is made through such electric energy, the facility investment can be minimized and on top of that, it is a high-class energy in a safe manner, since there is no danger of explosion unlike oil or gas. However, in the circumstances where the electric energy requires a higher heating cost, the end-users have no choice but to rely on the oil and gas energy, in spite of the fact that such oil or gas has encountered various environmental contamination, a heavy facility investment and safety problems.

[0003] Further, the conventional heating system using a heat transfer medium has been applied; a heat generated from a heat source is transferred to an electric heat medium and through the circulation of it, a heat air is indirectly given to some heated materials and distributed in a wider area by fan, while avoiding the local concentration heat by a direct heating method.

[0004] However, such heating system using a heat transfer medium has recognized some disadvantages in that (1) since a heat source is a gas or oil burner, it is extremely difficult to control its heating temperature appropriately, and as the case may be, the end-users hesitate to utilize the above system despite its higher energy efficiency, since the upper-limit temperature of heat transfer medium line may be exceeded, (2) environmental contamination problems exists, (3) a heavy facility investment should be required.

[0005] Therefore, an object of this invention is to provide a hot-air heating system that can ensure a high-efficiency heating in such a manner that a heat generated from an electric heater as a heat source, is emitted through a heat transfer medium having an efficient heat transfer action.

[0006] Another object of this invention is to provide a hot-air heating system that can ensure an efficient heating in such a manner that a heat is emitted in a wider surface area through a heat reservoir means which reserve the heat generated from a heat source to maintain a certain temperature and some thermally connected heat transfer medium pipes.

[0007] Another object of this invention is to provide a hot-air heating system that can ensure less environmental contamination and reasonable facility and maintenance costs using an electric heat as heat source.

[0008] To achieve the above objectives, the hot-air heating system of this invention is characterized in that the system comprises a case having a warm-air discharge vent hole provided at the upper front part having

an air-supply fan at the lower rear part; a plurality of heat transfer medium pipes having a plurality of radiating fins arranged at the outer surface; and a heat reservoir block where the lower part of the heat transfer medium pipes is connected and an electric heater is installed.

[0009] The heat transfer medium pipes comprise a sealed pipe body and liquid-phase heat transfer medium are contained in its inside. The heat reservoir block is stacked by a plurality of plates consisting of metals with a high heat conduction.

[0010] According to another embodiment of this invention, the heat reservoir block may be provided in a liquidtight container form; a heat transfer medium, which is the same as that contained in the heat transfer medium pipes, may be contained in the heat reservoir block. Further, the pipe body of heat transfer medium pipes and the heat reservoir block may be fabricated in an integrated form.

[0011] Embodiments of the invention will now be described, by way of example, with reference to the drawings, of which:

Fig. 1 is an exploded perspective view of a hot-air heating system according to this invention;

Fig. 2 is a sectional view showing the internal structure of a hot-air heating system according to this invention;

Fig. 3 is an exploded perspective view showing a heat transfer medium pipes and a heat reservoir block as heat reservoir means.

Fig. 4 is a partially sectional view showing a heat transfer medium pipes and a heat reservoir block.

Fig. 5 is a sectional view of a heat transfer medium pipes and a heat reservoir block according to another embodiment of this invention.

[0012] Fig. 1 shows that the whole structure of the hot-air heating system according to this invention is disassembled. As noted from Fig. 1 and Fig. 2, the hot-air heating system of this invention comprises a case 14 having a warm-air discharge vent hole 10 provided at the front upper part and having an air-supply fan 12 at the lower rear part. Provided in the case 14 is a heat reservoir block 16 and a plurality of heat transfer medium pipes 18 being thermally connected with the heat reservoir block 16.

[0013] Electric heaters 20 are connected to the heat reservoir block 16, and the latter serves to reserve a heat generated by the electric heaters 20 and transfer it to the heat transfer medium pipes 18.

[0014] According to the first embodiment 1 of this invention, the heat reservoir block 16 is stacked by a plurality of plates 22 consisting of aluminum or copper with a high conduction. Between these plates 22, the electric heater 20 as a heat source, is inserted to a recesses 24 formed to the opposite sides of the adjacent boards 22. Therefore, when the current flows into the electric heater 20 to generate a heating due to its resistance heat, the

heat is transferred to the heat reservoir block 16 consisting of a plurality of plates 22. Then, in order to connect the lower part of the heat transfer medium pipe 18 to the heat reservoir block 16, a plurality of insert grooves 26 are formed to the plates 22 of the heat reservoir block 16.

[0015] The heat transfer medium pipe 18 comprises a sealed pipe body 28. The inside of the pipe body 28 is completely filled with an organic or inorganic, non-combustible, liquid-phase heat transfer medium 30, which has a low vapor pressure with better thermal stability, less corrosiveness and large specific heat and vaporization heat, for sealing thereof. The pipe body 28 is fabricated by some metals such as aluminum or copper with better heat conduction. Further, to the outer side of the pipe body 28, a plurality of radiating fins 32 whose material is the same as the pipe body 28 are formed.

[0016] Since the lower part of the heat transfer medium pipe 18 is tightly inserted into the insert groove 26 of the heat reservoir block 16, the heat can be effectively transferred from the heat reservoir block 16 to the heat transfer medium pipe 18.

[0017] Meantime, a control panel 34 for controlling the operation of the electric heater 20 and the air-supply fan 12 are provided at the front of the case 14; at the rear side of the case 14, a temperature sensor 36 is installed so that the predetermined range of temperature can be maintained.

[0018] Fig. 5 shows another embodiment of the heat reservoir block; the heat reservoir block 16A has a liquidtight container where the heat transfer medium 30A, which is the same as that contained in the heat transfer medium pipe 18, along with the electric heater 20A in the heat reservoir block 16A. Like the first embodiment of this invention, a plurality of the heat transfer medium pipe 18A is tightly inserted into the heat reservoir block 16A for a complete sealing thereof. According to another embodiment of this invention, the heat transfer medium pipe 18A and heat reservoir block 16A are fabricated in an integrated form and the same heat transfer medium may be inserted into their inside.

[0019] As such, the hot-air heating system of this invention is operated in such a manner that through the control panel 34, the temperature of a heater is established and then, the current is supplied to the electric heater 20 to make a warm-air heating by the air-supply fan 12. The electric heater 20, so heated, generates a heat and then, the heat reservoir block 16 is heated. Since the heat reservoir block 16 having a large thermal mass, it can store a lot of heat. The stored heat is transferred to the heat transfer medium pipe 18 at the predetermined range of temperature. The heat reservoir block 16 is stacked by a plurality of plates 22 consisting of aluminum or copper with a high heat conduction. The lower part of the heat transfer medium pipe 18 is tightly inserted into the heat reservoir block 16. Since the heat transfer medium 30 with better heat conduction is housed in the heat transfer medium pipe 18, the heat

stored in the heat reservoir block 16 can be readily or effectively transferred to the heat medium transfer pipe 18. The heat is emitted via the radiating fins 32 of the heat medium transfer pipe 18, expanding the surface area of radiation to the maximum level. By heating the air supplied by the air-supply fan 12, an in-door equipped with the hot-air heating system becomes heated via the warm-air discharge vent hole 10 formed at the front of the case 14.

[0020] As mentioned above, the heat reservoir block 16 is stacked by a plurality of plates 22 consisting of metals with a high heat conduction. Since these plates can store a large amount of heat when heated by the electric heater 20, a sustained heat can be transferred to the heat transfer medium pipe 18 for a longer time, in spite of the temporal block-off of electric power.

[0021] As such, this invention has several advantages in that (1) a warm-air heating with a very high efficiency can be ensured in such a manner that a radiation via electric heat is made available using a heat transfer medium with an efficient heat transfer effect, (2) an efficient heating can be also ensured in such a manner that through the heat transfer medium pipes which is thermally connected with a heat reservoir means which can maintain a certain range of temperature by storing the heat generated from a heat source, a radiation may be made available at a large surface area, and (3) the hot-air heating system with a simple structure, which required less facility investment or maintenance cost, can be utilized as a comfortable in-door heater.

Claims

1. A hot-air heating system, wherein the system comprises a case having a warm-air discharge vent hole provided at the upper front part having an air-supply fan at the lower rear part; a plurality of heat transfer medium pipes having a plurality of radiating fins arranged at the outer surface; and a heat reservoir block where the lower part of the heat transfer medium pipes is connected and an electric heater is installed.
2. The hot-air heating system according to claim 1, wherein said heat transfer medium pipes comprise a sealed pipe body and liquid-phase heat transfer mediums are contained in its inside.
3. The hot-air heating system according to claim 1, wherein said heat reservoir block is stacked by a plurality of plates consisting of metals with a high heat conduction .
4. The hot-air heating system according to claim 1, wherein said heat reservoir block may be provided in a liquidtight container form, and a heat transfer medium, which is the same as the heat transfer me-

dium contained in the heat transfer medium pipe,
may be, contained in the heat reservoir blocks.

5. The hot-air heating system according to claim 1,
wherein said pipe body of heat transfer medium
pipes and heat reservoir blocks may be fabricated
in an integrated form.

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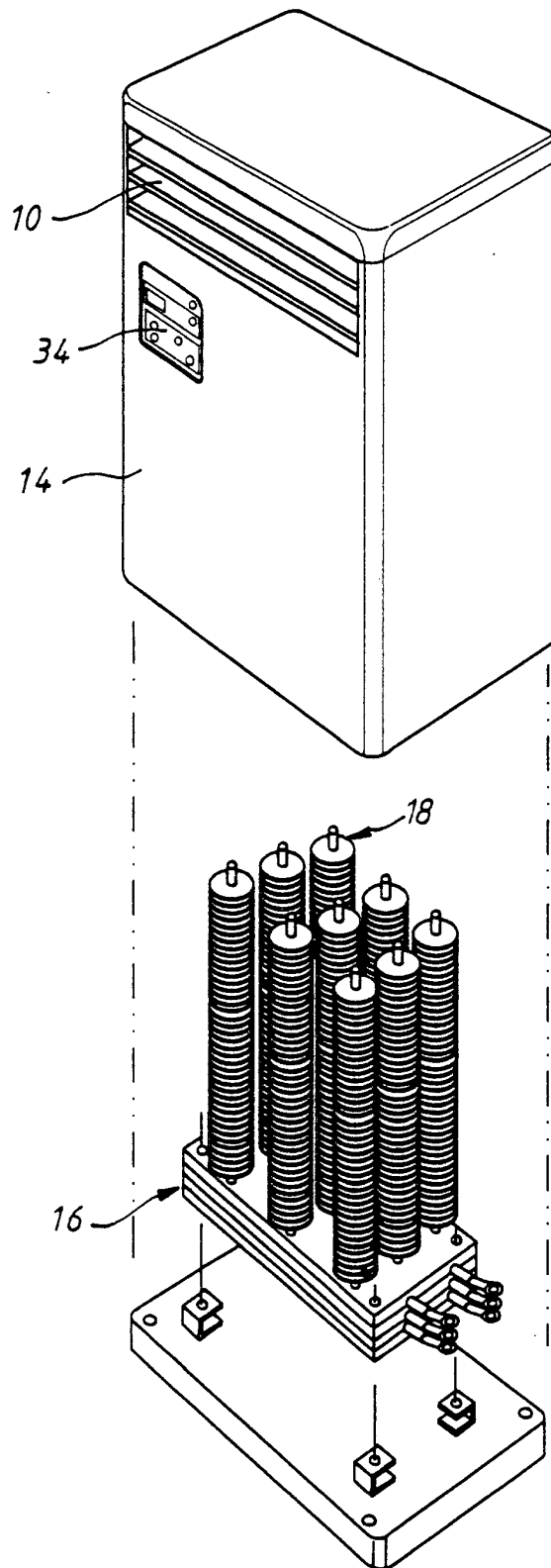


FIG. 1.

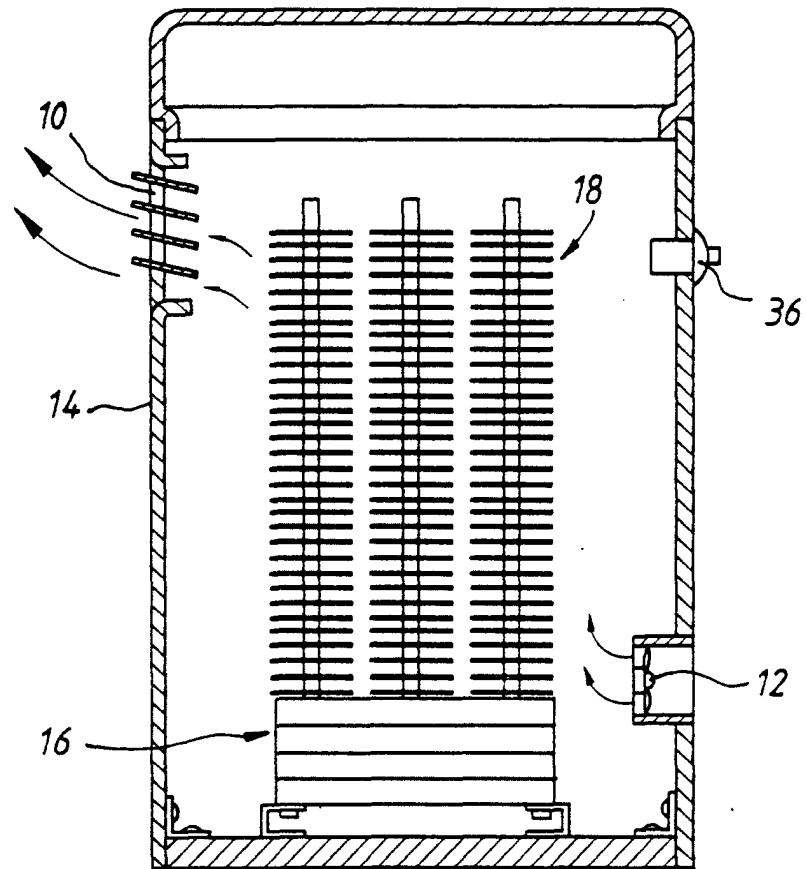


FIG. 2.

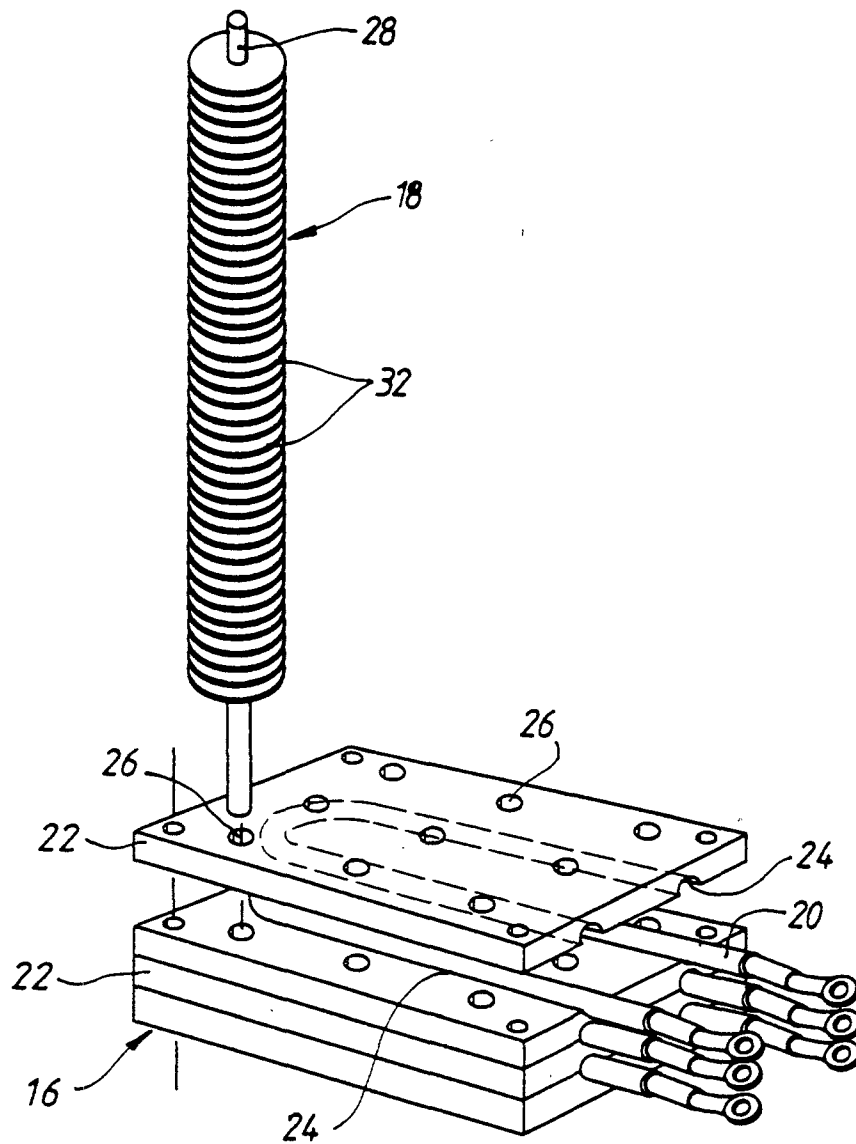


FIG. 3.

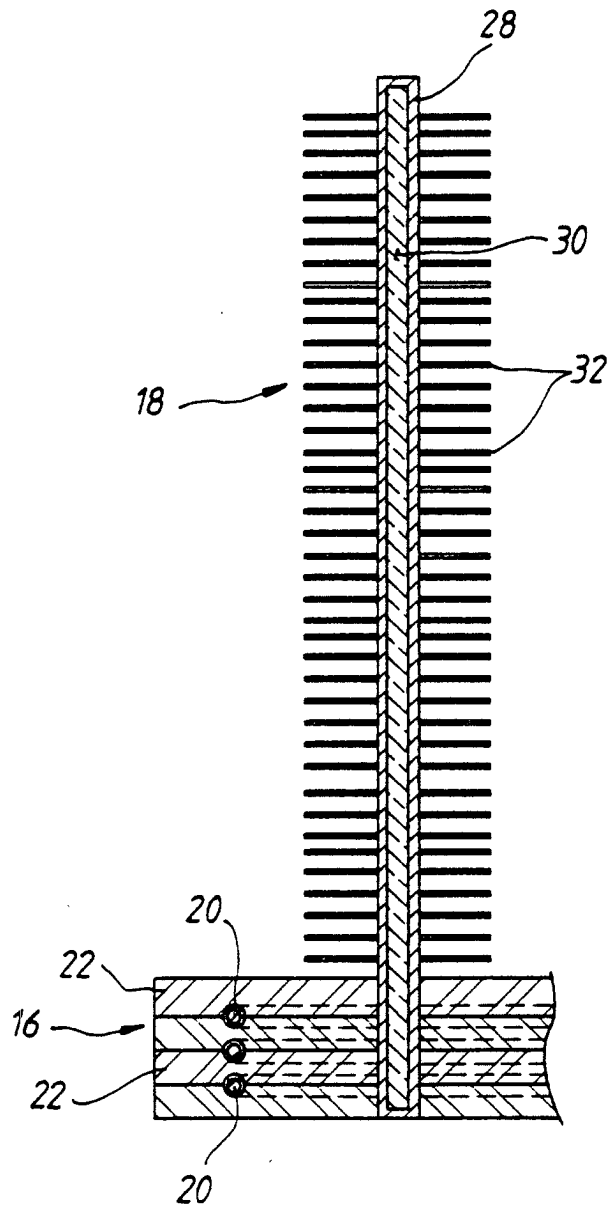


FIG. 4.

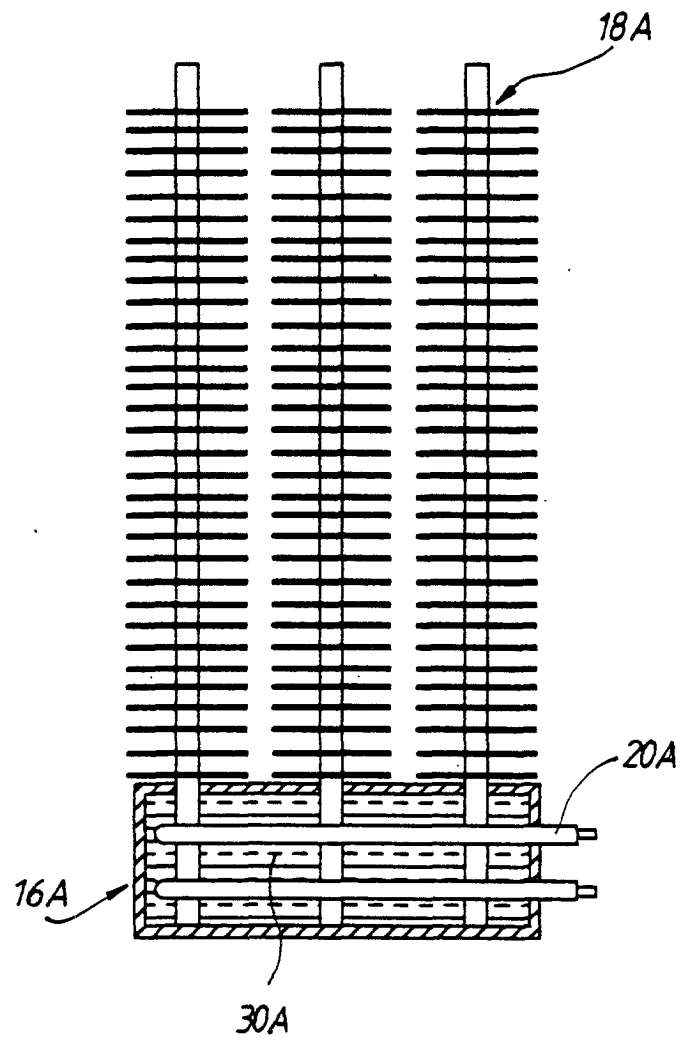


FIG. 5.



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EUROPEAN SEARCH REPORT

Application Number
EP 00 30 3129

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 721 804 A (GREENE III GRANT G) 24 February 1998 (1998-02-24) * abstract *	1, 2, 4, 5	F24H3/00
A	EP 0 820 215 A (ARBONIA AG) 21 January 1998 (1998-01-21) * figure 4 *	1, 3	
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7) F24H
Place of search THE HAGUE		Date of completion of the search 24 August 2000	Examiner Van Gestel, H
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 00 30 3129

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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