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(54) **HEAT EXCHANGER STRUCTURE**

WÄRMETAUSCHERSTRUKTUR

STRUCTURE D'UN ECHANGEUR DE CHALEUR

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Description

Technical field

[0001] The present invention relates to a heat exchanger structure that is particularly indicated for central heating boilers and the production of sanitary hot water.

Background Art

[0002] As is known, a heat exchanger is any type of equipment designed for thermal exchange between liquids separated by a conducting wall. In particular, the exchange of heat between two liquids is generally obtained across a surface made of a good heat-conducting material, such as metal, which separates the two liquids that flow through the exchanger at the same time: in this way, the heat is transmitted, across the surface, from the hotter liquid to the cooler one. Up to now, the exchangers that are currently on the market that are present in central heating and water heater boilers are usually of the tubular type, so that the first liquid flows inside the pipes and the second flows along the outside.

[0003] In greater detail, currently in boilers, the exchanger is composed of a coiled pipe or various pipes placed horizontally, over a burner used to heat the air that then comes into contact with the metal surface designed to remove heat from the air and transfer it to the water inside the pipes. The pipes are connected to a cold water inlet pipe and a hot water outlet pipe; which, while flowing through the exchanger pipes, is heated. In addition to what has been described above, the exchanger, on the outside of the pipes, has a plurality of metal plates that are designed to increase the thermal exchange surface.

[0004] The exchangers present on the market, while working very well, have presented a plurality of drawbacks, once they are inserted into a boiler for heating.

[0005] One first drawback found derives from the fact that, in current boilers, there are empty spaces where heat dispersal is detected. One of these spaces where heat is lost is the space between the burner and the exchanger, while another space is above the exchanger. As is known, the heat tends to rise from the bottom to the top, so the heat produced by the burner involves and comes into contact with the exchanger for only a very limited vertical stretch as all the pipes are arranged horizontally. In particular, the water flows inside the exchanger parallel to the burner while the heat moves vertically so there is considerable dispersal of heat as the contact zone for the heat with the exchanger is limited vertically. In fact, the heat flow exploitation zone is limited to the vertical overhang of the exchanger, so boilers have areas with the presence of unused heat, which may also be considerable.

[0006] Another drawback, therefore, that is found in current exchangers derives from the fact that they release fumes into the environment and atmosphere that

are still hot, and as a result, waste and disperse energy that over time leads to high running costs of the system, as well as the fact that the fumes released contribute to environment global warming, with resulting changes to the ecosystem in the long term.

[0007] To compensate for what has just been described, technical solutions have been studied to recover and reuse the fumes that are still very hot and avoid point-less heat dispersal into the environment. With this aim, many of the boilers on the market have devices for the recovery of fumes and heat so that part of the heat produced by the burner is not wasted but reused to heat the water. These boilers, called condensation boilers, work in two phases: the first phase heats while the second recovers "temperature" and heat from the fumes and introduces them into the exchanger again. In greater detail, the heat, produced during the first burner phase and dispersed in the fumes after passing through the exchanger, is used to heat the area surrounding the exchanger itself in order to be able to use it further but this means that the structure and devices in the exchanger need to have a very complex design.

[0008] The boilers described above also present various drawbacks.

[0009] One drawback derives from the fact that condensation boilers, as previously mentioned, are becoming more and more elaborate and equipped with devices for greater use of the heat produced by the fumes, but these components make them complicated and expensive, both to produce and to maintain.

[0010] Another drawback found emerges from the fact that, even by reusing the fumes, the boilers have high fuel consumption lost in heat dispersal, due to the presence of areas in which the heat produced by the burner does not come into contact with the water pipes.

[0011] In addition to what has been described above, condensation boilers have proved to be more delicate and subject to wear and deterioration of the devices and components.

[0012] The applicant is aware of patent EP 1.136.667, which shows a heat exchanger structure featuring a pair of radiating elements, each of which is composed of two parts which are mutually coupled in a symmetrical manner as defined in the preamble of claim 1. In particular, the external flow is not continuous and uniform, as it is interrupted by a series of dividers, therefor the radiating element is lapped by the fluid only in the three central zones and not over the entire surface, creating a discontinuity and differences in temperature, and has mutually perpendicular flows.

[0013] Furthermore, the applicant is aware of German patent DE 873921, which shows a modular structure composed of a plurality of radiating elements, each of which is composed of a pair of internal elements equipped with fins and a pair of external portions whose function is to contain and clad the internal elements. In particular, the two internal elements are mutually coupled so that the fins are mutually interposed in a parallel fash-

ion. Each external portion features, externally, a series of loops which, when the two portions are coupled, create channels. In German patent DE 873921, each radiating element is composed of two internal elements and two external cladding portions, therefore the said radiating element is composed of several pieces which must be assembled.

[0014] Patent DE 37 04 215 features a heat exchanger composed of a single radiating element, which is composed of two mutually different, mutually coupling half-parts. The radiating element is absolutely not couplable with another identical element way, therefore it is not possible to create a heat exchanger consisting of a plurality of elements.

[0015] Finally, American patent U.S. 1.850.211 shows a radiator core for cars which is composed of modular radiating elements composed of a single piece. In particular, it features fins on the internal part, and each fin is obtained from an element folded back on itself.

Disclosure of Invention

[0016] The aim of the present invention is substantially to resolve the problems of the current techniques by overcoming the difficulties described above by means of a heat exchanger structure, which is able to completely exploit all the heat produced by a burner to heat a liquid with just one flow cycle and without the recovery of the fumes.

[0017] The second aim of the present invention is to have a heat exchanger structure that allows the flow of heat across an exchange surface that is considerably increased.

[0018] The third aim of the present invention is to have a heat exchanger structure that allows considerable saving of energy consumption of the burner for the same flow heated and temperature obtained.

[0019] Another aim of the present invention is to have a heat exchanger structure that has a simple and modular structure and a small overhang and that is able to exploit all the unused spaces inside boilers.

[0020] A further aim of the present invention derives from the fact that the heat exchanger allows the liquid heating to be performed in a single phase. The last but not least important aim of the present invention is to produce a heat exchanger that is simple to produce and that works well.

[0021] These aims and others, which shall better emerge in the description that follows, are achieved by a heat exchanger structure, claimed as follows. Further characteristics and advantages shall better emerge in the description that follows of a heat exchanger structure, according to the present embodiment, illustrated below with reference to the plates enclosed, provided purely in the form of non-limiting examples, in which:

- figure 1 illustrates a schematic and exploded view of a heat exchanger which is the subject matter of

the present invention;

- figure 2 illustrates schematically and in perspective view the heat exchanger shown in figure 1;
- figure 3 illustrates schematically and from another perspective view the heat exchanger shown in figure 2;
- figure 4 illustrates a partially-sectioned view from above of the heat exchanger according to the present invention;
- figure 5 illustrates the section axes;
- figure 6 illustrates a section view of the heat exchanger in question along the A-A axis;
- figure 7 illustrates a section view of the heat exchanger along the B-B axis;
- figure 8 illustrates a partially-sectioned lateral view of the heat exchanger shown in figure 1;
- figure 9 illustrates a section view of a basic component of the heat exchanger in figure 1;
- figure 10 illustrates a front view of the basic component shown in figure 9;
- figure 11 illustrates a lateral view of the basic component of the heat exchanger shown in figure 9;
- figure 12 illustrates a perspective view of the basic component shown in figure 9;
- figure 13 illustrates another perspective view of the basic component of the heat exchanger shown in figure 9;
- figure 14 illustrates a detail of the basic component shown in figure 12;
- figure 15 illustrates a detail of the basic component shown in figure 13;
- figure 16 illustrates a perspective view of the coupling of two basic components of the heat exchanger in question;
- figure 17 illustrates in detail a radiating component of the heat exchanger shown in figure 1;
- figure 18 illustrates a detail of the radiating component shown in figure 17;
- figure 19 illustrates a lateral view of the coupling of two basic components;
- figure 20 illustrates a lateral view of a radiating component of the heat exchanger according to the present invention;
- figure 21 illustrates a lateral view of a variation of the basic component of the heat exchanger in question;
- figure 22 illustrates a section view of the basic component shown in figure 21 along the C-C axis;
- figure 23 illustrates a front view of the basic component shown in figure 21;
- figure 24 illustrates a perspective view of the basic component shown in figure 21;
- figure 25 illustrates schematically a view from above of the heat exchanger with the basic component shown in figure 21 and the indication of the heat flow;
- figure 26 illustrates schematically a section view of the heat exchanger shown in figure 25 along the D-D axis;
- figure 27 illustrates schematically a section view of

the heat exchanger shown in figure 25 along the E-E axis;

- figure 28 illustrates schematically a section view of the heat exchanger shown in figure 25 along the F-F axis;
- figure 29 illustrates schematically and in perspective view a boiler with a heat exchanger according to the present invention;
- figure 30 illustrates schematically a lateral view of the boiler shown in figure 29;
- figure 31 illustrates schematically a front section view of the boiler shown in figure 29 with the heat exchanger in question;
- figure 32 illustrates schematically a section view from above of the boiler shown in figure 29 with the heat exchanger;
- figures 33 and 34 illustrate the functioning diagram of the boiler with the heat exchanger according to the present invention.

[0022] With reference to the figures mentioned, and in particular figure 1, with 1 a heat exchanger structure has been indicated overall, according to the present invention.

[0023] The heat exchanger structure 1 is substantially composed of a frame 2 inside which are arranged, parallel with each other, a plurality of radiating components 3.

[0024] Each radiating component 3 is substantially composed of a pair of basic components 3a and 3b that are coupled with each other symmetrically as shown in figures 16 to 20. In greater detail, each basic component 3a or 3b is composed of a plate 30 with, on the inner side, a plurality of primary wings 31, equally spaced from each other and positioned orthogonally to the plate itself, and on the outer side a series of secondary wings 32, which are also positioned orthogonally to the plate 30 and equally spaced from each other, but closer to each other than the primary wings 31 as shown in figures 13, 15 and 22.

[0025] In accordance with the present embodiment, the secondary wings 32 are designed to absorb the heat produced by a burner 4 positioned under the frame 2 of the exchanger and transmit it to the plate 30 and the primary wings 31 inside the radiating component, so that it is transmitted to the liquid that flows inside the space 34, created by the coupling of the two basic components 3a and 3b.

[0026] In addition to what has already been described, the plate 30 is equipped with two projections 30a and 30b forming an arch, facing each other and designed to couple with the corresponding projection present on the other basic component forming a channel 350 as shown in figures 16, 17, 18, 19 and 20.

[0027] In the present embodiment, the frame 2 is equipped with at least one first cold liquid inlet duct 5 positioned below the base of the frame itself. The first duct 5 is connected to the space 34 of each radiating

component 3 by means of a first passage 35 present in the duct 5 and through which the liquid from the duct 5 enters the first channel 350 created by the coupling of the projections 30a in each radiating component present in the frame 2 as shown in figures 1 and 7.

[0028] Similarly, the frame 2 is provided with at least one second hot liquid outlet duct 6 positioned above the top of the frame itself. The second duct 6 is also connected with the space 34 of each radiating component 3 by means of a second passage 36 present in the duct 6 and through which the liquid, from the second channel 350 created by the coupling of the projections 30b, enters the duct 6 from the opposite side to the plate with respect to the passage 35.

[0029] According to the present invention, the exchanger is equipped with two first cold liquid inlet ducts 5 in the plurality of radiating components and two second outlet ducts 6 for the liquid output that in the meantime has been heated by the plurality of radiating components.

[0030] A different embodiment foresees that the cold liquid enters the duct 6 and when heated exits from the duct 5.

[0031] According to the present invention, each basic component is composed of extruded or moulded metal so the manufacturing of the entire exchanger is very simple, as it is achieved by the assembly of two basic components to obtain a radiating component 3 and the arrangement of a plurality of radiating components that are arranged vertically and parallel with one another.

[0032] In addition to what has been described above, the first and the last basic components do not have the external wings 32 as shown in figure 1. Besides, if the first and last basic components have external wings 32 also on the ends, the exchanger has an enclosing wall 7 as shown in figures 2 and 3.

[0033] Another variation foresees the presence of just one radiating component 3.

[0034] After what has been described above prevalently regarding the structure, the functioning of the embodiment in question is as follows.

[0035] The functioning principle of the heat exchanger structure in question is achieved by the fact that the burner produces heat that heats the air present, which tends to rise upwards giving off a quantity of heat that is released, while moving upwards towards the boiler exhaust, to the radiating components inside which the water flows that receives heat from the metal structure that the radiating components removed from the air. The air, while flowing from the burner to the exhaust, shall have released all its heat and used up its heating energy that has been taken up from the radiating components along the whole vertical length that the air moves along and not only for a short length as happened with the prior art where the exchanger had a very small vertical overhang as the pipes that constituted it and in which the water flowed were positioned horizontally. In the case of a boiler, the water that has to be heated enters the exchanger structure into the spaces 34 through the duct 5

after having passed through the passage 35 and entered the first channel 350 of each radiating component to then exit through the hot water duct 6 passing through the second channel 350 and the passage 36.

[0036] During its vertical passage, the water collects all the heat produced by the burner, completely exploiting it, and the air that exits through the boiler exhaust shall have used up all the heat energy contained in it and shall be at a low temperature. The heating cycle may be continuous without interruptions or idle periods and without heat dispersal or the necessity to recover it to introduce it into the exchanger again as happens in many boilers of the prior art. In particular, the configuration of the exchanger allows the use, and therefore complete exploitation of the heat produced by the burner at all the points as, the heat, while flowing through the boiler, always comes into contact with the exchanger structure in every horizontal and vertical section.

[0037] The present invention therefore achieves the aims proposed.

[0038] The exchanger structure according to the present invention allows the complete exploitation of all the heat produced by a burner to heat a liquid with just one cycle and without recovering the fumes.

[0039] In fact, the vertical configuration of the plates and the vertical water cycle allows all the heat produced by the burner to be used while flowing from the bottom to the top. In this way, the radiating components are able to absorb all the heat produced and transmit it to the water that is flowing inside them.

[0040] In particular, the exchanger in question allows the heat to pass across an exchange surface that is considerably increased due to the presence of plates and not a pipe, as happened in the prior art, and internal wings. Advantageously, the heat exchanger structure allows a considerable saving to be made in the energy consumption of the burner, with the same flow heated and temperature obtained, with savings in methane consumption, for example, of over 50% due to the fact that all the heat produced is used and transferred to the water.

[0041] Besides, the reduced consumption of the burner allows the reduction, as a result, of the resulting emission into the atmosphere with resulting limitation and reduction of pollutants released into the air. Advantageously, the heat exchanger structure is simple and modular, has a small overhang and exploits all the unused spaces present in the boilers of the prior art. Besides, the exchanger structure in question is able to transfer a greater quantity of heat in a smaller space, thereby reducing the possibility for dispersal unlike what happens in the boilers currently on the market.

[0042] In addition to what has been described above, the exchanger structure allows the upwards distribution of the heat produced by the burner to be exploited optimally with a large exchange surface.

[0043] Besides, the exchanger does not need containment and protection walls as is necessary with those of the prior art as while assembling the radiating compo-

nents, the overall structure is already obtained so it is therefore possible to create a watertight chamber type boiler without the external structure.

[0044] In particular, the exchanger structure according to the present invention is simple, as it is the sum of a single piece, the radiating component, that is multiplied, unlike the components that compose the exchangers of the prior art that are composed of a certain number of single pieces that are different from each other and that are then assembled, so it is possible to build a very compact boiler with low manufacturing costs, even using a single radiating component.

[0045] A further advantage of the present exchanger derives from the fact that it is very versatile and easy to use; in fact it allows all the heat produced by the burner to be used, with a simple structure and a single operative cycle for the boiler.

[0046] The last but not least advantage of the present invention is that it is considerably easy to use, simple to manufacture and works well.

[0047] Of course, numerous modifications and variations may be made to the present invention, which are all included in the field of the inventive concept that characterises it.

Claims

1. Heat exchanger structure substantially composed of at least one of a plurality of radiating components (3) in which each radiating component (3) is composed of a pair of basic components (3a and 3b) coupled with each other symmetrically, wherein each basic component (3a or 3b) is composed of a plate (30) with a plurality of primary wings (31) on one side that are spaced equally from each other and placed orthogonally to the plate itself **characterised by** each basic component having a series of secondary wings (32) on the other side which are also positioned orthogonally to the plate (30) and spaced equally from each other but closer to each other with respect to the primary wings (31) and said radiating components (3) are arranged parallel with each other inside a frame (2), said frame (2) being provided with at least one first cold liquid inlet duct (5) positioned below the base of the frame itself and at least one secondary hot liquid outlet duct (6) positioned at the top of the structure.
2. Heat exchanger structure according to claim 1, **characterised by** the fact that Heat exchanger structure according to claim 1, **characterised by** the fact that the said secondary wings (32) are designed to absorb the heat produced by a burner (4) positioned below the frame (2) of the exchanger and transmit it to the plate (30) and to the primary wings (31) inside the radiating component (3) so that it is transmitted to the liquid that flows inside a space (34) that is

created by the coupling of the two basic components (3a and 3b).

3. Heat exchanger structure according to claim 1, **characterised by** the fact that the said plate (30) is equipped with two projections (30a and 30b) forming an arch, opposite each other and designed to couple with the corresponding projection present in the other basic component forming a channel (350).
4. Heat exchanger structure according to claim 1, **characterised by** the fact that the said first duct (5) is connected with the space (34) of each radiating component (3) by means of a first passage (35) present in the duct itself and through which the liquid from the duct (5) enters the first channel (350) created by the coupling of the projections (30a) in each radiating component present in the frame (2).
5. Heat exchanger structure according to claim 1, **characterised by** the fact that the said second duct (6) is also connected to the space (34) in each radiating component (3) by means of a second passage (36) present in the duct (6) and through which the liquid from the second channel (350) created by the coupling of the projections (30b) exits into the duct (6) on the opposite side of the plate with respect to the passage (35).
6. Heat exchanger structure according to claim 1, **characterised by** the fact that it is equipped with two first cold liquid inlet ducts (5) in the plurality of radiating components and two second ducts (6) for the liquid outlet that in the meantime has been heated by the plurality of radiating components.
7. Heat exchanger structure according to claim 1, **characterised by** the fact that each basic component (3a, 3b) is produced in extruded or moulded metal.
8. Heat exchanger structure according to claim 1, **characterised by** the fact that it is achieved by the assembly of two basic components to obtain a radiating component (3) and the arrangement of a plurality of radiating components that are arranged vertically and parallel with each other for the overall structure.
9. Heat exchanger structure according to claim 1, **characterised by** the fact that the said first and last basic components do not have external wings (32).
10. Heat exchanger structure according to claim 1, **characterised by** the fact that it has an enclosing wall (7) if the said first and last basic components have external wings (32) also on the ends.
11. Heat exchanger structure according to claim 1, **characterised by** the fact that it has only a single radiat-

ing component (3).

Patentansprüche

1. Struktur eines Wärmetauschers, bestehend im Wesentlichen aus mindestens einem von mehreren Strahlelementen (3), bei denen jedes Strahlelement (3) aus einem Paar Grundelementen (3a und 3b) besteht, die miteinander auf symmetrische Weise verbunden sind, und bei denen jedes Grundelement (3a oder 3b) eine Platte (30) aufweist, die auf einer Seite über mehrere erste Lamellen (31) mit gleichem Abstand zueinander verfügt, die rechtwinklig zu dieser Platte angeordnet sind; die Grundelemente sind zudem **dadurch gekennzeichnet, dass** jedes auf der anderen Seite eine zweite Reihe Lamellen (32) aufweist, die ebenfalls rechtwinklig zur Platte (30) angeordnet sind und den gleichen Abstand zueinander haben, der jedoch geringer als bei den ersten Lamellen (31) ist; die genannten Strahlelemente (3) sind parallel zueinander innerhalb eines Rahmens (2) angeordnet und der genannte Rahmen weist zumindest eine erste Eingangsleitung (5) der kalten Flüssigkeit unter dem Fuß des Rahmens sowie mindestens eine zweite Ausgangsleitung (6) der heißen Flüssigkeit im oberen Teil der Struktur auf.
2. Struktur eines Wärmetauschers gemäß Patentanspruch 1, **dadurch gekennzeichnet, dass** die genannten zweiten Lamellen (32) dazu vorgesehen sind, die von einem unter dem Rahmen (2) des Wärmetauschers befindlichen Brenners (4) erzeugte Wärme aufzunehmen und diese Wärme an die Platte (30) und die ersten Lamellen (31) innerhalb des Strahlelementes (3) abzugeben, so dass sie auf die Flüssigkeit übertragen wird, die innerhalb eines Raumes (34) fließt, die durch die Verbindung der beiden Grundelemente (3a und 3b) gebildet wird.
3. Struktur eines Wärmetauschers gemäß Patentanspruch 1, **dadurch gekennzeichnet, dass** die genannte Platte (30) zwei bogenförmige Vorsprünge (30a und 30b) aufweist, die einander gegenüber liegen und zur Verbindung mit dem entsprechenden Vorsprung dienen, der am anderen Grundelement vorhanden ist, um einen Kanal (350) zu bilden.
4. Struktur eines Wärmetauschers gemäß Patentanspruch 1, **dadurch gekennzeichnet, dass** die genannte erste Leitung (5) mit dem Raum (34) jedes Strahlelementes (3) durch einen ersten Durchlass (35) in dieser Leitung verbunden ist, über den die Flüssigkeit aus der Leitung (5) in das Innere des ersten Kanals (350) gelangt, der durch die Verbindung der Vorsprünge (30a) in jedem im Rahmen (2) vorhandenen Strahlelement gebildet wird.

5. Struktur eines Wärmetauschers gemäß Patentanspruch 1, **dadurch gekennzeichnet, dass** die genannte zweite Leitung (6) ebenfalls mit dem Raum (34) jedes Strahlelementes (3) durch einen zweiten Durchlass (36) in dieser Leitung (6) verbunden ist, über den die Flüssigkeit aus dem zweiten Kanal (350), der durch die Verbindung der Vorsprünge (30b) gebildet wird, auf der der Platte in Bezug zum Durchlass (35) gegenüberliegenden Seite die Leitung (6) verlässt. 5 10
6. Struktur eines Wärmetauschers gemäß Patentanspruch 1, **dadurch gekennzeichnet, dass** er über die ersten beiden Leitungen (5) zur Einleitung der kalten Flüssigkeit in die mehreren Strahlelemente und die beiden zweiten Leitungen (6) für den Auslass der Flüssigkeit verfügt, die in der Zwischenzeit von der Vielzahl der Strahlelemente erwärmt wurde. 15
7. Struktur eines Wärmetauschers gemäß Patentanspruch 1, **dadurch gekennzeichnet, dass** jedes Grundelement (3a, 3b) aus gepresstem oder extrudiertem Metall besteht. 20
8. Struktur eines Wärmetauschers gemäß Patentanspruch 1, **dadurch gekennzeichnet, dass** diese durch Montage von zwei Grundelementen zur Bildung eines Strahlelementes (3) sowie aus der Anordnung einer Vielzahl von senkrecht sowie hinsichtlich der Struktur in ihrer Gesamtheit parallel zueinander angeordneten Strahlelementen erzielt wird. 25 30
9. Struktur eines Wärmetauschers gemäß Patentanspruch 1, **dadurch gekennzeichnet, dass** das genannte erste und letzte Grundelement keine äußeren Lamellen (32) aufweisen. 35
10. Struktur eines Wärmetauschers gemäß Patentanspruch 1, **dadurch gekennzeichnet, dass** er eine Abschlusswand (7) aufweist, wenn das genannte erste und letzte Grundelement auch an den Enden äußere Lamellen (32) aufweisen. 40
11. Struktur eines Wärmetauschers gemäß Patentanspruch 1, **dadurch gekennzeichnet, dass** er nur ein Strahlelement (3) aufweist. 45

Revendications

1. Structure d'échangeur de chaleur essentiellement constitué par au moins un élément d'une pluralité d'éléments rayonnants (3) où chaque élément rayonnant (3) est constitué par une paire d'éléments de base (3a et 3b) accouplés les uns aux autres de façon symétrique, où chaque élément de base (3a ou 3b) est constitué par une plaque (30) ayant d'un côté une pluralité de premières ailettes (31) équita- 50 55

blement espacées et placées orthogonalement à la plaque, **caractérisé en ce que** chaque élément de base présente de l'autre côté une série de secondes ailettes (32) elles aussi placées orthogonalement à la plaque (30) et équitablement espacées mais de façon plus dense que les premières ailettes (31) et lesdits éléments rayonnants (3) sont disposés, de façon parallèle les uns par rapports aux autres, à l'intérieur d'un bâti (2), ledit bâti (2) étant muni d'au moins un premier conduit (5) d'entrée de liquide froid situé dans la partie inférieure de la base du bâti et d'au moins un second conduit (6) de sortie de liquide chaud situé au sommet de la structure.

2. Structure d'échangeur de chaleur selon la revendication 1, **caractérisé en ce que** lesdites secondes ailettes (32) sont destinées à absorber la chaleur produite par un brûleur (4) situé dans la partie inférieure du bâti (2) de l'échangeur et transmettre ladite chaleur à la plaque (30) et aux premières ailettes (31) à l'intérieur de l'élément rayonnant (3) de manière à ce qu'elle soit transmise au liquide qui coule à l'intérieur d'un espace (34) créé par l'accouplement des deux éléments de base (3a et 3b).
3. Structure d'échangeur de chaleur selon la revendication 1, **caractérisé en ce que** ladite plaque (30) est équipée de deux saillies (30a et 30b) configurées en arc, opposées et prévues pour s'accoupler à la saillie correspondante présente dans l'autre élément de base formant un canal (350).
4. Structure d'échangeur de chaleur selon la revendication 1, **caractérisé en ce que** ledit premier conduit (5) est raccordé à l'espace (34) de chaque élément rayonnant (3) moyennant un premier passage (35) présent dans le conduit et à travers lequel le liquide entre depuis le conduit (5) à l'intérieur du premier canal (350) créé par l'accouplement des saillies (30a) dans chaque élément rayonnant présent dans le bâti (2).
5. Structure d'échangeur de chaleur selon la revendication 1, **caractérisé en ce que** ledit second conduit (6) est lui aussi raccordé à l'espace (34) de chaque élément rayonnant (3) moyennant un second passage (36) présent dans le conduit (6) et à travers lequel le liquide sort dans le conduit (6) par le côté opposé de la plaque par rapport au passage (35), à partir du second canal (350) créé par l'accouplement des saillies (30b).
6. Structure d'échangeur de chaleur selon la revendication 1, **caractérisé en ce qu'il** est muni de deux premiers conduits (5) d'introduction du liquide froid dans la pluralité d'éléments rayonnants et de deux seconds conduits (6) pour la sortie du liquide qui a été réchauffé entre temps par la pluralité d'éléments

rayonnants.

7. Structure d'échangeur de chaleur selon la revendication 1, **caractérisé en ce que** chaque élément de base (3a, 3b) est réalisé dans un matériau métallique pour l'emboutissage et l'extrusion. 5
8. Structure d'échangeur de chaleur selon la revendication 1, **caractérisé en ce qu'**elle est obtenue par l'assemblage de deux éléments de base pour avoir un élément rayonnant (3) et par la disposition d'une pluralité d'éléments rayonnants disposés verticalement et parallèles l'un par rapport à l'autre pour la structure dans son ensemble. 10
9. Structure d'échangeur de chaleur selon la revendication 1, **caractérisé en ce que** ledit premier et dernier élément de base ne présente par lesdites ailettes externes (32). 15
10. Structure d'échangeur de chaleur selon la revendication 1, **caractérisé en ce qu'**il présente une paroi de fermeture (7) au cas où ledit premier et dernier élément de base présente également des ailettes externes (32) aux extrémités. 20
11. Structure d'échangeur de chaleur selon la revendication 1, **caractérisé en ce qu'**il présente un seul élément rayonnant (3). 25

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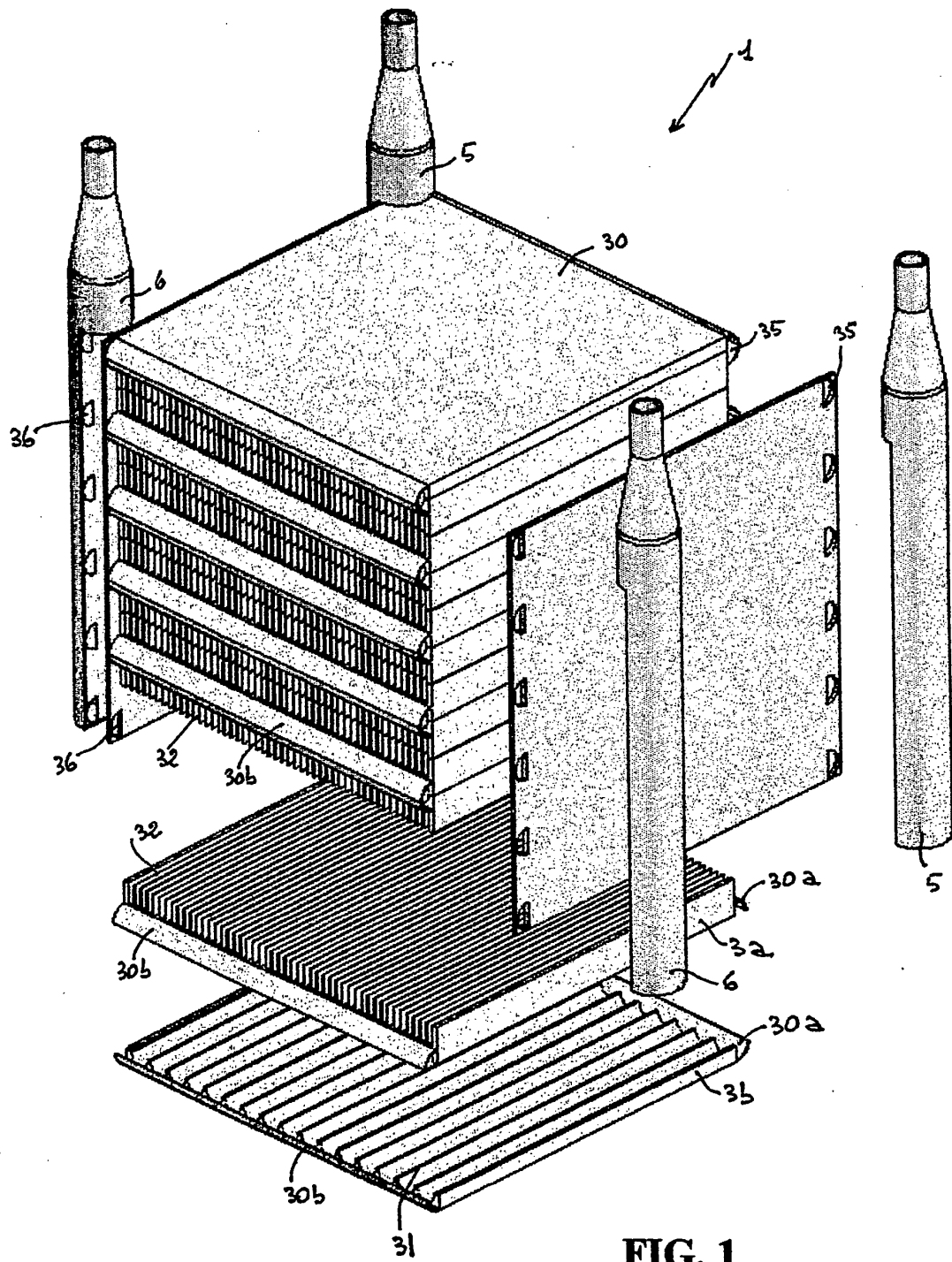


FIG. 1

FIG.2

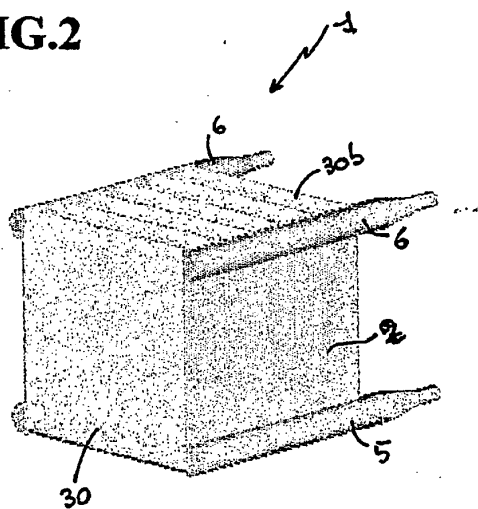


FIG.3

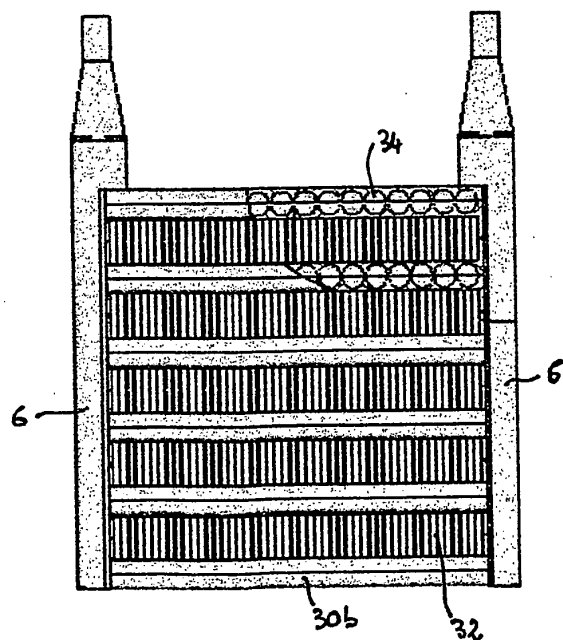
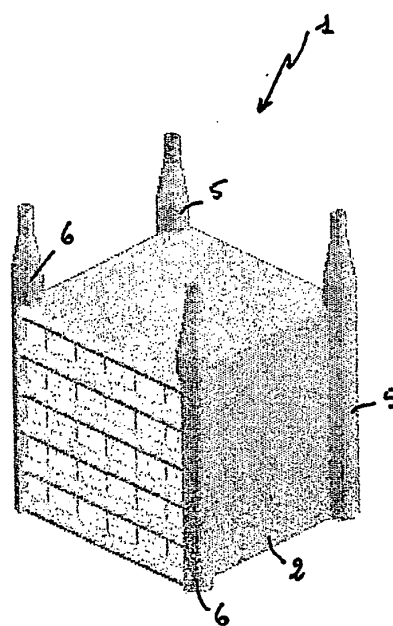


FIG. 4

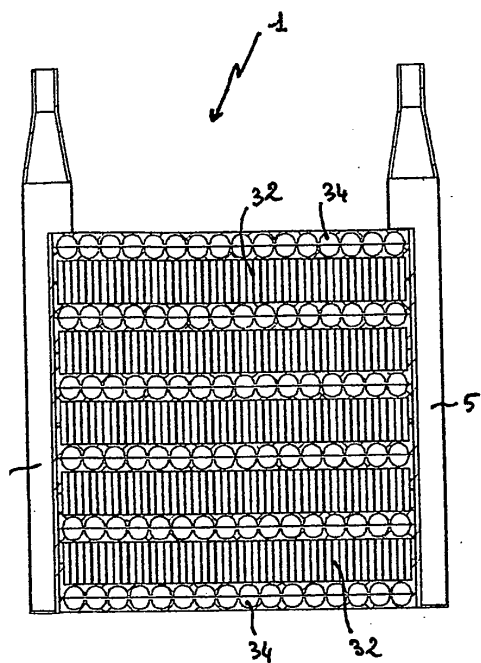


FIG. 6

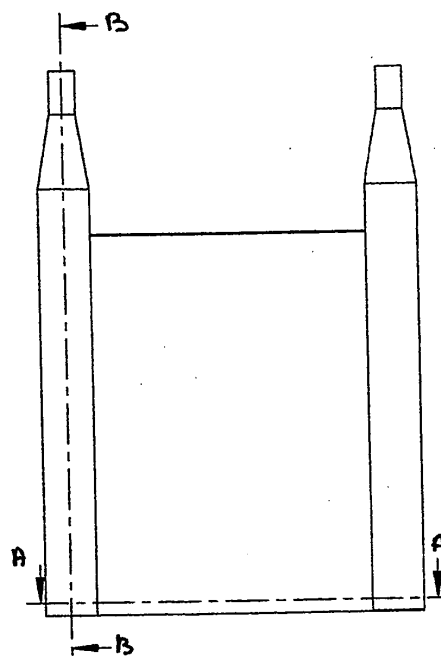
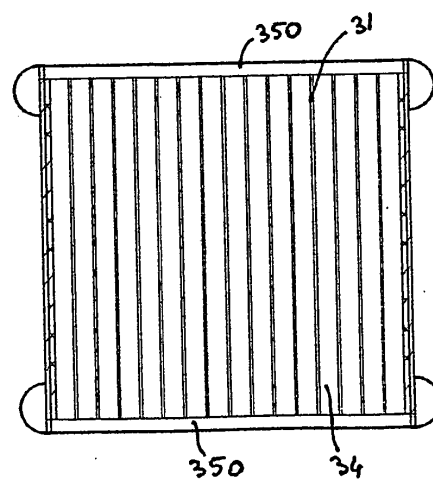


FIG. 5

FIG. 7



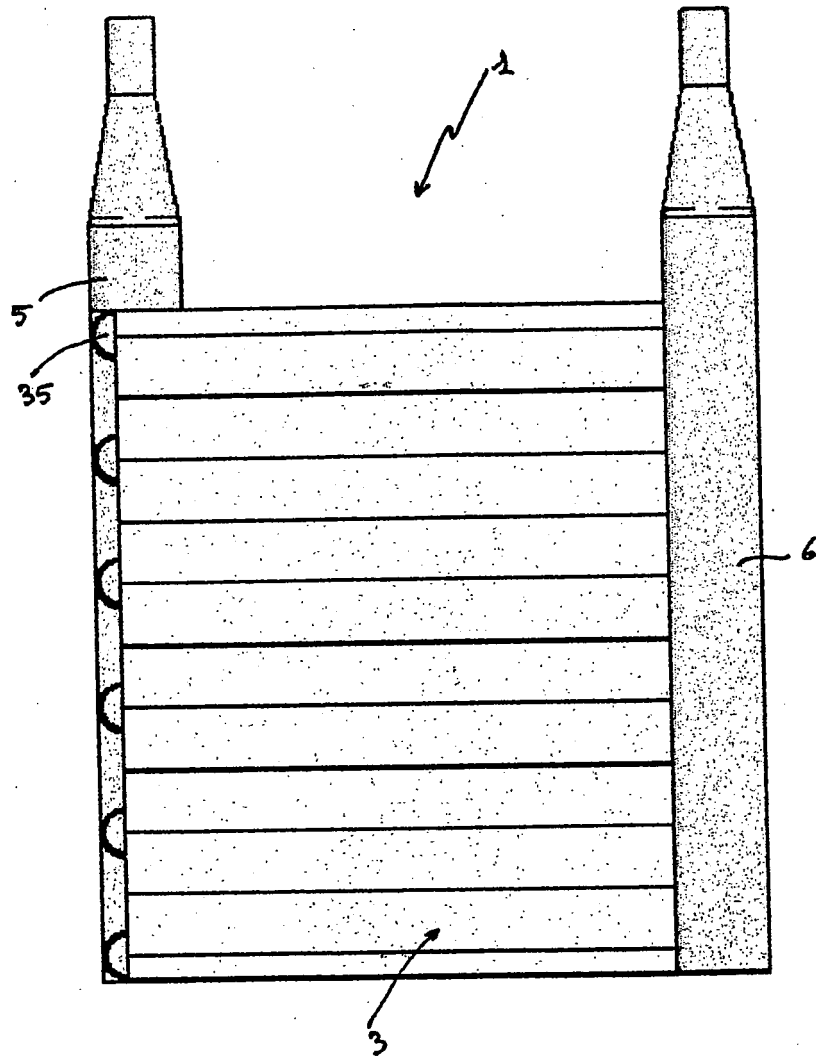


FIG. 8

FIG.9

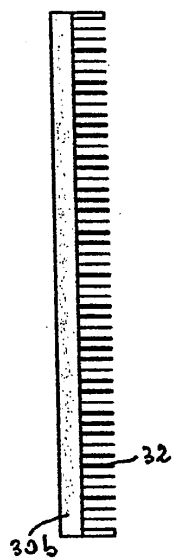


FIG.10

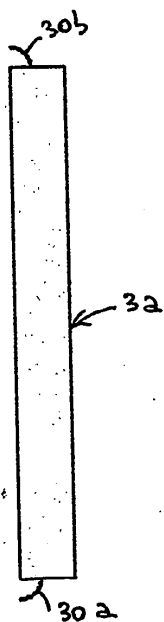
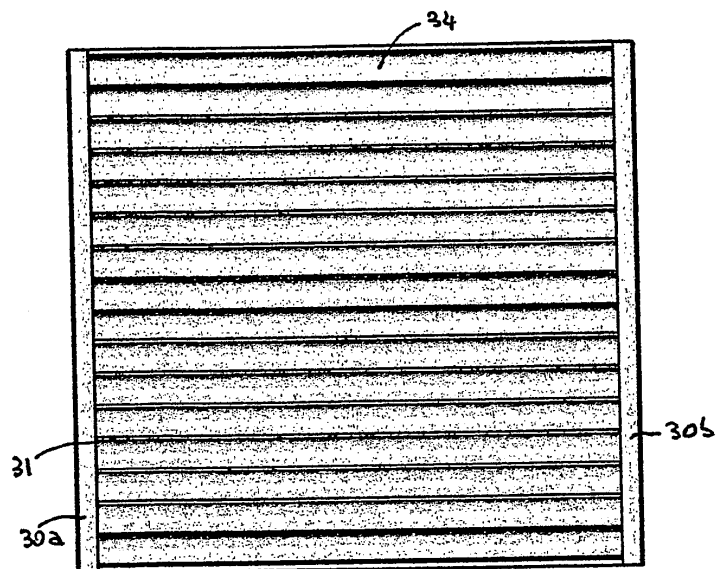


FIG. 11

FIG.12

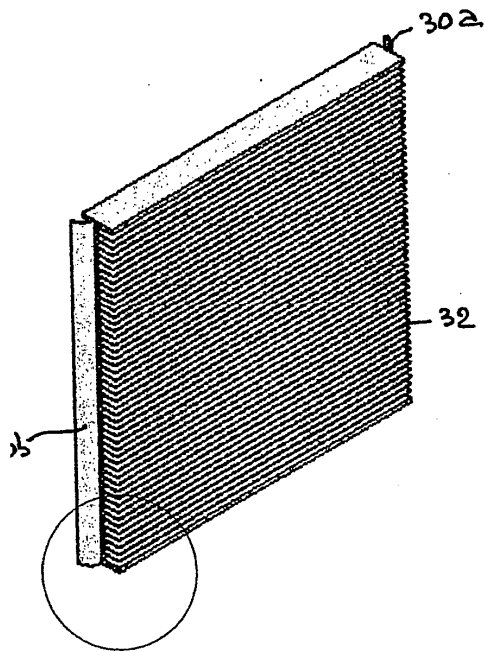


FIG.13

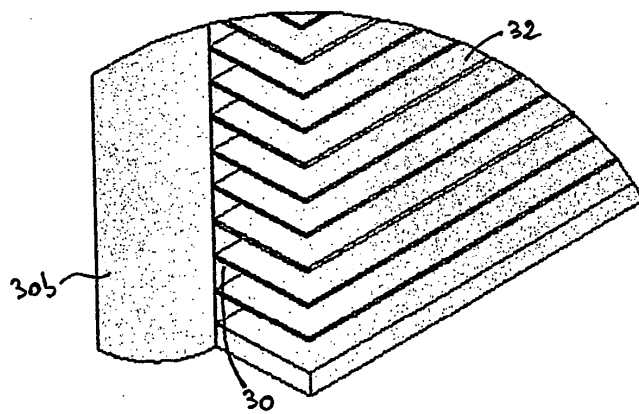
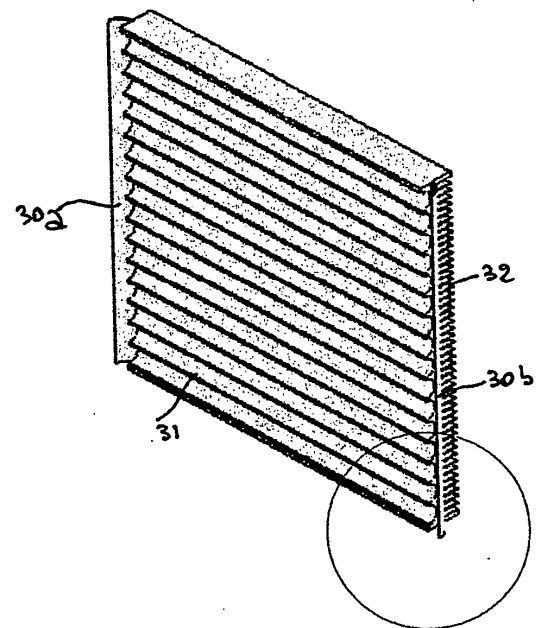


FIG. 14

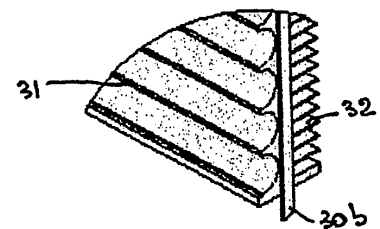


FIG.15

FIG.16

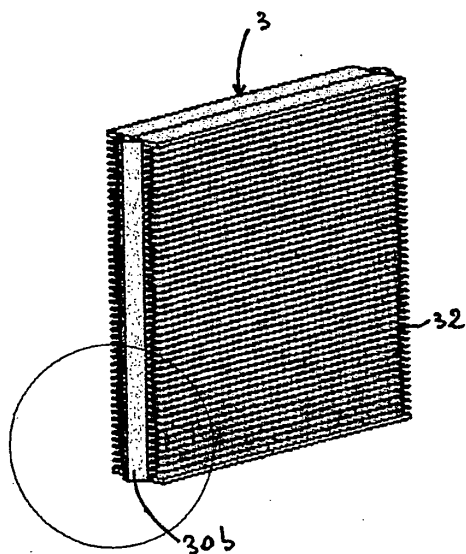
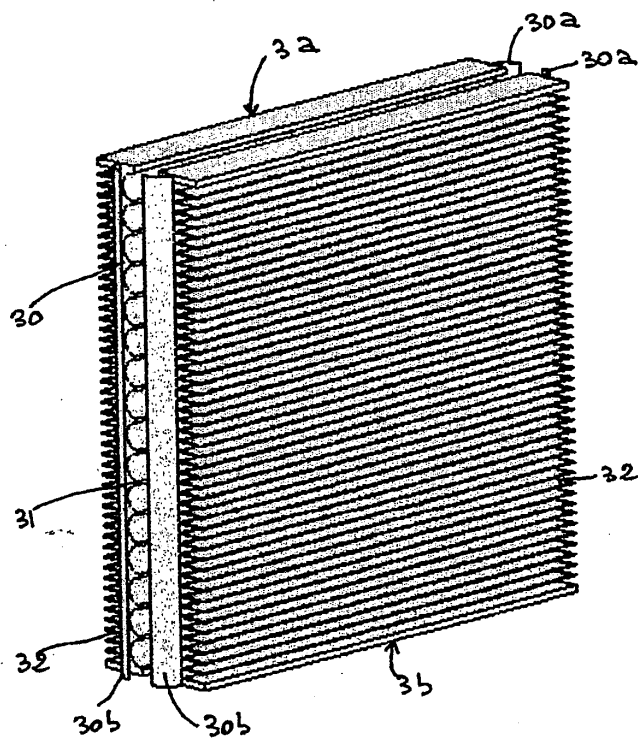


FIG.17

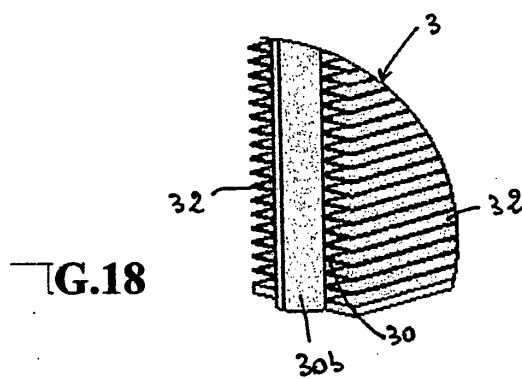


FIG.18

FIG.19

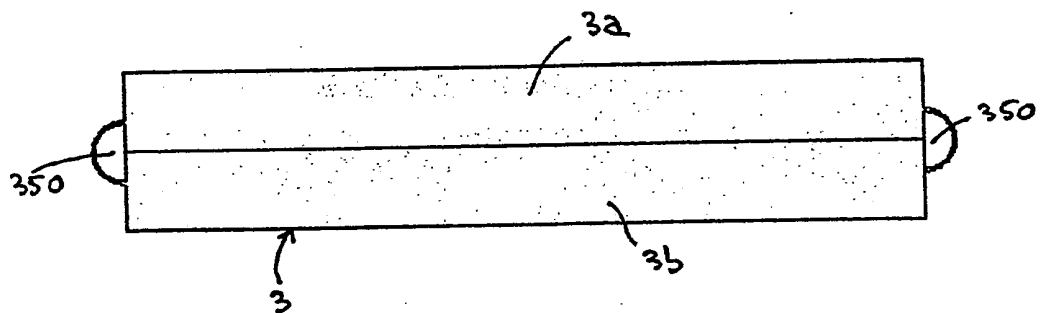
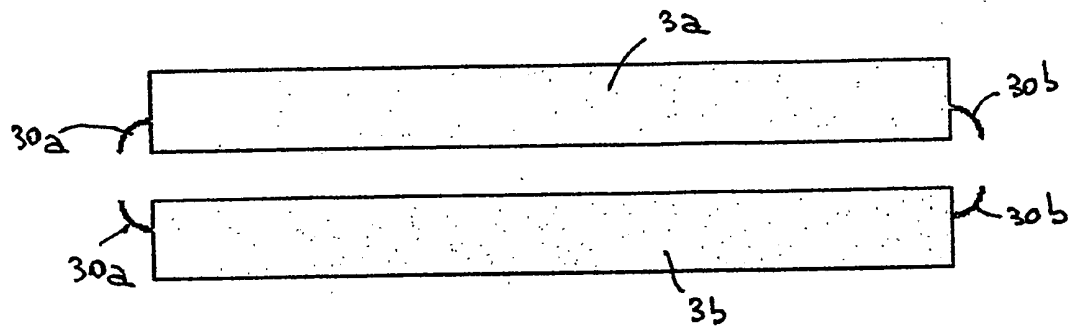


FIG.20

FIG.21

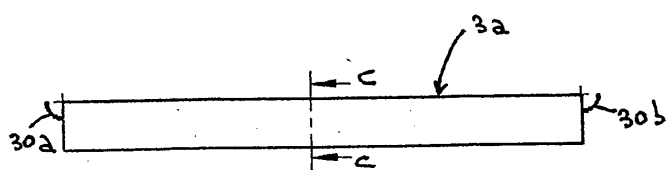


FIG.22

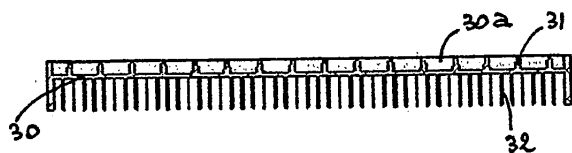


FIG.23

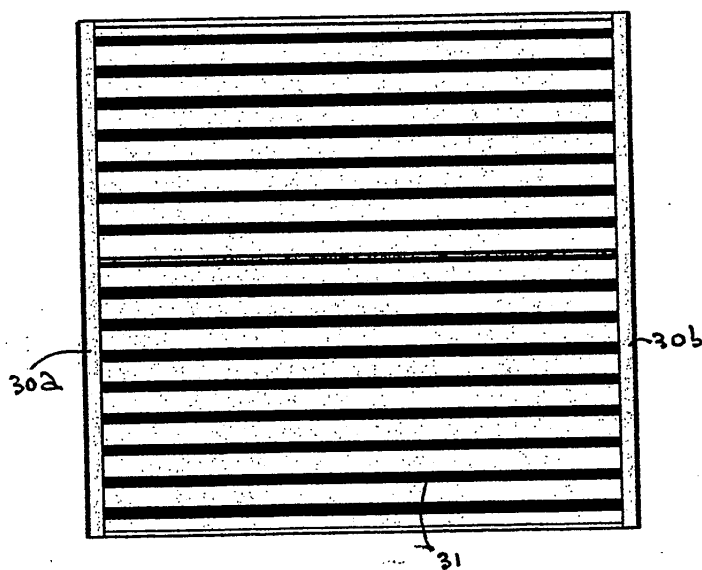


FIG.24

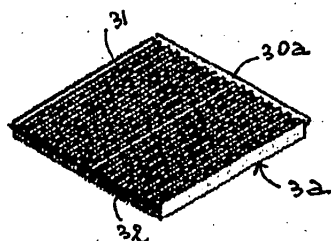


FIG.25

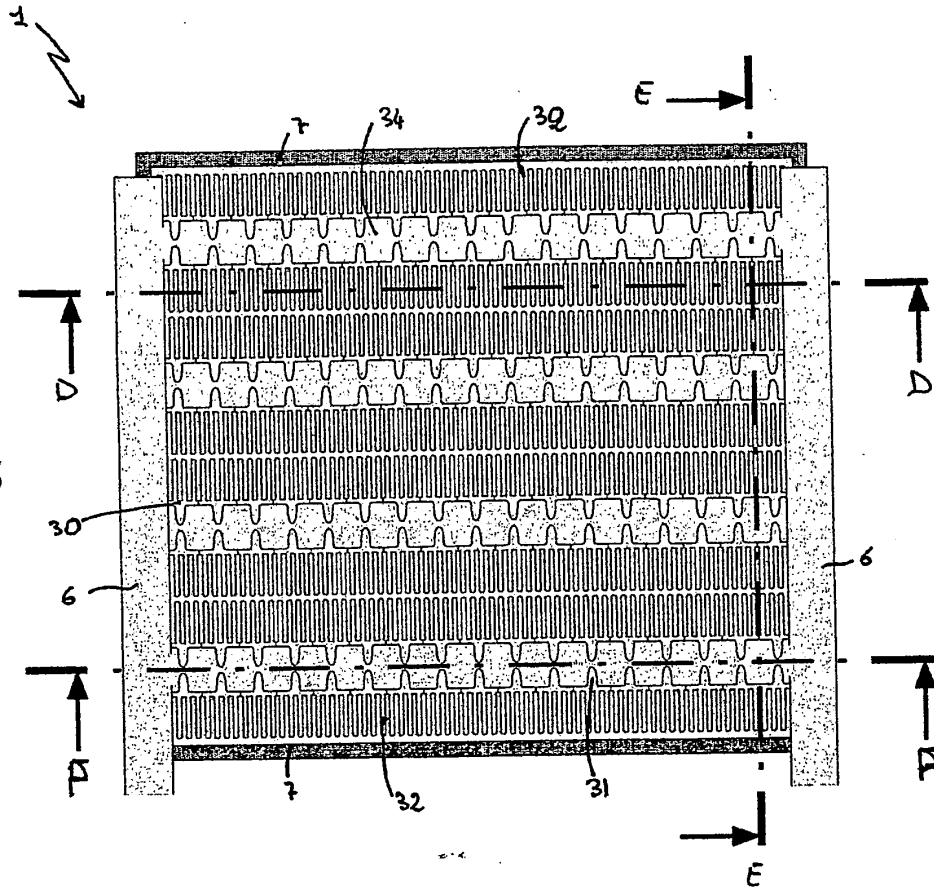


FIG.26

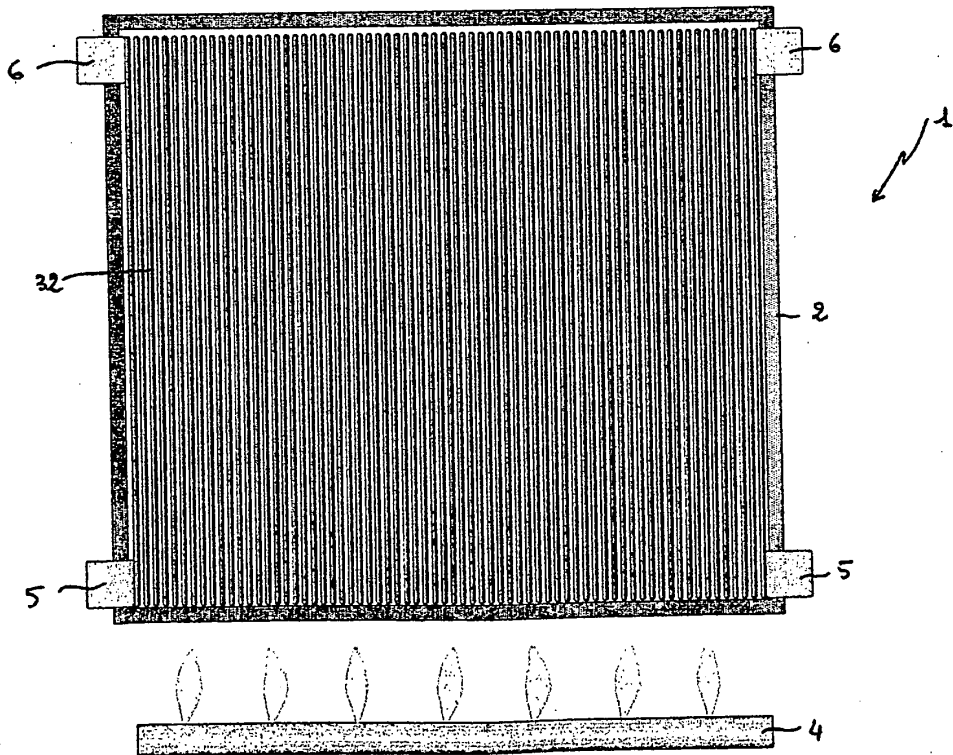


FIG.27

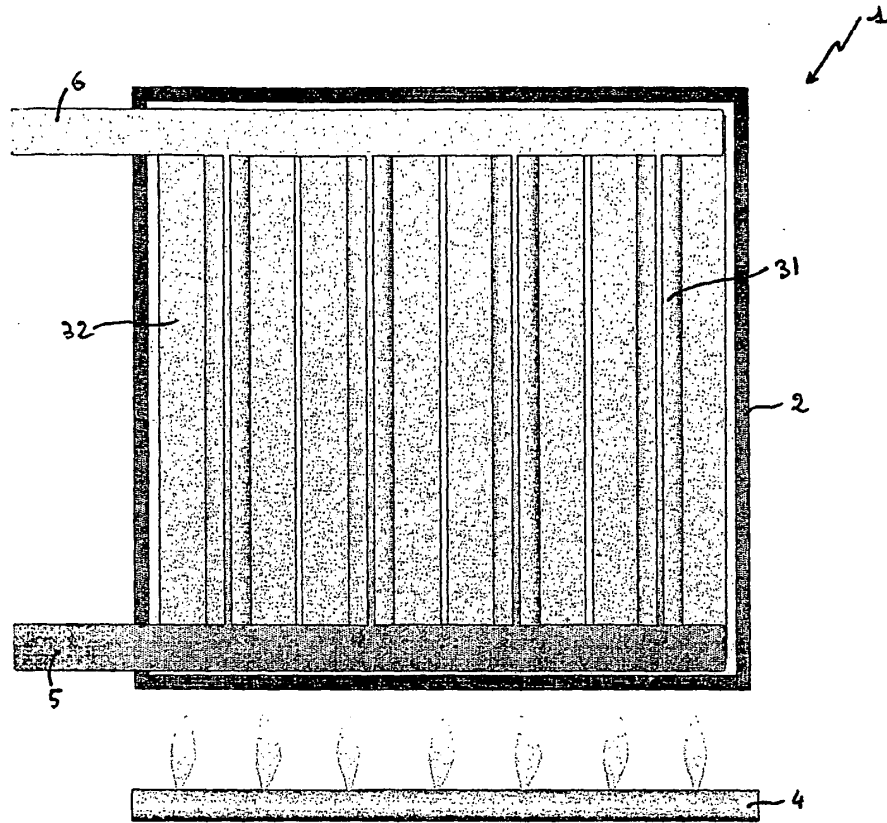


FIG.28

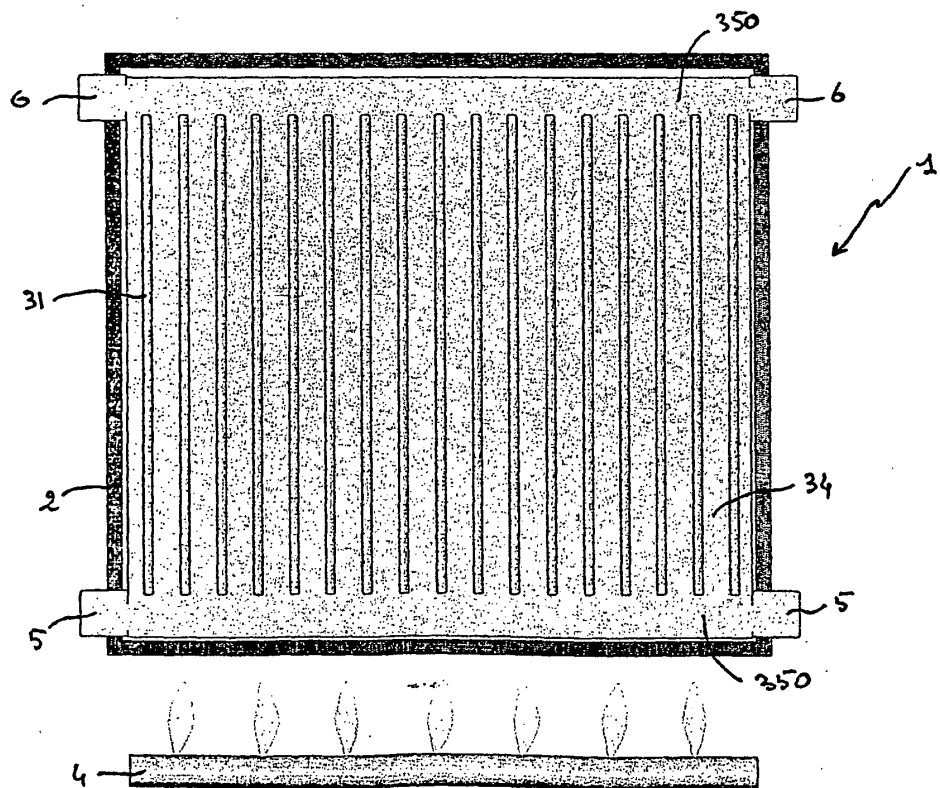


FIG.29

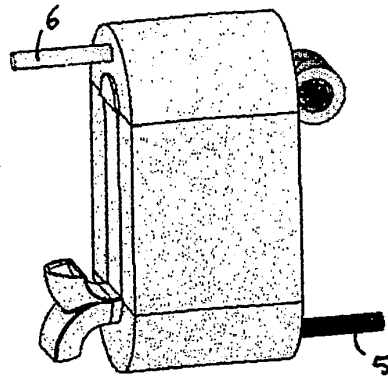


FIG.30

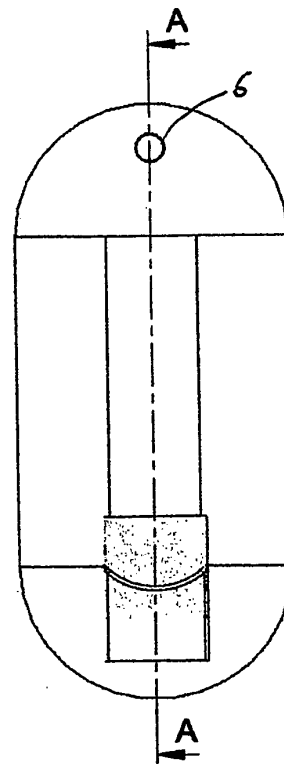


FIG.31

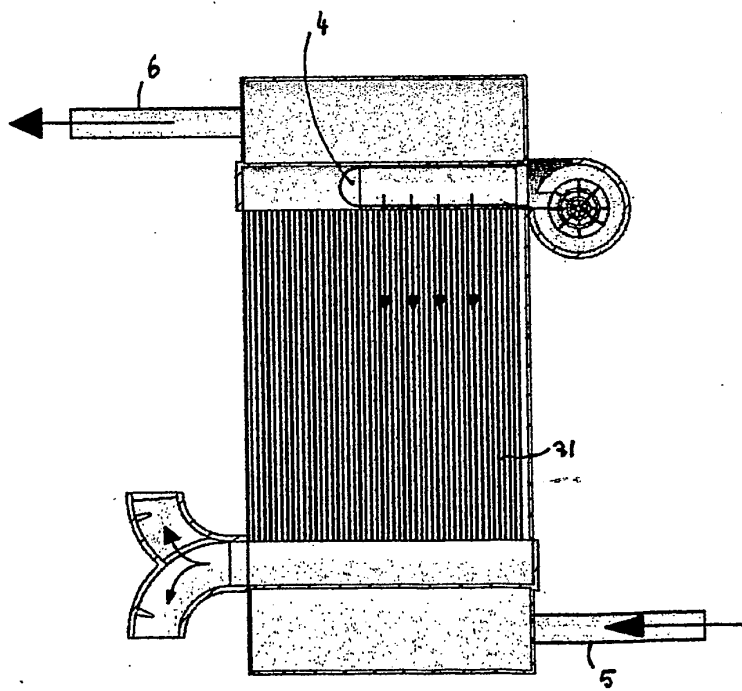


FIG.32

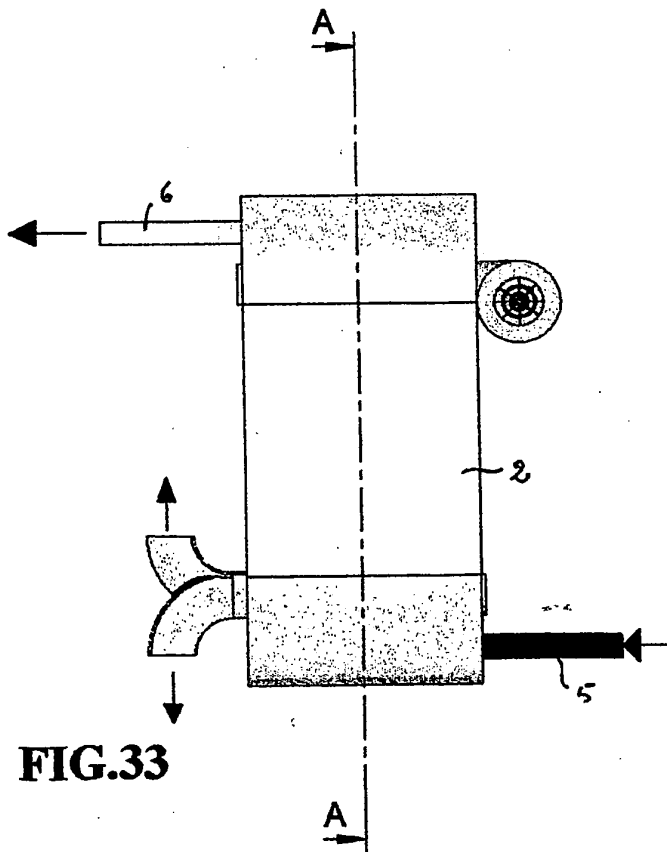
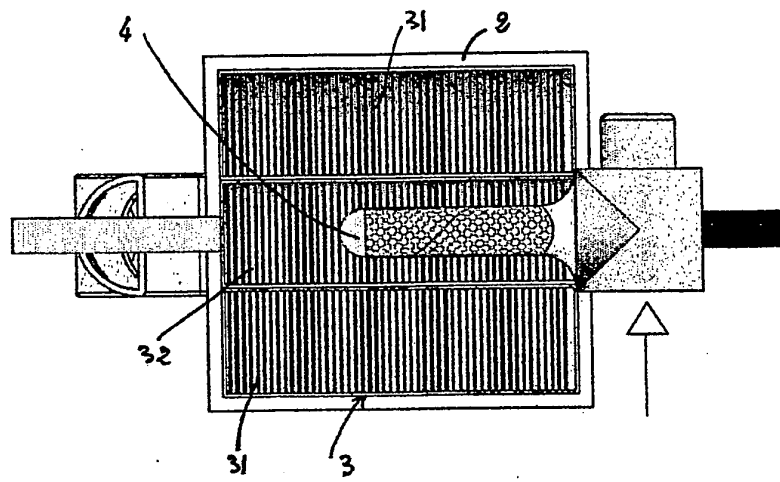


FIG.33

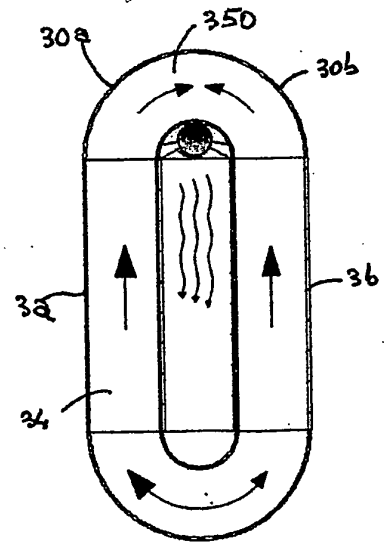


FIG.34

REFERENCES CITED IN THE DESCRIPTION

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