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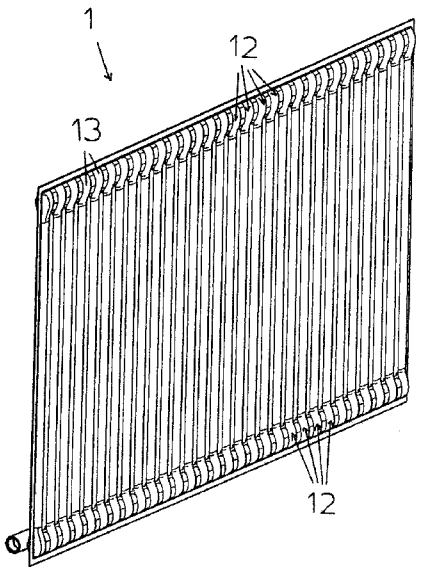


FIG1

(57) Abstract: A plate for a radiant plate radiator for heating a room, formed by a sheet metal body composed of two half-shells (2, 2) reciprocally united along the perimeter thereof at lowered contact areas (3), the body being configured in such a way as to internally delimit a circuit for a heating fluid, comprising a first longitudinal manifold (4), which extends along a first side of the perimeter of the half-shells (2, 2), a second longitudinal manifold (6), which extends along a second side of the perimeter of the half-shells (2, 2) opposite the first side, and a plurality of flat channels (8) which transversally connect the first and second manifold (4, 6) and are separated by the lowered contact areas (3), at least one of the manifolds (4, 6) having mechanical stiffening means for increasing resistance to the pressure of the heating fluid.

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RADIANT PLATE FOR A RADIATOR FOR HEATING A ROOM

DESCRIPTION

The present invention relates to a radiant plate for a radiator for heating a room, and to a radiator that has such a radiant plate.

A type of radiant plate radiator that is either connected to a circuit or autonomous, wherein each radiant plate is formed by one or more sheet metal bodies composed of two half-shells reciprocally united along their perimeter and at lowered internal contact areas, is well known. The body is configured in such a way as to internally delimit a circuit for a heating fluid, comprising a first flat longitudinal manifold which extends along a first side of the perimeter of the half-shells, a second flat longitudinal manifold which extends along a second side of the perimeter of the half-shells opposite the first side, and a plurality of flat channels which transversally connect the manifolds and are separated by the lowered contact areas.

The radiator is designed to be able to withstand the operating pressure, test pressure and burst pressure in accordance with strict regulations.

The solution widely adopted today to impart the necessary structural strength to the radiant plates, especially at the manifolds, where the most critical points are located, envisages the use of sheet steel whose thickness is increased taking into account a specific safety factor. Consequently, the sheet steel presently used for the construction of radiant plates generally has a thickness in the range of 1.1 to 1.2 mm.

This solution, though ensuring the necessary mechanical strength, results in a high consumption of raw materials and heavy weight of the finished product.

The technical task that the present invention sets itself is thus to realize a radiant plate for a radiator for heating a room which enables the aforementioned technical drawbacks of the prior art to be eliminated.

Within the scope of this technical task, one object of the invention is to realize a radiant plate which, though ensuring the necessary mechanical strength, achieves decided savings in raw materials and ultimately a reduction in the weight of the finished product.

Another object of the invention is to realize a robust, economical, lightweight radiant plate which assures optimized heat exchange efficiency.

The technical task, as well as these and other objects, according to the present invention, are achieved by realizing a plate for a radiant plate radiator for heating a room, formed by a sheet metal body composed of two half-shells reciprocally united along their perimeter and at lowered contact areas spaced from said perimeter, said body being configured in such a way as to internally delimit a circuit for a heating fluid, comprising a first longitudinal manifold which extends along a first side of the perimeter of the half-shells, a second longitudinal manifold which extends along a second side of the perimeter of the half-shells opposite the first side, and a plurality of flat channels which transversally connect said first and second manifold and are separated by said lowered contact areas, characterized in that at least one of the manifolds has mechanical stiffening means for increasing its resistance to the pressure of the heating fluid.

According to one particularly advantageous aspect of the invention, the necessary mechanical strength is imparted to the plate not by increasing the thickness of the

sheet of the body it is formed from, but rather by appropriately shaping the sheet with the aim of reinforcing the weaker areas more exposed to the hydraulic pressure of the heating fluid.

Other features of the present invention are moreover defined in the dependent claims.

Additional features and advantages of the invention will be more apparent from the description of a preferred but non-exclusive embodiment of the radiant plate and of the radiant plate radiator according to the invention, illustrated by way of non-restrictive example in the appended drawings, in which:

figure 1 shows an axonometric view of a radiant plate for a radiator:

figure 2 shows the radiant plate of figure 1 viewed frontally;

figure 3 shows the radiant plate cut away along the line B-B of figure 2;

figure 4 shows the radiant plate cut away along the line C-C of figure 2;

figure 5 shows the radiant plate cut away along the line A-A of figure 2 and provided with a first type of plumbing connection;

and figure 6 shows the radiant plate cut away along the line A-A of figure 2 and provided with a traditional type of plumbing connection.

With reference to the aforementioned figures, there is shown a radiant plate 1 for a radiator for heating a room.

The radiator can comprise one or more radiant plates 1 connected in cascade and is generally installed so that it mainly lies in a vertical plane.

Each radiant plate 1 is formed by a sheet metal body, generally of steel, composed of two half-shells 2 reciprocally united, by welding, along their perimeter and at

lowered contact areas 3 spaced from their perimeter.

The body has a much smaller dimension in the direction Z (indicated by an arrow in figure 3), orthogonal to the plane L in which it mainly lies, than in the two directions X, Y (indicated by arrows in figure 2), which are orthogonal to each other and parallel to the plane L in which it mainly lies L (indicated by dot-dash line in figure 4).

The body is configured in such a way as to internally delimit a circuit for a heating fluid, comprising a first longitudinal manifold 4, which extends along a first side 5 of the perimeter of the half-shells 2, a second longitudinal manifold 6, which extends along a second side 7 of the perimeter of the half-shells 2 opposite to the first side 5, and a plurality of flat channels 8 which transversally connect the first manifold 4 to the second manifold 6 and are separated by means of the lowered contact areas 3.

More precisely, each manifold 4, 6 extends along a straight longitudinal axis, whereas the flat channels 8, as well as the areas 3, are parallel to one another and equally spaced and extend along a straight longitudinal axis which is orthogonal to that of the manifolds 4, 6.

In particular, each flat channel 8 has a substantially rounded hexagonal cross section, being delimited by two opposite flat walls 9 parallel to the plane L in which the body mainly lies and by four inclined walls 10, whereas each lowered contact area 3 is defined between two mutually opposite flat walls 11 in contact and parallel to the plane L in which the body mainly lies.

Advantageously, at least one of the manifolds 4, 6, and preferably both of the

manifolds 4, 6, have mechanical stiffening means for increasing the resistance to the pressure of the heating fluid.

The reinforcement means preferably comprise one or more reinforcement ribs 12 obtained by suitably shaping the metal sheet of the half-shells 2 in the area that forms the manifolds 4, 6.

The half-shells 2 are configured in such a way that at least one manifold 4, 6 and preferably both manifolds 4, 6 have a dimension in the direction Z, orthogonal to the plane L in which the body mainly lies, that is preferably greater than or equal to that of the flat channels 8.

In particular, each manifold 4, 6 has a large rounded cross section for at least most of its longitudinal extent.

The ribs 12 are preferably configured as areas 13 of the sheet which project toward the outside of the manifolds 4, 6.

In this manner, the ribs 12 contribute on one hand to increasing the passage section for the heating fluid supplied by manifolds 4, 6, and on the other hand create in the manifolds 4, 6 recesses which favour the creation of greater turbulence in the flow of heating fluid, as exemplified by the arrows in figures 5 and 6, which illustrate the path of the heating fluid, with a consequent improvement in the overall heat exchange efficiency.

Each area 13 extends along the axial extension of a flat channel 8, and preferably extends for the whole transversal extent of the manifold 4, 6.

Therefore, the manifold 4, 6 comprises, in an axial direction, a sequence of areas 13 that are in greater relief due to the presence of the ribs 12, alternating with areas

that are in lesser relief 21, where no ribs 12 are present, but which nonetheless have a dimension in direction Z that is preferably is greater than or equal to that of the flat channels 8.

Along the transversal direction of each manifold 4, 6, the areas 13 have a variable distance in direction Z from the areas 21, and in particular this distance is progressively reduced proceeding from the end of the flat channel 8 to the perimetrical side of the half-shells 2.

In the area where a hole 15 is provided for the plumbing connector 16, the manifold 4, 6 can advantageously be flattened to facilitate the connection with the connector 16 itself.

The plumbing connector in figure 5, specially designed for the new plate, comprises a bushing 17 having a flat end fixed against the inner side of the flattened area of the manifold 4, 6. The part of the bushing 17 that is external to the plate is introduced at a right angle into a coupling 19 and is provided with radial holes 18 for the passage of the heating fluid from the coupling 19 to the manifold 4, 6.

The plumbing connector 16 shown in figure 6 is instead of a traditional type and is mounted with the aid of a ring 20 fixed inside the manifold 4, 6. Advantageously, therefore, it is possible to apply a traditional plumbing connection to the new plate without the need to change the already existing equipment and assembly lines.

Thanks to the stiffening means provided, a sheet of reduced thickness can be used for the half-shells 2, in particular a sheet steel of a thickness ranging between 0.7 mm and 0.9 mm, with obvious positive repercussions in terms of savings of raw

materials and reduction in the weight of the finished product.

It has been found that in this range of sheet thickness the heat exchange efficiency remains practically unchanged compared to that obtainable with the thicknesses traditionally adopted.

The radiator that is realizable with such a radiant plate can be connected to a circuit or be autonomous and the heating fluid is preferably water, a water and glycol mixture, or diathermic oil.

The radiant plate thus conceived is susceptible of numerous modifications and variants, all falling within the scope of the inventive concept; moreover, all the details may be replaced with other technically equivalent ones.

In practice, all of the materials used, as well as the dimensions, can be any whatsoever according to need and the state of the art.

CLAIMS

1. A plate (1) for a radiant plate radiator for heating a room, formed by a sheet metal body composed of two half-shells (2) reciprocally united along the perimeter thereof and at lowered contact areas (3) spaced from said perimeter thereof, said body delimiting a circuit for a heating fluid, comprising a first longitudinal manifold (4) which extends along a first side (5) of the perimeter of the half-shells (2), a second longitudinal manifold (6) which extends along a second side (7) of the perimeter of the half-shells (2) opposite the first side (5), and a plurality of flat channels (8) which transversally connect said first and second manifold (4, 6) and are separated by said lowered contact areas (3), characterized in that at least one of the manifolds (4, 6) has mechanical stiffening means for increasing the resistance thereof to the pressure of the heating fluid, and that the dimension of at least one manifold (4,6) in the direction orthogonal to the plane (L) in which the body mainly lies is greater than or equal to that of the flat channels (8).
2. The plate (1) for a radiant plate radiator for heating a room according to the preceding claim, characterized in that said stiffening means comprise one or more ribs of the metal sheet (12).
3. The plate (1) for a radiant plate radiator for heating a room according to any preceding claim, characterized in that at least one manifold (4, 6) has a rounded cross section at least along a main longitudinal portion thereof.
4. The plate (1) for a radiant plate radiator for heating a room according to any preceding claim, characterized in that at least one manifold (4, 6) has a flattened

area provided with a hole (15) for inserting a plumbing connector (16).

5. The plate (1) for a radiant plate radiator for heating a room according to any of claims 2 to 4, characterized in that said ribs (12) are configured as areas (13) projecting toward the outside of the manifold.
6. The plate (1) for a radiant plate radiator for heating a room according to the preceding claim, characterized in that at least one projecting area (13) extends along the extension of a flat channel (8).
7. The plate (1) for a radiant plate radiator for heating a room according to either of claims 5 and 6, characterized in that at least one projecting area (13) extends for the entire transversal extent of the manifold (4, 6).
8. The plate (1) for a radiant plate radiator for heating a room according to any one of claims 5 to 7, characterized in that said manifold (4, 6) comprises, in an axial direction, a sequence of projecting areas (13) that are in greater relief due to the presence of the ribs (12), alternating with areas that are in lesser relief (21), where no ribs (12) are present, but which have a dimension in the direction orthogonal to the plane (L) in which the body mainly lies that is greater than or equal to that of the flat channels (8).
9. The plate (1) for a radiant plate radiator for heating a room according to the preceding claim, characterized in that along the transversal direction of the manifold (4, 6) the projecting areas (13) have a variable distance from the areas in lesser relief (21) in the direction orthogonal to the plane (L) in which the body mainly lies.
10. The plate (1) for a radiant plate radiator for heating a room according to the

preceding claim, characterized in that said distance progressively decreases proceeding from the end of the flat channel (8) to the perimetrical side of the half-shells (2).

11. The plate (1) for a radiant plate radiator for heating a room according to the preceding claim, characterized in that said sheet metal is steel and has a thickness ranging between 0.7 mm and 0.9 mm.

12. A radiator for heating a room, characterized in that it comprises at least one radiant plate in accordance with any preceding claim.

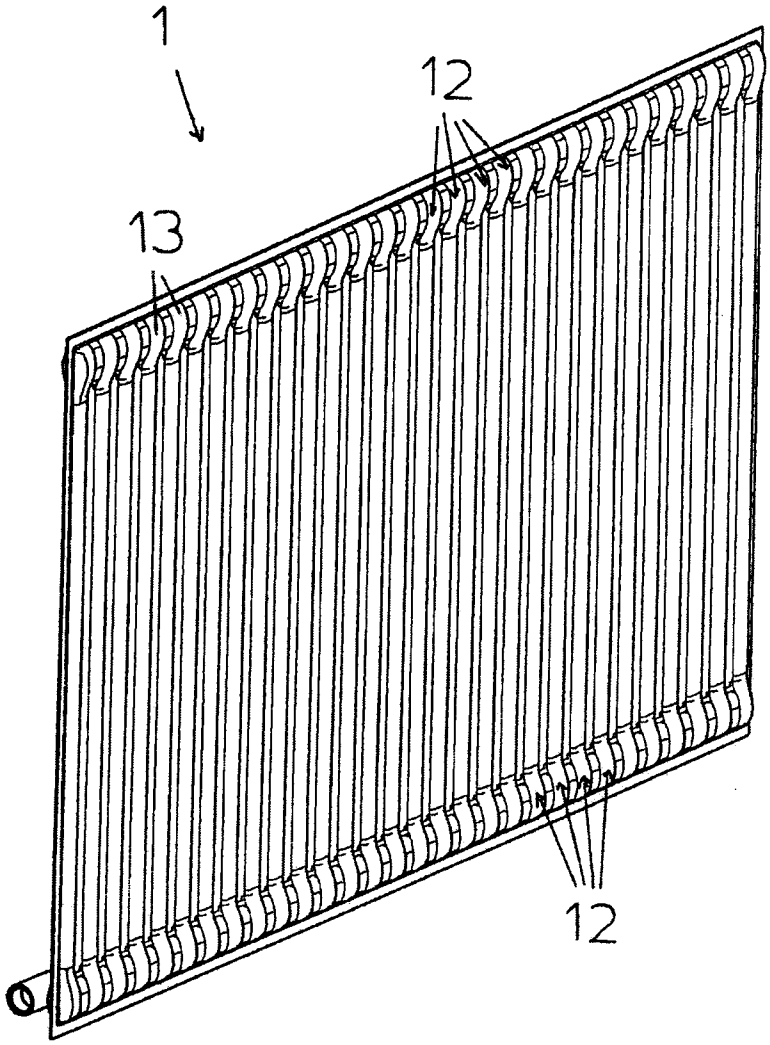


FIG1

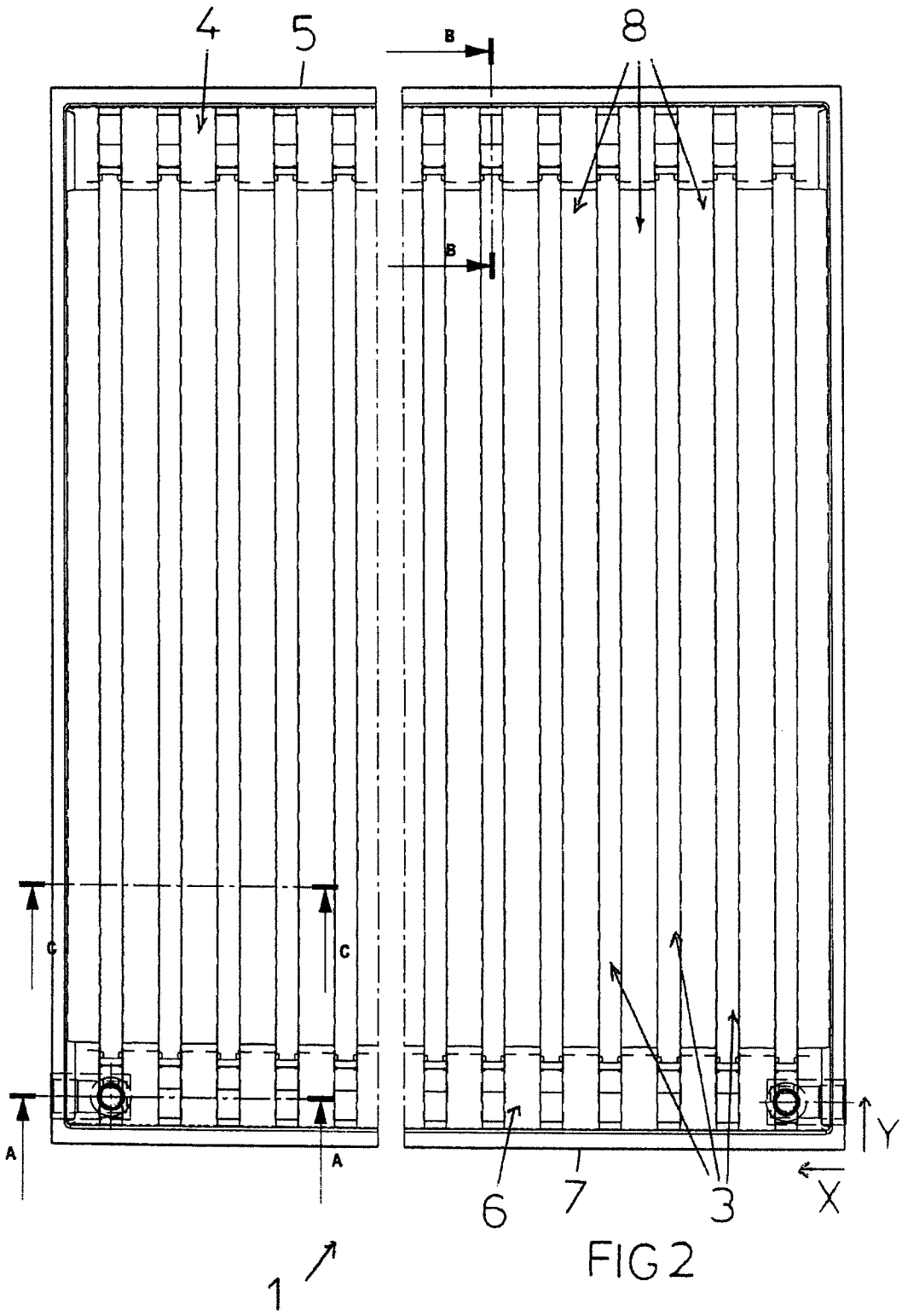


FIG 2

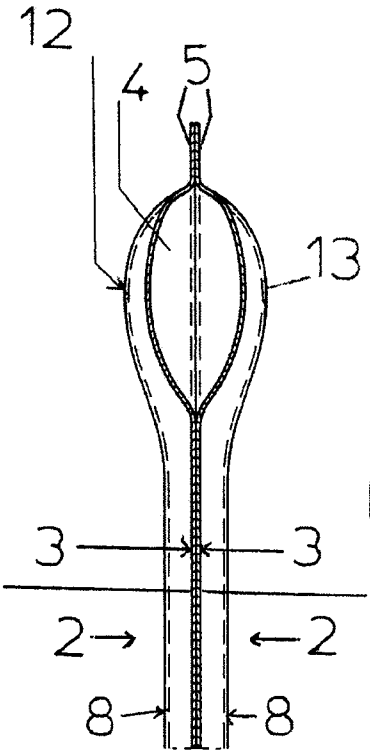


FIG3

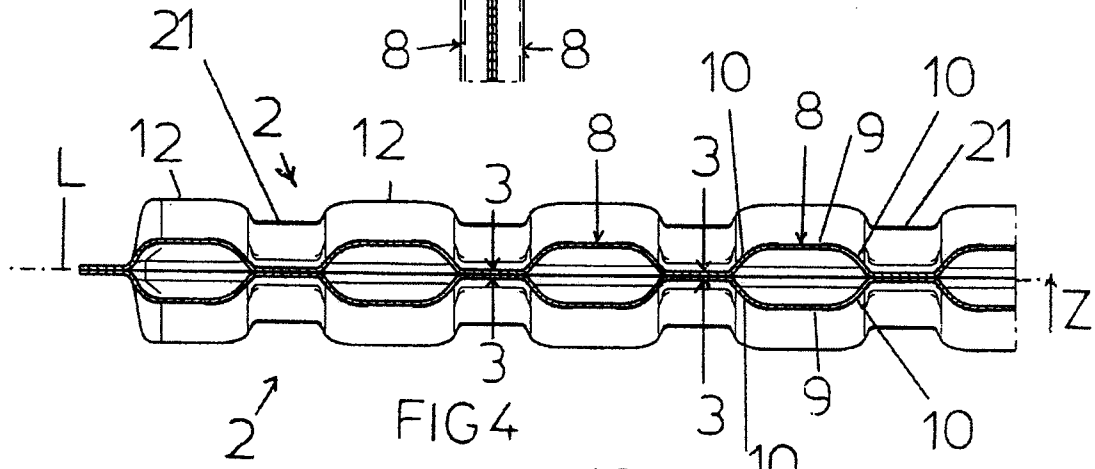


FIG4

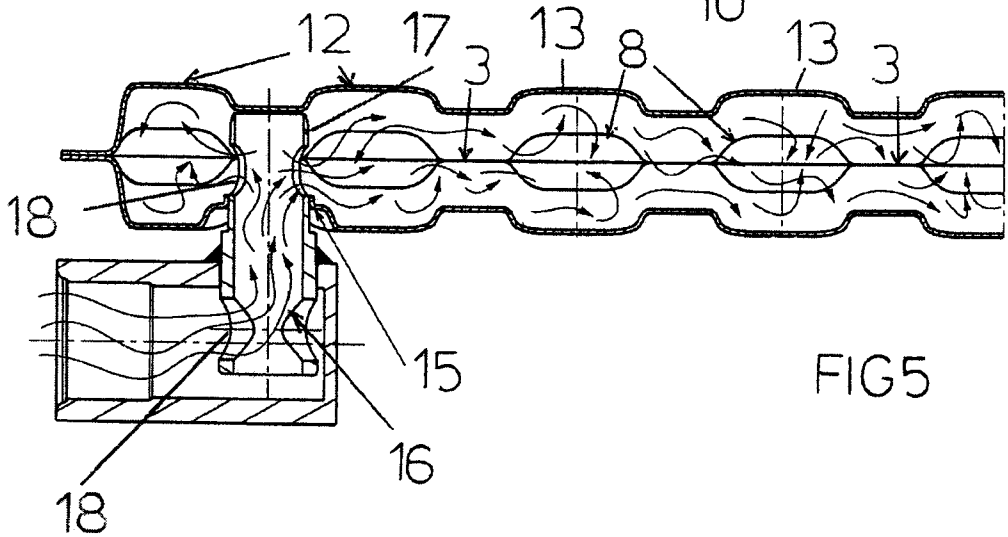


FIG5

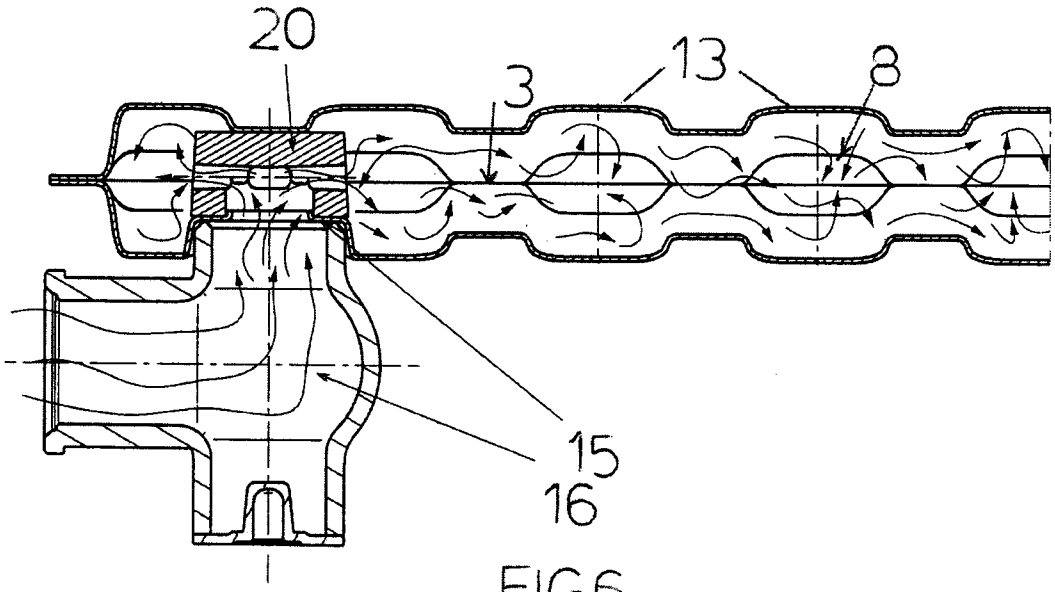


FIG 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/IT2013/000173

A. CLASSIFICATION OF SUBJECT MATTER
INV. F28D1/03
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F28D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	FR 1 566 662 A (SOCIETE GENERALE DE FONDERIE) 9 May 1969 (1969-05-09) page 1 - page 2; figures 1-5	1
X	US 2 957 679 A (CAMPBELL HUNTLY M) 25 October 1960 (1960-10-25) column 3, line 40 - column 4, line 34; figures 1,6	1
A	FR 1 398 806 A (FINISSAGE DE PRODUITS METALLUR) 14 May 1965 (1965-05-14) figures 1-3	1-12

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
18 September 2013	27/09/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Delval, Stéphane

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Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2004/005825 A1 (DANA CANADA CORP [CA]; WU ALAN [CA]; MARTIN MICHAEL [CA]; ABELS KENNET) 15 January 2004 (2004-01-15) page 3, line 19 - page 4, line 2; figure 1 -----	1-12
A	FR 1 566 565 A (SOCIETE GENERALE DE FONDERIE) 9 May 1969 (1969-05-09) figures 1-9 -----	1-12

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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