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(72) Inventors:
• **Crosetta, Cristiano**
31023 Resena TV (IT)
• **Crosetta, Renzo**
31023 Resena TV (IT)

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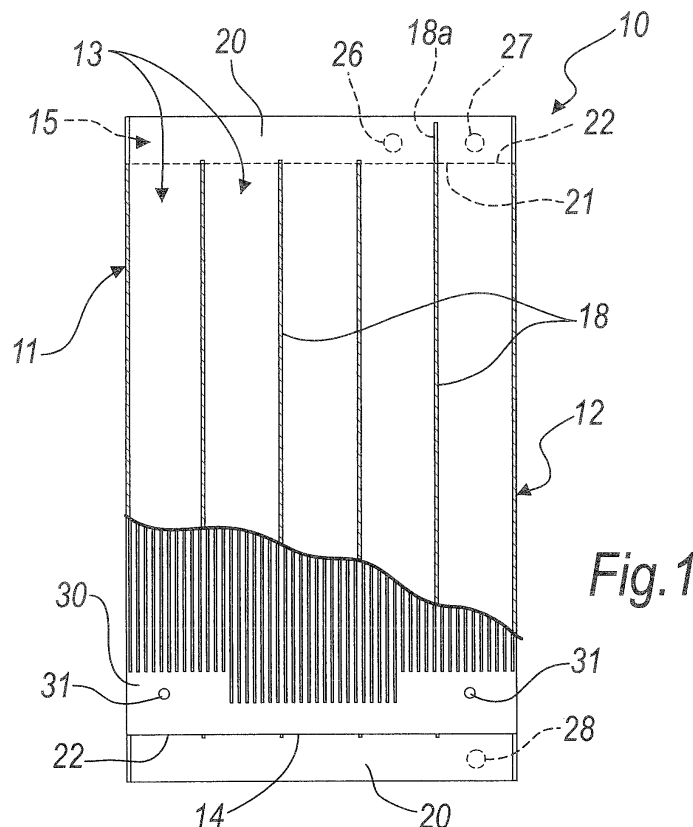
(74) Representative: **Modiano, Micaela Nadia**
Dr. Modiano & Associati SpA
Via Meravigli 16
20123 Milano (IT)

(71) Applicant: **Tubes Radiatori S.R.L.**
31023 Resana TV (IT)

(54) **Heating element for heaters**

(57) A heating element for heaters, of the modular type, comprising at least one radiating module (11, 111), which is constituted by a metallic plate (12, 112) within which, along its planar dimension, there are a plurality of parallel ducts (13, 113) which are open at their ends (14,

114), and at least two manifold modules (15, 115), which are fixed to the plate (12, 112) respectively on opposite sides at the opposite end openings (14, 114) of the ducts (13, 113). The plate (12, 112) that composes the radiating module (11, 111) and the manifold modules (15, 115) are each constituted by a single piece of extruded aluminum.



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Description

[0001] The present invention relates to a heating element for heaters.

[0002] A current trend in the market of furniture components for heating is to provide heaters which have a spare styling and are as flat as possible.

[0003] For example, radiators composed in practice of radiating panels, constituted by a shell-and-tube heating element incorporated in a flat matrix which radiates its heat into the environment, are particularly appreciated.

[0004] The aim of the present invention is to provide a heating element for heaters which is particularly flat so that it can be associated with flat heaters, achieving in any case a heat efficiency which is perceived as satisfactory by the user.

[0005] Within this aim, an object of the present invention is to provide a heating element for heaters which is flexible in its association with flat heaters.

[0006] Another object of the present invention is to provide a heating element for heaters which has a reduced wall space occupation with respect to known heating elements.

[0007] Another object of the present invention is to provide a heating element for heaters which has excellent radiating capabilities.

[0008] Another object of the present invention is to provide a heating element for heaters which allows to achieve cost reductions for its manufacture and/or inventory management.

[0009] A further object of the present invention is to provide a heating element which can directly constitute a heater.

[0010] A still further object of the present invention is to provide a heating element which can be manufactured with known systems and technologies.

[0011] This aim and these and other objects, which will become better apparent hereinafter, are achieved by a heating element for heaters, of the modular type, characterized in that it comprises at least one radiating module, which is constituted by a metallic plate within which, along its planar dimension, there are a plurality of parallel ducts which are open at their ends, and at least two manifold modules, which are fixed to said plate respectively on opposite sides at the opposite end openings of said ducts, said at least two manifold modules, together with said parallel ducts, forming a path for a heat transfer liquid, said radiator being composed selectively of a single plate or of several plates, which form the radiating modules and are mutually fixed at their lateral edges so that said ducts of all the radiating modules are parallel, said at least two manifold modules being arranged transversely to all of said ducts at the opposite end openings of said ducts.

[0012] Further characteristics and advantages of the invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment thereof, illustrated by way of non-limiting ex-

ample in the accompanying drawings, wherein:

Figure 1 is a partially sectional front view of a heating element for heaters according to the invention;

Figure 2 is a top view of the radiating module which composes a heating element for heaters according to the invention;

Figure 3 is a sectional side view of a heating element for heaters according to the invention;

Figure 4 is an enlarged-scale view of a detail of the lateral cross-section of Figure 3;

Figure 5 is a schematic perspective view of a corner portion of a heating element for heaters according to the invention;

Figure 6 is an exploded schematic perspective view of a corner portion of a heating element for heaters according to the invention;

Figure 7 is a front view of a heating element for heaters composed of three radiating modules which are welded laterally.

[0013] With reference to the figures, in a first embodiment a heating element for heaters according to the invention is generally designated by the reference numeral 10.

[0014] The heating element 10 comprises a radiating module 11, which is constituted by a metal plate 12 inside which, along its planar dimension, there are a plurality of parallel ducts 13, which are open at their ends 14.

[0015] The heating element 10 further comprises two manifold modules 15, which are fixed to the plate 12 respectively on opposite sides at the opposite end openings 14 of the ducts 13.

[0016] The two manifold modules 15, together with the ducts 13, form a path for a heat transfer liquid, such as hot water, which arrives from a heating system connected to the heating element 10.

[0017] In particular, the plate 12 is constituted by a single piece of extruded aluminum, which has a rectangular perimetric shape; in practice, the plate 12 has two facing plate-like portions, respectively a first plate-like portion 16 and a second plate-like portion 17, which are connected by longitudinal partitions 18 which delimit the ducts 13 laterally.

[0018] The ducts 13 therefore have a flattened rectangular contour.

[0019] A series of fins 19 protrudes at right angles outward from the first plate-like portion 16; said fins are parallel to the longitudinal dimension of the ducts 13 and are formed monolithically with the plate 12.

[0020] At the end openings 14 of the ducts 13, the second plate-like portion 17 protrudes beyond the end openings 14, forming a band 20 which is oriented transversely with respect to the ducts 13 (according to the orientation of the figures, there are two bands 20, an upper one and a lower one).

[0021] In practice, each manifold module 15 is formed by a single element which has a substantially L-shaped

cross-section.

[0022] Each manifold module 15 rests, with a first longitudinal end edge 21, on the border 22 of the first plate-like portion 16 which corresponds to the region of the end openings 14 and, with its second longitudinal end edge 23, which is perpendicular to the first longitudinal end edge 21, against the second plate-like portion 17.

[0023] As shown in Figure 4, the second longitudinal end edge 23 of the manifold module 15 is wider, in order to rest well against the second plate-like portion 17, so that it is aligned with the end edge 24 thereof.

[0024] The manifold modules 15 also are made of extruded aluminum and are fixed to the plate 12 by welding.

[0025] Figure 4 also shows a bevel 25, which is formed on the first longitudinal end edge 21 in order to facilitate the welding of said region of the manifold module 15 to the plate 12.

[0026] In particular, the longitudinal partitions 18 which delimit laterally the ducts 13 protrude externally with respect to the border 22 of the first plate-like portion 16 which corresponds to the region of the end openings 14.

[0027] In this embodiment, the longitudinal partitions 18 that correspond to the side walls of the plate 12 reach the end edge 24 of the second plate-like portion 17, so as to close laterally the space delimited by the plate 12 and by the manifold modules 15.

[0028] Depending on the particular manufacturing requirements, each longitudinal partition 18 related to the inside of the plate 12 can protrude externally with respect to one of the two borders 22 of the first plate-like portion 16, obstructing the channel formed by the manifold module 15 together with the band 20 of the plate 12, so as to provide dividing walls 18a inside said manifold module which are adapted to form a particular path for the heat transfer fluid, which is useful for distributing said heat transfer fluid over the entire surface of the plate 12; in this embodiment there is a single dividing wall 18a arranged on the lower band 20.

[0029] In the manifold modules 15 there are also an intake hole 26 and a discharge hole 27 for the heat transfer fluid, which are connected to the duct of the hydraulic heating system, and there is a vent hole 28, where the vent valve is to be connected.

[0030] The intake hole 26 and the discharge hole 27 are arranged, for example, on opposite sides of the dividing wall 18a, while the vent hole 28 is located at the upper band 20.

[0031] At the corners 30 of the area occupied by the fins 19, said fins have a recess so as to provide space for positioning the wall supports 31 for the heating element 10.

[0032] A different embodiment of the heating element, now designated by the reference numeral 100, as shown in Figure 7, is described hereinafter.

[0033] This embodiment comprises three radiating modules 111 which are arranged side-by-side and are welded in pairs.

[0034] In particular, the plates 112 which form the ra-

diating modules 111 are welded at the lateral edges 129 so that the ducts 113 of all the radiating modules 115 are parallel.

[0035] The two manifold modules 115 of course are arranged transversely to all the ducts at the opposite end openings 114 of said ducts.

[0036] In this case, the longitudinal partitions 118 which correspond to the outer side walls of the outermost plates 112 reach the end edge 124 of the second plate-like portion 117, so as to close laterally the space delimited by the plates 112 and by the manifold modules 115.

[0037] In this case also, the intake hole 126 and the discharge hole 127 are arranged, for example, on opposite sides of a dividing wall 118a, while the vent hole 128 is located at the upper band 20.

[0038] In both of the described cases, the preferred manufacturing method entails producing the plates and the manifold modules by extrusion and subsequent working, by chip-forming machining, said plates at the ends in order to obtain the geometry suitable to mate with the manifold modules.

[0039] In practice it has been found that the invention thus described achieves the intended aim and objects.

[0040] In particular, the present invention provides a modular heating element which allows to produce in a standardized manner substantially just two types of element, the radiating modules and the manifold modules, reworking them subsequently in order to adapt them to requirements.

[0041] Substantial cost reductions are thus obtained both in terms of production and in terms of storage, since it is necessary to manage substantially just two components.

[0042] The use of an extruded aluminum plate entails the possibility to obtain a very low thickness for the heating element and to obtain an integrated element without therefore having to assemble the various tubes which are typical of known shell-and-tube structures.

[0043] The reduced space occupation also leads to a reduced amount of water, to the full advantage of energy saving.

[0044] The fact of having aluminum modules allows to have reduced masses to be managed both during transport and during installation of the heating element and also allows to use wall supports which are smaller than those typically used for heaters made of heavier materials.

[0045] Moreover, aluminum is more resistant to the attack of metal deterioration phenomena, such as for example corrosion.

[0046] The reduced thickness and modular assembly make the heating element according to the invention adapted to be associated with aesthetic covering elements having various shapes and dimensions, in order to compose a design heater; at the same time, if finished with care, it can be used directly as a visible heater.

[0047] In practice, the materials employed, so long as they are compatible with the specific use, as well as the

dimensions, may be any according to requirements and to the state of the art.

[0048] The disclosures in Italian Utility Model Application No. PD2005U000028 from which this application claims priority are incorporated herein by reference.

[0049] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A heating element for heaters, of the modular type, **characterized in that** it comprises at least one radiating module (11, 111), which is constituted by a metallic plate (12, 112) within which, along its planar dimension, there are a plurality of parallel ducts (13, 113) which are open at their ends (14, 114), and at least two manifold modules (15, 115), which are fixed to said plate (12, 112) respectively on opposite sides at the opposite end openings (14, 114) of said ducts (13, 113), said at least two manifold modules, together with said ducts (13, 113), forming a path for a heat transfer liquid, said radiator (10, 100) being composed selectively of a single plate (12) or of several plates (112), which form the radiating modules (11, 111) and are mutually fixed at their lateral edges (129) so that said ducts (113) of all the radiating modules (111) are parallel, said at least two manifold modules (115) being arranged transversely to all of said ducts (113) at the opposite end openings (114) of said ducts (113).
2. The heating element according to claim 1, **characterized in that** said plate (12, 112) is constituted by a single piece of extruded aluminum.
3. The heating element according to claim 2, **characterized in that** said plate (12, 112) has two facing plate-like portions, respectively a first plate-like portion (16) and a second plate-like portion (17), which are connected by longitudinal partitions (18) which delimit laterally said ducts (13, 113), a series of fins (19) protruding at right angles outward from said first plate-like portion (16), said fins being parallel to the extension of said ducts (13, 113), and being formed monolithically with said plate (12, 112).
4. The heating element according to claim 3, **characterized in that** said ducts (13, 113) have a flattened rectangular contour.
5. The heating element according to one or more of the preceding claims, **characterized in that** said second plate-like portion (17), at said end openings (14, 114) of said ducts (13, 113), protrudes beyond said end openings (14, 114), forming respective opposite bands (20), each of which is oriented transversely to said ducts (13, 113), each one of said manifold modules (15, 115) being formed by a single element which has a substantially L-shaped contour and rests, with a first longitudinal end edge (21) thereof, on the border (22) of said first plate-like portion (16), which corresponds to the region of said end openings (14, 114), and rests, with its second longitudinal end edge (23), which is perpendicular to said first longitudinal end edge (21), against said second plate-like portion (17).
6. The heating element according to claim 5, **characterized in that** said second longitudinal end edge (23) of each one of said manifold modules (15, 115) is wider so as to rest well against said second plate-like portion (17), so as to be aligned with the end edge (24) of said second plate-like portion (17), a bevel (25) being formed on each one of said manifold modules (15, 115) on said first longitudinal end edge (21), in order to facilitate the welding of said region of the manifold module (15, 115) to said plate (12, 112).
7. The heating element according to one or more of the preceding claims, **characterized in that** said manifold modules (15) also are made of extruded aluminum like said at least one radiating module (11, 111) and are fixed to said at least one radiating module (11, 111) by welding.
8. The heating element according to one or more of the preceding claims, **characterized in that** said longitudinal partitions (18) which delimit laterally said ducts (13, 113) protrude externally with respect to said border (22) of said first plate-like portion (16) which corresponds to the region of said end openings (14, 114).
9. The heating element according to one or more of the preceding claims, **characterized in that** said longitudinal partitions (18) which correspond to the side walls of the plate (12) reach the end edge (24) of the second plate-like portion (17), so as to close laterally the space delimited by said plate (12) and by the manifold modules (15).
10. The heating element according to one or more of the preceding claims, **characterized in that** it comprises at least one dividing wall (18a), which is formed by the protrusion of a corresponding longitudinal partition (18) outside one of the two borders (22) of said first plate-like portion (16), so as to obstruct the channel formed by the corresponding manifold module (15, 115) and by the band (20) of the plate (12, 112).

11. The heating element according to one or more of the preceding claims, **characterized in that** in said manifold modules (15, 115) there is also the intake hole (26) and the discharge hole (27) for the heat transfer fluid, which can be connected to the duct of the hydraulic heating system, and there is also a vent hole (28) to which the vent valve can be connected. 5
12. The heating element according to claim 11, **characterized in that** said intake hole (26) and said discharge hole (27) are arranged on opposite sides of said dividing wall (18a). 10
13. The heating element according to one or more of the preceding claims, **characterized in that** said fins (19) are provided with a recess at the corners (30) of the area occupied by said fins (19) so as to provide space for positioning the wall supports (31) for the heating element (10, 100). 15

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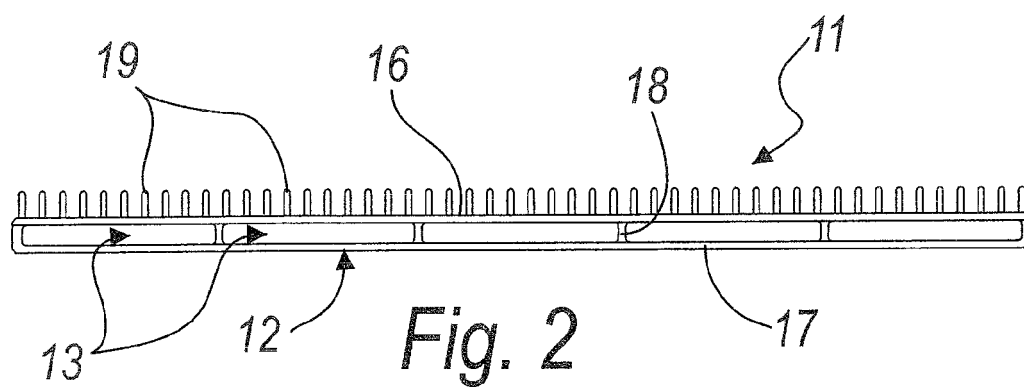
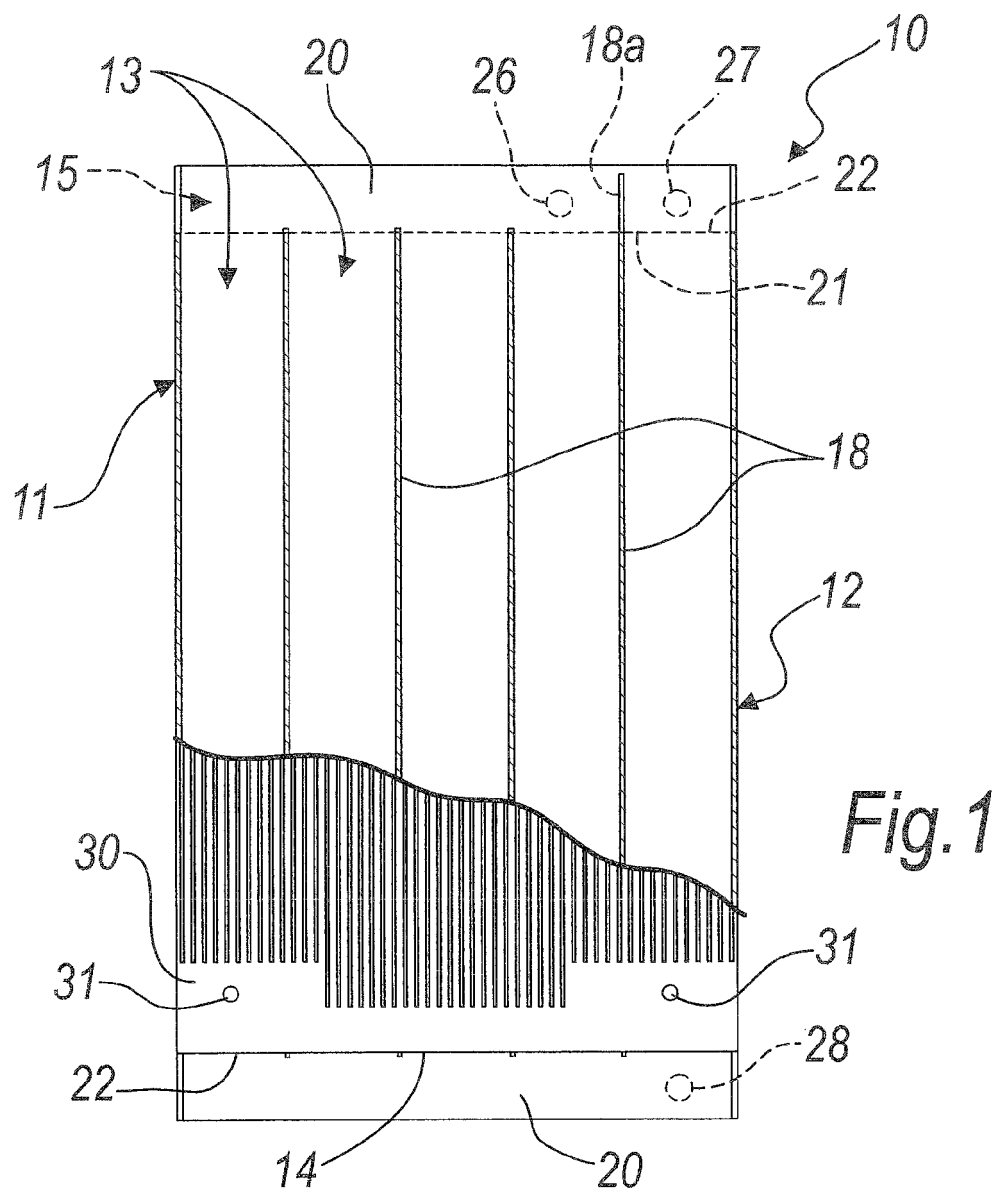
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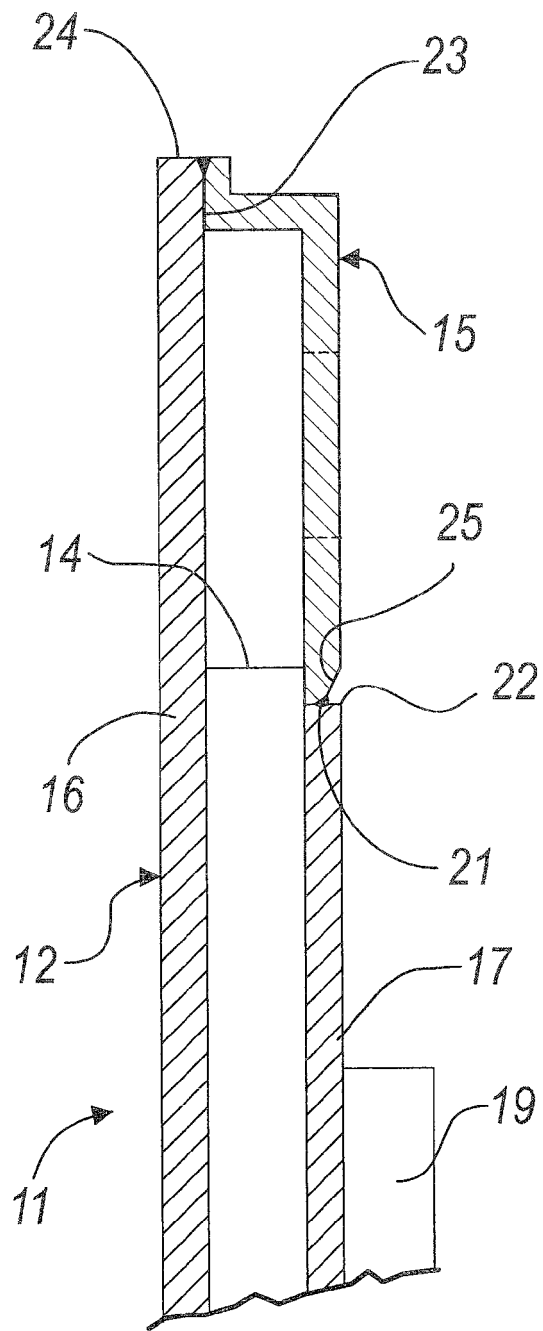
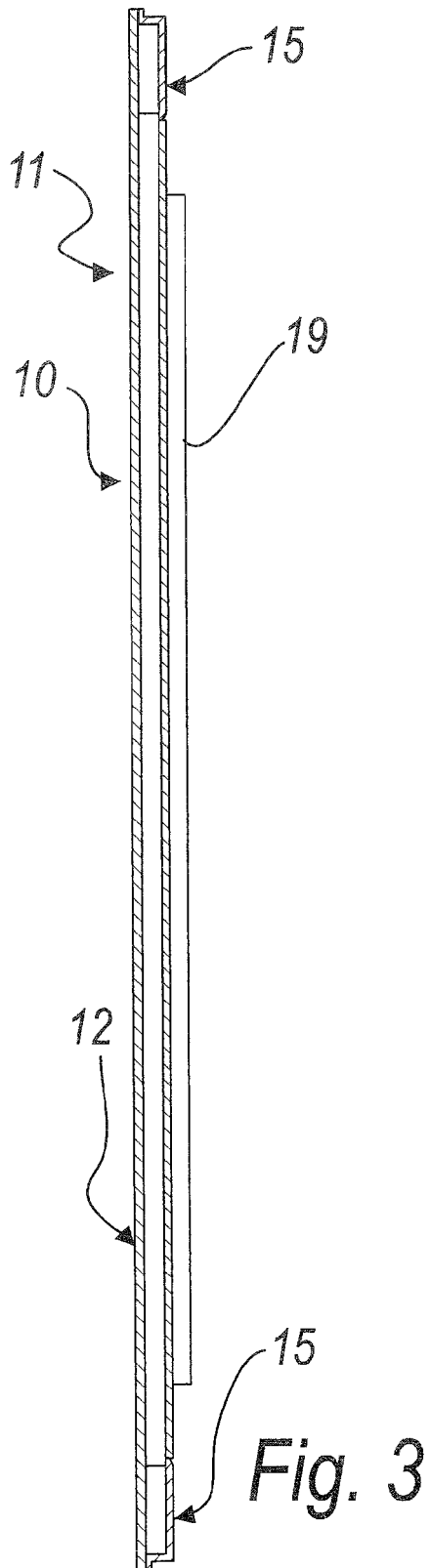
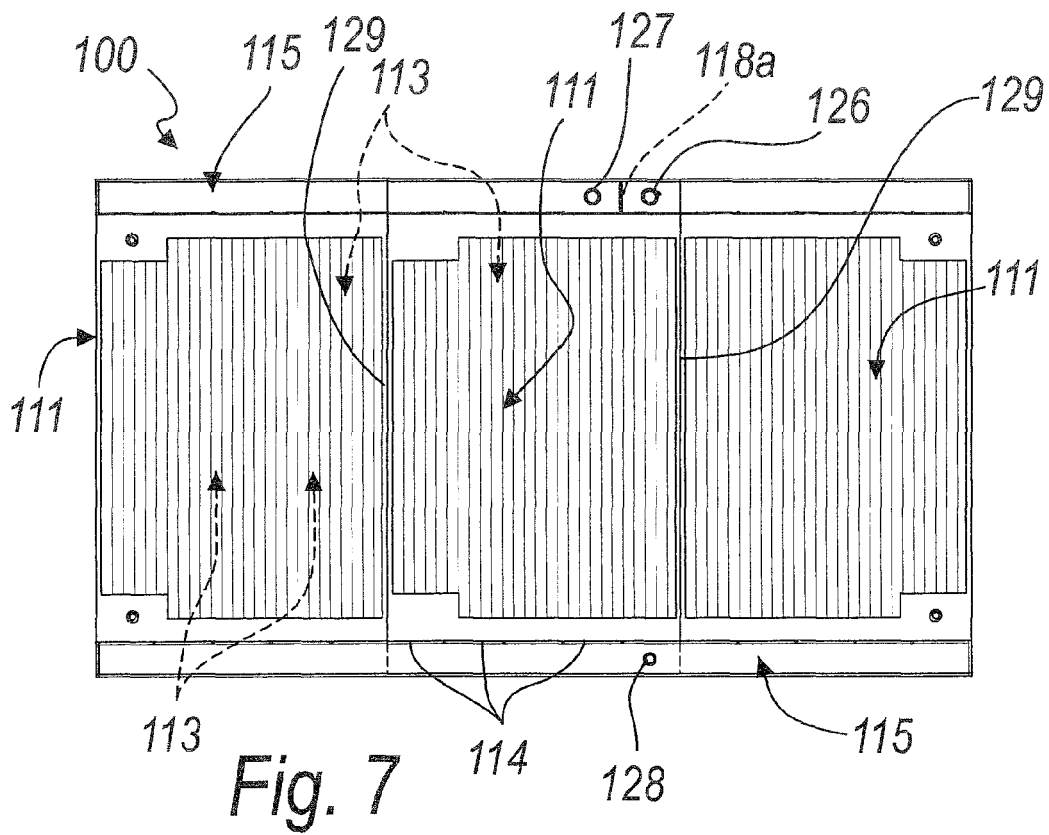
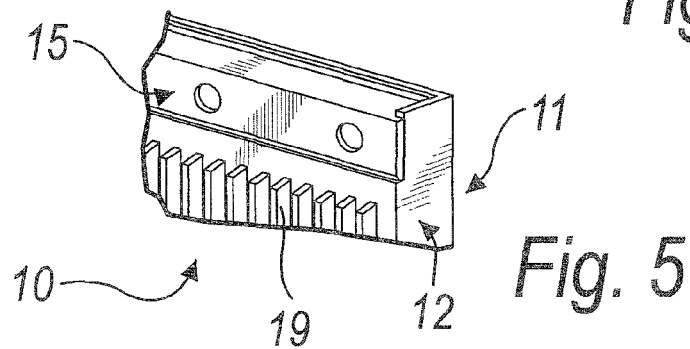
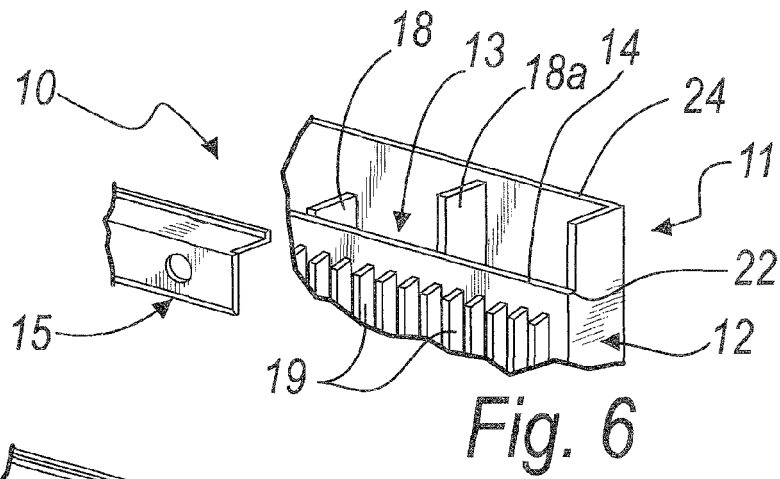


Fig. 4





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 06 11 1634

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 908 693 A (ALUSUISSE TECHNOLOGY & MANAGEMENT AG) 14 April 1999 (1999-04-14) * paragraphs [0022] - [0025], [0028], [0029]; figures 1-8 *	1-4,7,11	INV. F28F3/12 F28F9/02
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 20 September 2006	Examiner Leclaire, Thomas
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			

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EPC FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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