

(19)



(11)

EP 2 642 233 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

25.09.2013 Bulletin 2013/39

(51) Int Cl.:

F28F 1/16 (2006.01)

F28D 1/053 (2006.01)

(21) Application number: **13160721.0**

(22) Date of filing: **22.03.2013**

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

Designated Extension States:

BA ME

(30) Priority: **23.03.2012 IT UD20120051**

(71) Applicant: **De' Longhi Appliances S.r.l. Con Unico
Socio
31100 Treviso (IT)**

(72) Inventors:

- **De' Longhi, Giuseppe
31100 Treviso (IT)**
- **Zanolin, Sergio
33070 Polcenigo (PN) (IT)**

(74) Representative: **Petraz, Gilberto Luigi et al**

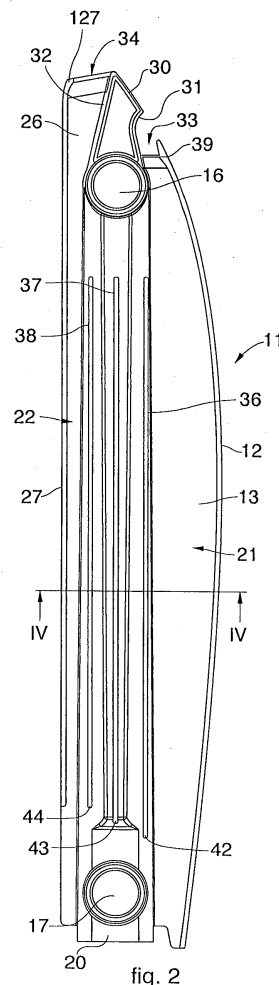
GLP S.r.l.

Piazzale Cavedalis 6/2

33100 Udine (IT)

(54) **Heating apparatus**

(57) A heating device, preferably made of aluminum, comprises at least a heating plate (12), a central body (20), a rear plate (27), and a plurality of lateral ribs (36, 37, 38) provided with lower ends (42, 43, 44) and being attached vertically and parallel to each other at the sides of said central body (20), which generate at least a vertical front channel (21) and a vertical rear channel (22). A conveying element (30) disposed between said front channel (21) and said rear channel (22) defines at the upper part a first exit (33) for the air and a second exit (34) for the air, separated from each other. Said lateral ribs (36, 37, 38) have their lower ends (42, 43, 44) becoming progressively shorter towards the rear of the heating device.



EP 2 642 233 A1

Description

FIELD OF THE INVENTION

[0001] The present invention concerns a heating device, advantageously but not exclusively for domestic use.

[0002] In particular, the invention concerns a device, such as a radiator consisting of a plurality of aluminum modules, to be attached to the wall of a room to be heated, for example in a house, an office, a shop or in any case an interior which needs heating.

BACKGROUND OF THE INVENTION

[0003] Heating devices are known, in particular to heat a domestic environment or an office, a shop or in any case a closed environment.

[0004] In particular, from the international application WO-A-2006/070273 (WO'273) a radiator device is known, made of aluminum, suitable to be attached to a wall of a room in a closed environment. The radiator described in WO'273 comprises a plurality of thin, oblong, heating plates, located one adjacent to the other. A rectilinear rib is associated at the rear of each heating plate, along its main dimension of development. An upper pipe and a lower pipe pass through the device and contain the heat-carrying fluid which heats the device.

[0005] To increase the heating surface, WO'273 provides to shape the heating plates in order to make, by means of them, suitable profiles, and/or use lateral fins, attached inclined with respect to the central ribs.

[0006] However, the known device of WO'273 has some limits, a first of which concerns the conveying of the air in the rear part of the device. Indeed, the conformation and the disposition of the heating plates limit a more intense conveying of the cooler air in the rear part of the radiator.

[0007] Another limit concerns the upper part of the radiator which, with this disposition, results in the air coming from the rear part, toward the upper part of the radiator, causing a limited circulation of the air.

[0008] EP 1471309 describes a heating device with the characteristics of the preamble of the main claim 1.

[0009] A purpose of the present invention is to obtain, in a heating device of the type mentioned above, a better conveying of the air to be heated in the rear part of the radiator, in order to keep the front part and the rear part of the heating device at suitable and differentiated temperatures, according to the regulations in this field.

[0010] Another purpose of the present invention is to cause the air coming from the rear part of the radiator, exiting from the upper part of the radiator, to have an exit direction such as to render the circulation of the air better and more efficient.

[0011] Another purpose is to prevent the walls getting dirty due to the flow of air exiting vertically toward the top.

[0012] Moreover, another purpose of the present in-

vention is to obtain a heating device which is light and at the same time is esthetically pleasing.

[0013] Another important purpose of the present invention is to optimize the thermal flows, achieving a circulation such as to guarantee heating capacities that allow to obtain the same heat yield using a lower number of elements (modules) compared to current solutions.

[0014] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0015] The present invention is set forth and characterized in the independent claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0016] In accordance with the above purposes, a heating device, such as a radiator, made of aluminum modules, according to the present invention, is suitable to be used to heat internal environments such as those of a house, an office or a shop etc., or in any case of any closed environment.

[0017] The radiator, in its minimum form, comprises a heating element, substantially formed by a slightly curved heating plate, a central body, a rear plate, a plurality of lateral ribs which define a plurality of vertical air channels and a conveying element which defines at least two upper exits.

[0018] A pipe containing heat-carrying fluid, such as water, oil or other fluid suitable for the purpose, passes through each module of the radiator and has at the upper and lower ends suitable collectors for communication between one module and the other.

[0019] The heating element can be assembled in a known way, by positioning it adjacent to other identical heating elements, or modules, so as to generate from three to six vertical channels per side, advantageously four. In particular, at least a front channel and a rear channel are defined.

[0020] The channels and the walls defined by the lateral ribs, the heating plate and the rear plate are profiled to differentiate the quantity of air in transit. Moreover, the entrances located at the lower part are disposed so as to accentuate the different quantity of air, favoring the rear channel. Furthermore, the exits located at the top are oriented to direct the heated air toward the room to be heated, and the cooler air upward and forward for a more efficient circulation of the air.

[0021] According to one characteristic of the present invention, the lateral ribs, as well as increasing the heating surface, are disposed scaled down to direct the flow of air toward the rear, that is, toward the lateral rib nearest the rear plate, so that the greatest flow is conveyed in the rear channel.

[0022] According to a variant of the invention, the lower ends of each lateral rib are provided with means to divert

the flow, such as for example fins inclined with respect to the lateral rib, in order to convey the air in the desired way. The inclined fins have lengths and inclinations which decrease toward the back of the radiator.

[0023] The lower end of the rear plate is aligned with the lower end of the nearest lateral rib in the case where the rear plate, during the use of the radiator, is close to the wall.

[0024] According to a variant, the lower end of the rear plate is scaled down in relation to the lateral ribs in the case where the rear plate itself, during use, is at a distance from the wall. In this case another channel is defined between the rear plate and the wall.

[0025] Thanks to this configuration, the air sent toward the front channel of the radiator moves at a slower speed, while the air sent toward the rear channel moves at a faster speed, thus getting less hot.

[0026] Moreover, due to the conformation of the exits, the air which arrives at the upper part from the rear part of the radiator accompanies and promotes the exit of the air coming from the front channel. This promotes the circulation of the air and improves the performance.

[0027] The rear channel, according to the present invention, is such that the cold air moves more quickly than the air present in the front channel, thus removing less heat.

[0028] According to a variant, the fins present on at least one end of the lateral ribs are adjustable, so as to be able to vary the entity and/or the direction of the air.

[0029] According to another variant, the fins are adjustable in pitch. Intervals can therefore be provided with regard to the adjustment amplitudes.

[0030] According to another variant, the fins are replaceable, both so that they can be cleaned and also so that they can be replaced depending on the different behavior of the radiator.

[0031] According to another variant, the fins are made of different material, for example plastic, rubber or other, with respect to the material with which the ribs are made.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] These and other characteristics of the present invention will become apparent from the following description of one form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a perspective view of the heating device of the present invention;
- fig. 2 is a lateral view of an element of fig. 1;
- fig. 3 is an enlarged detailed view of the upper part of the module of fig. 2;
- fig. 4 shows the section from iv to iv of fig. 2, in which the detail of the shape of the oil channel present inside the module of the heating device according to the invention can be seen;
- fig. 5 shows, with a detail, a variant of the invention.

DESCRIPTION OF ONE FORM OF EMBODIMENT

[0033] With reference to fig. 1, a heating device 10 is shown, in this case a radiator to be attached to a wall, to heat a closed environment.

[0034] The heating device 10 comprises a plurality of heating elements 11, preferably made of aluminum, identical to each other and disposed adjacent to each other. Each heating element 11 comprises a heating plate 12, at the front during use, in this case slightly curved and rounded toward the front, which constitutes a large part of the heating surface.

[0035] A rectilinear front central rib 13 (fig. 2) is associated orthogonally to the surface of each heating plate 12, on the side facing toward the wall.

[0036] An upper pipe 16 and a lower pipe 17 pass through the heating device 10 and contain the heat-carrying fluid, such as water or oil for example, which heats the heating device 10.

[0037] A central body 20 is disposed vertically between the upper pipe 16 and the lower pipe 17 in correspondence to each heating plate 12, so as to substantially occupy all the bulk widthwise of the heating device 10.

[0038] A rear plate 27, during use, is attached in a known way to the wall.

[0039] The central body 20 is disposed so as to divide the heating device 10 into two main parts, that is, a front channel 21, defined between the heating plate 12 and the central body 20, and a rear channel 22, defined between the rear plate 27 and the central body 20.

[0040] A rear central rib 26 is disposed inside the rear channel 22, substantially aligned with the corresponding front central rib 13 and joined to the central body 20 and the rear plate 27.

[0041] A conveying element 30 is disposed between the front channel 21 and the rear channel 22, and above the upper pipe 16. The conveying element 30 has a conformation such that, in its part that is at the front during use, it has a curved profile 31, suitable to convey the air coming from the front channel 21 substantially forward, that is, in the opposite direction to the wall and toward the room to be conditioned; in its rear part it has a substantially straight profile 32, although inclined forward, suitable to direct the air coming from the rear channel 22 upward and away from the wall. The conveying element 30 therefore defines two distinct and separate exits of the heated air, facing substantially upward and partly forward, a first front exit 33 and a second rear exit 34, which allow the air coming respectively from the front channel 21 and from the rear channel 22 to come out.

[0042] In substantial correspondence to its upper end, and in proximity to the first exit 33, the heating plate 12 has a thicker part 39 facing toward the inside, which restricts the transit channel of the air immediately before the exit, generating an acceleration which improves the heat exchange conditions between the heated air exiting from the heating device 10 and the air in the room.

[0043] Moreover, in correspondence to its upper end,

the rear plate 27 has a deflector element 127 with a reduced angle, which gradually accompanies the air channeled into the rear channel toward the room to be conditioned, preventing it from exiting vertically.

[0044] A plurality of lateral ribs, in this case three, respectively 36, 37, 38, are attached vertically and parallel to each other, at the sides of each central body 20. The lower ends 42, 43, 44 of the lateral ribs 36, 37, 38 are disposed scaled down toward the rear (fig. 2), that is, progressively shorter going toward the wall, in order to better convey the cooler air toward the rear channel 22.

[0045] The channel 51 in which the thermal fluid transits has a cross section substantially shaped like the number eight (fig. 4), with the end parts 52 and 53 widened and the central part 54 with a reduced width.

[0046] This conformation of the channel 51, together with the presence of the two upper exit apertures 33 and 34, the radius of curvature of the front heating plate 12, its upper thicker part 39, the front and rear conformation of the conveying element 30, and the deflector element 127 concur together to optimize the movement of the flows of conditioned air, and their expulsion into the surrounding environment, optimizing the subsequent heat exchange.

[0047] This optimization allows to obtain optimal results comparable to devices of the known type but with one element (module) less, so that, given the same thermal effects, the device according to the present invention allows to obtain a considerable saving in costs.

[0048] According to the variant in fig. 5, a mean to divert the flow is disposed at the lower end 42, 43, 44 of each lateral rib 36, 37, 38, in this case a flat inclined rib 48, 49, 50. The inclined rib 48 forms an angle α with respect to the lateral rib 36. The angle α , in the case shown, is greater than an angle β which represents the angle of inclination of the inclined fin 49 with respect to the lateral rib 37. The angle β , in this case, is in its turn greater than an angle γ , which represents the inclination of the inclined fin 50 with respect to the lateral rib 38. Moreover, the inclined fin 48 is longer than the inclined fin 49, which in its turn is longer than the inclined fin 50.

[0049] This disposition of the lower ends 42, 43, 44 of the respective lateral ribs 36, 37, 38 and of the inclined fins 48, 49, 50 is suitable to better convey the cooler air in the rear channel 22 of the heating device 10, as well as increasing, together with the lateral ribs 36, 37, 38 themselves, the heating surface.

[0050] It is clear that modifications and/or additions of parts may be made to the heating device 10 as described heretofore, without departing from the field and scope of the present invention.

[0051] For example, the inclined fins 48, 49, 50 can be provided adjustable, or can be replaceable.

[0052] Moreover, the angles of inclination of the fins 48, 49, 50 with respect to their lateral ribs 36, 37, 38 can be identical to each other or two can be identical and one different, or other possibilities.

[0053] Furthermore, the inclined fins 48, 49, 50 can be

made of a different material than that of the lateral ribs 36, 37, 38.

[0054] It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of device, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

Claims

1. Heating device, preferably made of aluminum, comprising at least a heating plate (12) disposed during use toward the room to be heated, a central body (20), a rear plate (27), a plurality of lateral ribs (36, 37, 38) provided with lower ends (42, 43, 44), which generate at least a vertical front channel (21) and a vertical rear channel (22), a channel (51) for the passage of thermal fluid being made inside said central body (20), **characterized in that** it also comprises a conveying element (30) defined between said front channel (21) and said rear channel (22), and having at the upper part a first exit (33) for the air and a second exit (34) for the air, separated from each other, **and in that** at least said lateral ribs (36, 37, 38) have said lower ends (42, 43, 44) scaled down toward the rear.
2. Heating device as in claim 1, **characterized in that** said exits (33, 34) located at the upper part are oriented the one (33) so as to direct the hotter air toward the room to be heated and the other one (34) to direct the cooler air upward and forward.
3. Heating device as in claim 2, **characterized in that**, in a part that, during use, is at the front, said conveying element (30) has a curved profile (31) suitable to convey the air coming from the front channel (21) substantially forward, toward the room to be conditioned, while in its rear part it has a substantially straight profile (32), although slightly inclined forward, suitable to direct the air coming from the rear channel (22) upward and away from the wall.
4. Heating device as in any claim hereinbefore, **characterized in that** in substantial correspondence to its upper end, and in proximity to the first exit (33), the heating plate (12) has a thicker part (39) facing toward the inside, able to narrow the transit channel of the air immediately before the exit.
5. Heating device as in any claim hereinbefore, **characterized in that** said channel (51) in which the thermal fluid transits, has, in cross section, a substantially eight shaped section with widened end parts (52, 53) and central part (54) with a reduced width.

6. Heating device as in claim 1, **characterized in that** at least said associated lateral ribs (36, 37, 38) have, at their lower end (42, 43, 44), means to divert the flow, such as inclined fins (48, 49, 50). 5
7. Heating device as in claim 6, **characterized in that** said inclined fins (48, 49, 50) have respective lengths which reduce toward the rear. 10
8. Heating device as in claim 6, **characterized in that** said inclined fins (48, 49, 50) are fixed. 15
9. Heating device as in claim 6, **characterized in that** said inclined fins (48, 49, 50) are adjustable at least in the angle of inclination. 20
10. Heating device as in any claim from 6 to 9, **characterized in that** said inclined fins (48, 49, 50) are replaceable. 25

30

35

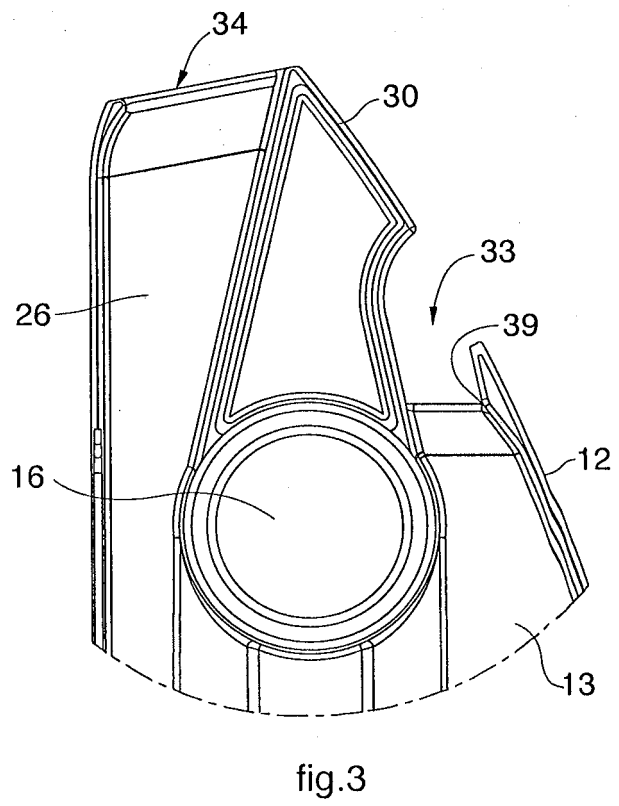
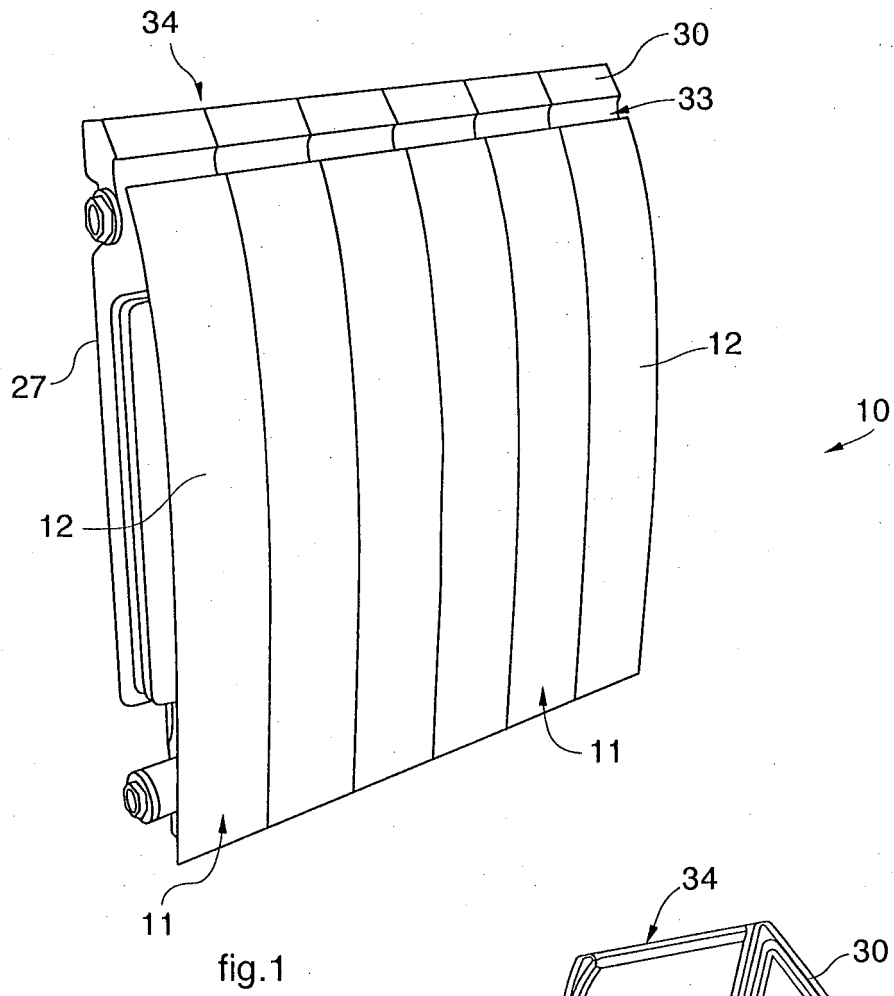
40

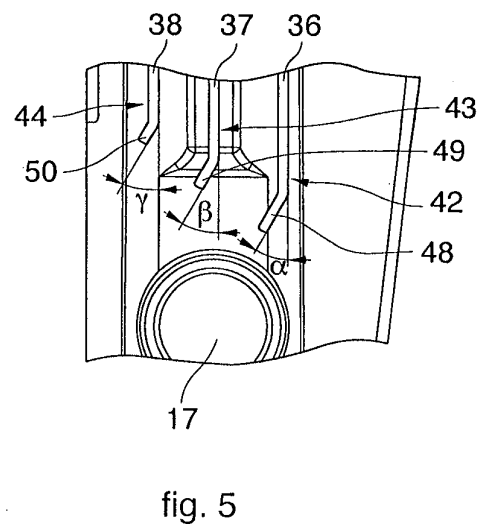
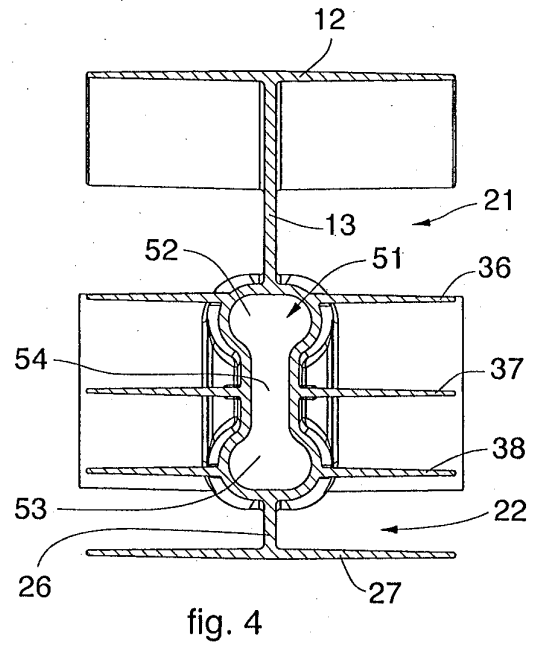
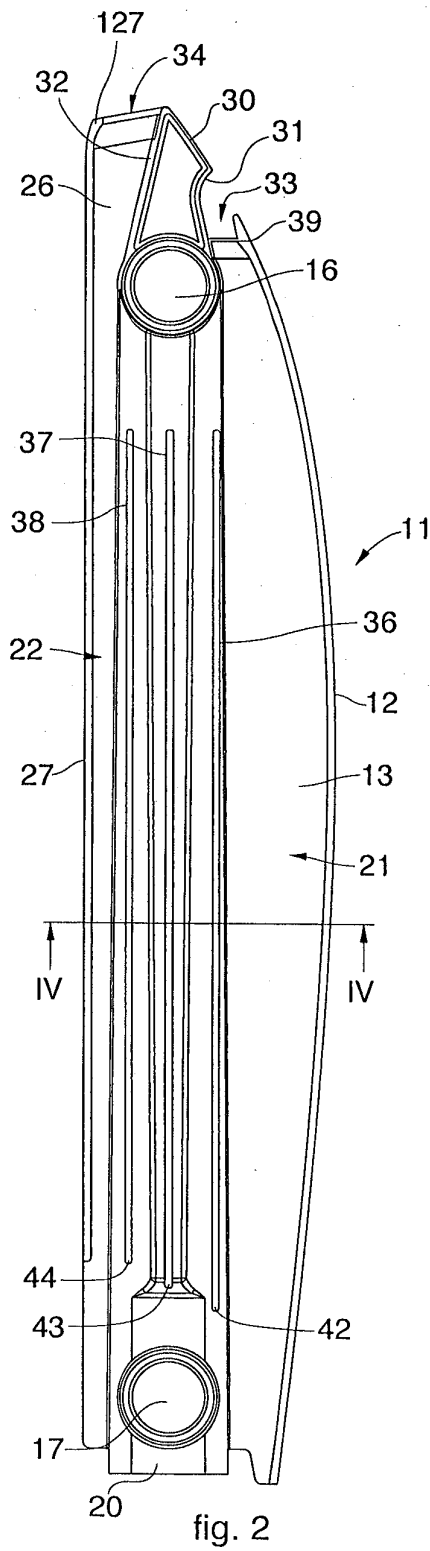
45

50

55

5







EUROPEAN SEARCH REPORT

Application Number
EP 13 16 0721

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 471 309 A2 (IND MECCANICHE DI ALANO S R L [IT]) 27 October 2004 (2004-10-27) * paragraphs [0038] - [0049], [0065], [0068] - [0070] * * figures 1-3, 10, 12 * -----	1-4	INV. F28F1/16 F28D1/053
A	DE 26 15 230 A1 (ANDREOLI MARIO) 21 October 1976 (1976-10-21) * pages 4-6 * * figures 1-5 * -----	1,6-8	
A	DE 10 21 553 B (S I R T A SOC IT RADIATORI TIR) 27 December 1957 (1957-12-27) * columns 2, 3 * * figures 4, 5 * -----	1,6,8	
A	CH 556 523 A (PAVEG ANSTALT) 29 November 1974 (1974-11-29) * column 6 * * figure 4 * -----	5	
A	ES 2 182 617 A1 (CORTES LIEBANA JUAN MIGUEL [ES]) 1 March 2003 (2003-03-01) * the whole document * -----	1-3	TECHNICAL FIELDS SEARCHED (IPC) F28D F28F F24D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 June 2013	Examiner Schwaiger, Bernd
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 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 16 0721

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

24-06-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1471309	A2	27-10-2004	NONE
DE 2615230	A1	21-10-1976	AT 352950 B 10-10-1979 BE 840473 A1 02-08-1976 CH 616738 A5 15-04-1980 DE 2615230 A1 21-10-1976 ES 446841 A1 01-06-1977 FR 2330969 A1 03-06-1977 GB 1548606 A 18-07-1979 GR 59805 A1 28-02-1978 US 4212350 A 15-07-1980
DE 1021553	B	27-12-1957	NONE
CH 556523	A	29-11-1974	NONE
ES 2182617	A1	01-03-2003	NONE

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2006070273 A [0004]
- EP 1471309 A [0008]