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(54) **"Radiator for heating a room"**

(57) The radiator for heating a room comprises electrical heating means adapted for generating a natural circulation of a thermal carrier fluid, a first header, a second header, a series of emitters each having a connection way to the first header with partial flow passage and a

connection way to the second header with partial flow passage, a first and respectively a second duct each having a connection way to the first header with total flow passage and a connection way to the second header with total flow passage.

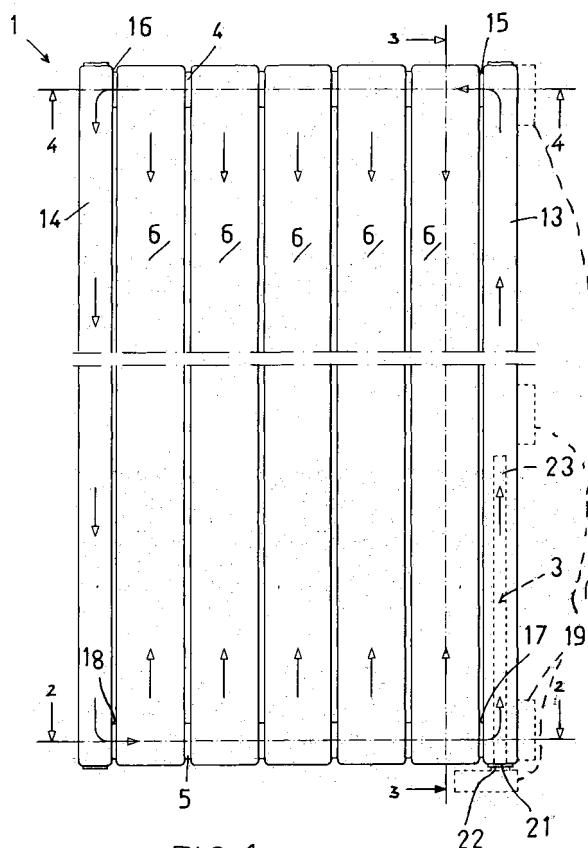


FIG. 1

Description

[0001] The present invention relates to a radiator for heating a room.

[0002] A traditional electrical radiator, in particular in the field of interior furnishing, for example bathroom, kitchen, dining room furnishing, etc., generally comprises a series of emitters arranged between two headers to which they are connected by calibrated passages.

[0003] In one of the headers there is inserted an electrical resistance that triggers the natural circulation of the thermal carrier fluid contained in the radiator.

[0004] Such radiator generates a natural circulation not always totally suitable for quickly removing the thermal power generated by the electrical resistance and quickly transferring it to the emitters.

[0005] As a consequence, several disadvantages may occur, among which an uneven distribution of the thermal power on the radiator surface, an excessively prolonged transient for reaching the steady operating condition, and inability to adopt high powers and specific loads. The technical task of the present invention therefore is to provide a designer radiator for heating a room which should allow eliminating the aforementioned technical disadvantages of the prior art.

[0006] Within the scope of this technical task, an object of the invention is to provide a designer radiator for heating a room capable of establishing a natural circulation which should allow quickly removing the thermal power generated by the electrical resistance and quickly transferring it to the emitters.

[0007] Another object of the invention is to provide a radiator for heating a room which should allow even distribution of the thermal power on the radiator surface.

[0008] Another object of the invention is to provide a radiator for heating a room which should exhibit a short transient for reaching the steady operating condition.

[0009] Another object of the invention is to provide a radiator for heating a room which should allow adopting high powers and specific loads.

[0010] A further object of the invention is to provide a radiator of the type with independent electrical operation or a radiator of the type with mixed operation, that is, an electrical radiator integrated in a centralised or independent heating system and capable of operating, besides electrically, also with the hot water supplied by the system.

[0011] A further object of the invention is to provide a radiator provided with closed wet side walls adapted for favouring a better convective dissipation of the air by chimney effect.

[0012] Last but not least, another object of the invention is to provide a radiator for heating a room which should be inexpensive, constructively simple and aesthetically very remarkable.

[0013] The technical task, as well as these and other objects, according to the present invention are achieved by making a radiator for heating a room according to claim

1.

[0014] Further features of the present invention, moreover, are defined in the following claims.

[0015] Further features and advantages of the invention will appear more clearly from the description of a preferred but non-exclusive embodiment of the radiator according to the finding, illustrated by way of a non-limiting example in the annexed drawings, wherein:

- 10 - figure 1 shows a front view of a radiator according to the present finding;
- figure 2 shows a plan view of the radiator of figure 1, sectioned along plane 2-2;
- figure 3 shows a side elevation view of the radiator of figure 1 sectioned along plane 3-3; and
- 15 - figure 4 shows a plan view of the radiator of figure 1 sectioned along plane 4-4.

[0016] With reference to the above figures, there is shown a radiator for heating a room, for example a bathroom towel warmer, globally indicated with reference numeral 1.

[0017] Radiator 1 comprises electrical heating means, in particular an electrical resistance 3, adapted for generating a natural circulation of a thermal carrier fluid.

[0018] Radiator 1 further comprises a first header 4, a second header 5 and a series of emitters 6 each connected to the first header 4 with partial flow passage and to the second header 5 with partial flow passage.

[0019] The connection way between each emitter 6 and the first header 4 is obtained by coupling one or more calibrated holes 9 of emitter 6 to one or more corresponding calibrated holes 10 of the first header 4 and accordingly, the connection way between each emitter 6 and the second header 5 is obtained by coupling one or more calibrated holes 12 of emitter 6 to one or more corresponding calibrated holes 11 of the second header 5.

[0020] According to a crucial aspect of the present invention, radiator 1 also comprises a first duct 13 and respectively a second duct 14 each having a connection way 15 and respectively 16 to the first header 4 with total flow passage and a connection way 17 and respectively 18 to the second header 5 with total flow passage.

[0021] Advantageously, the first header 4, the first connection duct 13, the second header 5 and the second connection duct 14 are arranged externally to emitters 6 forming a peripheral circuit ring wherein a preferential fluid circulation is established.

[0022] In particular, said circuit ring exhibits a quadrangle configuration of which the first header 4, the first connection duct 13, the second header 5, and the second connection duct 14 make a corresponding side.

[0023] Preferably, the quadrangle circuit ring exhibits two vertical sides and two horizontal sides.

[0024] In the case illustrated by way of an example the first and the second connection duct 13 and 14 are vertical straight tubes whereas the first and the second header 4 and 5 are horizontal straight tubes.

[0025] In a different embodiment not illustrated, the first and the second connection duct 13 and 14 are straight tubes arranged horizontally whereas the first and the second header 4 and 5 are straight tubes arranged vertically.

[0026] Headers 4 and 5 exhibit circular cross section whereas the first and the second connection element 13 and 14 exhibit polygonal cross section (rectangular, as illustrated, but also trapezoidal, triangular with right angle and hypotenuse or rectilinear or concave or convex).

[0027] Emitters 6 are of the flat blade type, and are arranged in a single array (as shown) or in two different arrays provided at diametrically opposite sides relative to headers 4 and 5.

[0028] In a variation not shown, emitters 6 may be round or with a different shape.

[0029] Moreover, dry convection finned surfaces may be applied to emitters 6 for improving the thermal exchange.

[0030] One of the vertical sides of the peripheral circuit ring, in particular the first connection duct 13, exhibits a hole 21 at the base thereof for introducing the electrical resistance 3.

[0031] The electrical resistance 3 comprises a support and sealing base 22 that fixes into hole 21 and a longitudinal heating body 23 that develops parallel and internally to the first connection duct 13.

[0032] Also a thermostat 19 is applied laterally (or at the bottom) on the first vertical connection duct 13 for controlling the electrical resistance 3.

[0033] Thermostat 10 in the various admissible positions is shown with a dashed line in figure 1.

[0034] The correct and easy positioning of thermostat 19 is laterally favoured by the flat surface for the support thereof offered by the first connection duct 13.

[0035] Adjacent the base of the vertical side of the peripheral circuit ring where the electrical resistance 3 is there is obtained a wet raceway 20 for the protected and hidden passage of electrical cables, for example cables for supplying the electrical resistance 3 and/or thermostat 19.

[0036] In this way besides being protected, the electrical cables are hidden to the sight.

[0037] Finally, header 5 exhibits bushes 30 for charging the thermal carrier fluid (closable by a cap not shown) and for the connection to the system if the radiator is of the mixed operation type.

[0038] Advantageously, in fact, radiator 1 may be both of the type with independent electrical operation and of the type with mixed operation, that is, an electrical radiator integrated in a centralised or independent heating system and capable of operating, besides electrically, also with the hot water supplied by the system.

[0039] The operation of radiator according to the invention clearly appears from what described and illustrated, and in particular it substantially is as follows.

[0040] The natural circulation induced by the actuation of electrical resistance 3 is indicated by the arrows in

figure 1.

[0041] Upon the actuation of electrical resistance 3, a high rate natural circulation is established in the peripheral circuit ring.

5 **[0042]** The thermal carrier fluid heats up to the maximum temperature thereof at the medium-lower portion of the first connection duct 13 and the convective flow that generates goes up along the first duct 13 from which it passes inside the first header 4 through the passage way 15.

10 **[0043]** The flow that runs in the first header 4 feeds the emitters 6 it runs into and the flow fraction remaining downstream of the last emitter 6 entirely enters the second connection duct 14 through the passage way 16, and hence it passes entirely to the second header 5 through the passage way 18.

15 **[0044]** The flow that runs in the second header 5 feeds the emitters 6 it runs into and the flow fraction remaining downstream of the last emitter 6 entirely enters the first connection duct 13 through passage 17.

20 **[0045]** The flow that feeds emitters 6 from top tends to go down through emitters 6 themselves as it cools down.

25 **[0046]** The bottom feeding of emitters 6 is made possible by the fact that the thermal carrier fluid has undergone a marginal or modest cooling when it reaches the second header 5.

30 **[0047]** The flow from the bottom upwards through emitters 6 coming from the second header 5 meets the opposite flow from the top downwards through emitters 6 coming from the first header 4.

35 **[0048]** The high rate circulation in the peripheral circuit ring quickly removes the thermal power produced by the electrical resistance 3 and quickly puts emitters 6 in communication both at their top and at their bottom.

40 **[0049]** All of this favours an even distribution of the thermal power on the entire radiator surface, allows a particularly reduced time for the regular running and offers the possibility of adopting higher specific loads and powers.

45 **[0050]** In fact the high rate circulation allows the thermal carrier fluid to run through the entire peripheral circuit ring without undergoing an excessive temperature drop.

50 **[0051]** It should be noted that the thermal exchange efficiency is optimised for the fact that a part of the thermal exchange between the thermal carrier fluid and the ambient air, in particular the thermal exchange carried out at the second connection duct 14, takes place in backflow and considerably favours the air convection by chimney effect. Several changes and variations can be made to the radiator thus conceived, all falling within the scope of the inventive concept; moreover, all details can be replaced with technically equivalent elements.

55 **[0052]** For example, the electrical resistance usable in various types (cartridge, PTC, etc.) may exhibit the longitudinal heating body 23 arranged along a vertical side, as shown, or horizontal in the circuit ring, or inside header 5 of figure 1.

[0053] In the practice, the materials used as well as

the sizes and shapes can be whatever, according to the technical requirements and to the prior art.

Claims

1. Radiator for heating a room, comprising electrical heating means adapted for generating a natural circulation of a thermal carrier fluid, a first header of said fluid, a second header of said fluid, and a series of emitters each connected to said first header with partial flow passage and to said second header with partial flow passage, **characterised in that** it comprises a first and a second duct, each connected to said first header with total flow passage and to said second header with total flow passage. 10
2. Radiator according to claim 1, **characterised in that** said first header, said first connection duct, said second header and said second connection duct are arranged externally to said series of emitters and form a peripheral circuit ring wherein a preferential fluid circulation is established. 15
3. Radiator according to one or more of the previous claims, **characterised in that** said circuit ring exhibits a quadrangle configuration of which said first header, said first connection duct, said second header and said second connection duct make a corresponding side. 20
4. Radiator according to one or more of the previous claims, **characterised in that** said circuit ring exhibits two horizontal sides and two vertical sides. 25
5. Radiator according to one or more of the previous claims, **characterised in that** said first connection duct, said second connection duct, said first header and said second header are straight tubes. 30
6. Radiator according to one or more of the previous claims, **characterised in that** said first and second header exhibit circular cross section. 35
7. Radiator according to one or more of the previous claims, **characterised in that** said first and second connection element exhibit polygonal cross section. 40
8. Radiator according to one or more of the previous claims, **characterised in that** said emitters are of the flat blade type. 45
9. Radiator according to one or more of the previous claims, **characterised in that** said emitters are arranged in one or two arrays positioned diametrically opposite relative to said first and second header. 50
10. Radiator according to one or more of the previous 55

claims, **characterised in that** dry finned surfaces are applied to said emitters for improving the thermal exchange.

- 5 11. Radiator according to one or more of the previous claims, **characterised in that** said electrical heating means comprises an electrical resistance comprising a longitudinal heating body that develops along a side of said peripheral circuit ring. 10
12. Radiator according to one or more of the previous claims, **characterised in that** adjacent the base of said side of said peripheral circuit ring where said electrical resistance is present there is obtained a dry raceway for the protected and hidden passage of electrical cables. 15
13. Radiator according to one or more of the previous claims, **characterised in that** said side of said peripheral circuit ring where said electrical resistance is present exhibits a flat support surface for a thermostat for controlling said electrical resistance. 20
14. Radiator according to one or more of the previous claims, **characterised in that** it is of the independent electrical operation or mixed operation type. 25
15. Radiator as described and claimed. 30

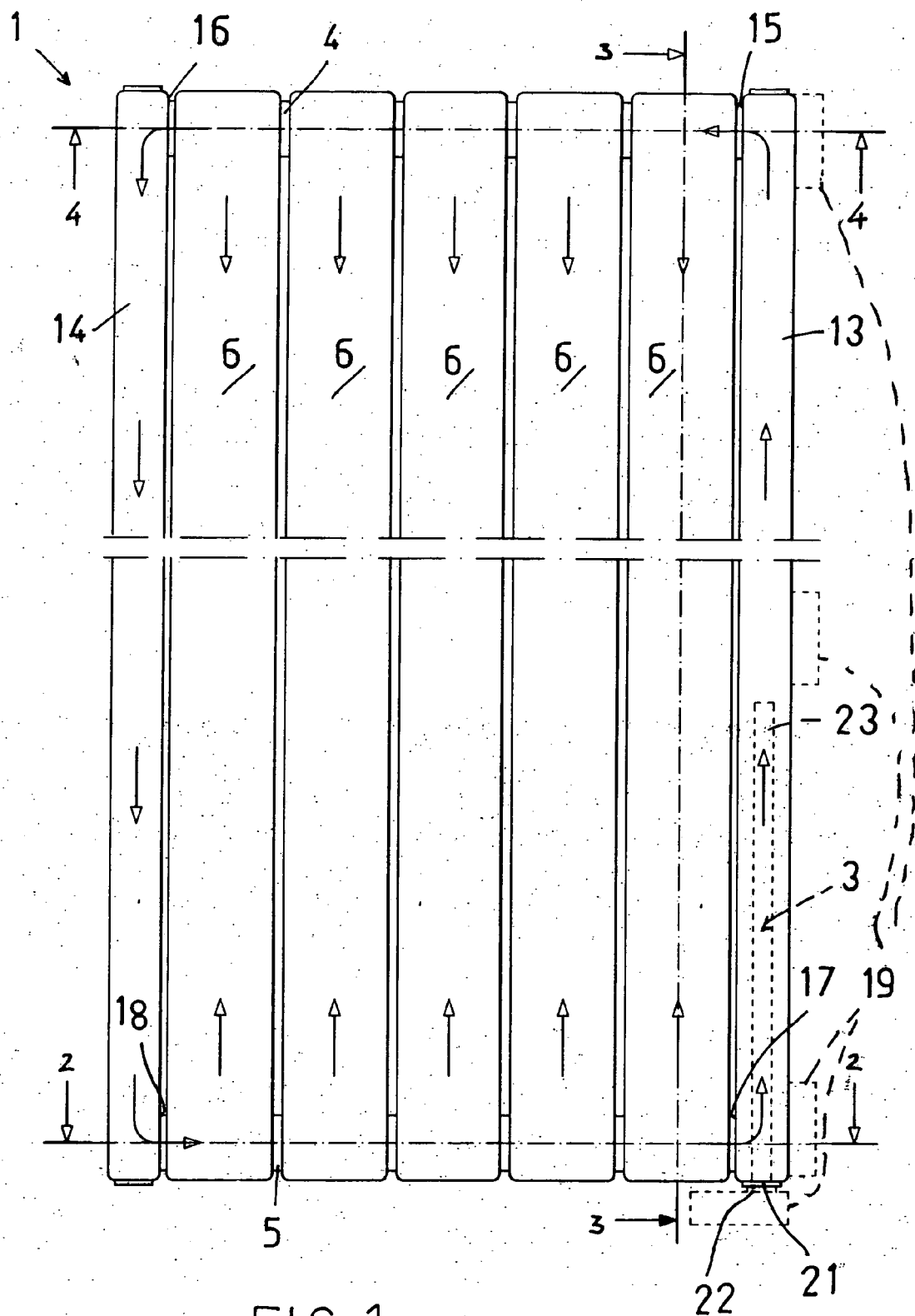


FIG. 1

