An electric radiator (1) for heating rooms has a body (2), provided with an internal cavity (3) delimited by a perimeter edge (4) and with at least one radiating wall (5, 6), an electrically-powered heating element (8) housed in the cavity, and a heat conduction structure (7) arranged between the heating element (8) and the radiating wall (5, 6); the structure (7) is provided with thermal insulation openings (30) and/or gaps (31) arranged between the heating element (8) and the radiating wall (5, 6) to reduce heat conduction through the structure (7).
Description

[0001] The present invention relates to an electric radiator for heating rooms.

[0002] A type of electric radiator for heating rooms that is known in the prior art has a metal body, formed by a plurality of modules arranged side by side each of which comprises variously-formed plates and flanges; the metal body is provided with an internal cavity that houses an electrically-powered resistance heating element; the heating element is inserted inside the cavity and comes into contact with the edges of the cavity; the heat generated by the heating element is transmitted by means of conduction and radiation to the external walls of the body and thus to the space to be heated. The structure and appearance of the radiator are similar to those of a hot water-filled radiator, but it is not connected to a hydraulic circuit.

[0003] The electric radiators of the type described above are not without drawbacks.

[0004] The heating elements normally available on the market have fixed and relatively high heat ratings; the users themselves demand high ratings, as heating elements with lower ratings are perceived as having lower heating efficiency. On the other hand, numerous countries have enforced laws defining maximum surface temperatures for radiators.

[0005] In order to use the heating elements available on the market and demanded by customers, while at the same time ensuring compliance with legal requirements, it is either necessary to completely redesign the body of the radiator, or install systems to adjust and control the temperature, for example a thermostat that disconnects the electricity supply to the heating element when the surface temperature of the radiator reaches a pre-set limit.

[0006] Both solutions are clearly relatively complex and expensive to implement. In the former case, it would be impossible to maintain the size and appearance of the products already on the market, money would need to be spent on research and development and new manufacturing equipment would be required; in the latter, the use of thermostats or other surface temperature control systems would increase the cost and complexity of the radiator and reduce the possibility of controlling and adjusting the room temperature.

[0007] Moreover, regardless of whether temperature control systems are present, with the radiators of the known type heat distribution is not always entirely satisfactory, in particular the temperature is not distributed uniformly.

[0008] One purpose of the present invention is to provide an electric radiator for heating rooms that overcomes the drawbacks of the prior art described above; in particular a purpose of the invention is to provide an electric radiator that, while maintaining the same radiator size and installing a heating element with the same power, allows the temperature of the external surfaces to be maintained within a pre-set limit, without the use of additional control devices.

[0009] A further purpose of the invention is to provide an electric radiator that, with respect to those of the known type, has a structure capable of distributing the heat generated by the heating element better, in order to achieve a more uniform temperature distribution.

[0010] In accordance with the aforesaid purposes, the present invention relates to an electric radiator for heating rooms and an electric radiator module as claimed respectively in claims 1 and 10.

[0011] With respect to a conventional radiator of the same size and with a heating element having the same power, with the radiator according to the invention it is possible to control the surface temperature and maintain this below a desired maximum limit, without the need for any additional control devices. Moreover, the radiator according to the invention achieves a more uniform distribution of the radiator surface temperature.

[0012] In fact, by appropriately dimensioning and/or arranging the openings and/or gaps it is possible to limit heat conduction by the heating element towards the external surfaces of the radiator and thus control the surface temperature of the radiator to maintain this within the legal limit or within the limits deemed most appropriate, while using heating elements and radiator structures normally manufactured and used and without the need for control devices that would be used to the detriment of controlling room temperature.

[0013] Further characteristics and advantages of the present invention will become clear from the description of the following non-limiting embodiments thereof, with reference to the accompanying drawings, in which:

- figure 1 is an exploded perspective schematic view of an electric radiator according to the invention;
- figure 2 is a side view of a module of the radiator of figure 1;
- figures 3 to 5 are partial side views of a radiator module according to variation embodiments of the invention.

[0014] In figure 1, indicated as a whole by number 1 is an electric radiator for heating rooms.

[0015] The radiator 1 comprises a body 2, preferably made of metal, for example aluminium, and provided with an internal cavity 3, delimited by a perimeter edge 4, and with at least one external radiating wall 5. In the non-limiting example shown in the figures, the body 2 has a front external radiating wall 5 and a rear external radiating wall 6; the radiating walls 5, 6 are substantially parallel and arranged on opposite sides of the cavity 3 and are connected by a heat conduction structure 7.

[0016] The cavity 3 internally houses an electrically-powered heating element 8, of a type that is substantially known, for example of the resistive type and consisting of an electrical resistor 9 incorporated or embedded in a prismatic block 10 of a suitable material (mineral, stone,
composite, refractory, etc.). For example, the electrical resistor 9 is arranged between two flat sheets 11 coupled face to face to constitute the block 10.

[0017] The radiating walls 5, 6 are arranged on opposite sides of the heating element 8 and face and are substantially parallel to respective faces of the heating element 8.

[0018] The cavity 3 is substantially prismatic and extends between two lateral ends 12 of the body 2, which are closed by respective sides 13.

[0019] The radiator 1 is preferably formed by a plurality of modules 20 arranged side by side and joined to one another (in a way that is known and is not illustrated or described in detail for the sake of simplicity) to constitute the body 2.

[0020] Also with reference to figure 2, each module 20 consists of a monolithic element 21, for example made of die-cast aluminium, extending along an axis A (in use substantially vertical). Each module 20 comprises at least one radiating end plate 22 and one heat conducting plate 23 connected and substantially orthogonal to the end plate 22; in the non-limiting example illustrated, the module 20 has a substantially H-shaped cross-section, with a pair of substantially parallel radiating end plates 22, 24, respectively located at the front and rear, joined by a central heat conducting plate 23, substantially perpendicular to the end plates 22, 24. The module 20 is also provided with a plurality of variously-shaped flanges 25, which project from opposite faces of the plate 23. The plate 23 of each module 20 is provided with a through window 26 elongated along the axis A and delimited by a closed ring-shaped edge 27. The plate 23 thus connects the edge 27 to the end plates 22, 24. The edge 27 is provided in particular with two lateral portions 28 facing one another and parallel to the axis A, and is provided with brackets 29 that project from a lower end of the edge 27 inside the window 26 to support the heating element 8.

[0021] The modules 20 are arranged side by side in a predefined number to constitute the body 2 of the radiator 1; the front end plates 22 and the rear end plates 24 of the modules 20 constitute respective portions of the front radiating wall 5 and, respectively, of the rear radiating wall 6 of the radiator 1; the windows 26 of the modules 20 constitute respective portions of the internal cavity 3 of the body 2 and together define the cavity 3.

[0022] The plates 23 constitute the structure 7, which is arranged between the cavity 3 that houses the heating element 8 and the radiating walls 5, 6. The plates 23 connect the perimeter edge 4 of the cavity 3 to the radiating walls 5, 6 and are transversal to the radiating walls 5, 6; in the example shown, the heat conducting plates 23 are substantially parallel to one another and orthogonal to the radiating walls 5, 6 and to the heating element 8.

[0023] Also with reference to figure 3, each module 20 (or at least some of the modules 20) is/are provided with thermal insulation openings 30 and/or gaps 31, arranged between the edge 27 of the window 26 and, as shown in the figures, one or both of the end plates 22, 24 to reduce heat conduction through the plate 23 towards the end plates 22, 24.

[0024] The overall structure 7 is thus provided with thermal insulation openings 30 and/or gaps 31, arranged between the heating element 8 and one or both of the radiating walls 5, 6 to reduce heat conduction through the structure 7 towards the radiating walls 5, 6.

[0025] In particular, one or more thermal insulation openings 30 are formed so as to pass through each plate 23 or some plates 23. Preferably (but not necessarily), the openings 30 are slit-shaped and elongated parallel to the radiating walls 5, 6 and each plate 23 is provided with a series of openings 30 separated from one another and arranged in a staggered fashion with respect to one another. The openings 30 of each plate 23 extend altogether along most of the length of the plate 23 measured parallel to the axis A.

[0026] In the non-limiting example shown in figure 3, each plate 23 is provided with two pairs of staggered openings 30 parallel to the axis A and arranged symmetrically on opposite sides of the axis A, or of the window 26 and thus of the heating element 8.

[0027] It is understood that shape, size and arrangement of the openings 30 may differ from those shown and described herein purely by way of example. For example, according to variation embodiments that are not illustrated, the openings 30 are aligned on each side of the axis A, or slanted with respect to one another and/or with respect to the axis A.

[0028] Further examples are shown in figures 4 and 5, in which the openings 30 are of a different shape, for example consisting of round or oval holes, aligned (as shown on the left of figure 4) or staggered (as shown on the right of figure 4), or consisting of slotted holes or slits of different shapes and sizes and aligned or arranged at various inclinations and/or in a staggered fashion with respect to one another (figure 5).

[0029] The heating element 8 is housed in the cavity 3 and rests inferiorly on the brackets 29.

[0030] In the embodiment shown in figure 2, the heating element 8 is substantially in contact with and supported laterally by the lateral portions 28 of the edges 27.

[0031] In the embodiment of figure 3, the heating element 8 is supported in the cavity 3 by lateral support elements 33 that project into the cavity 3 from the perimeter edge 4; in particular, opposing support elements 33 project from the lateral portions 28 of the edges 27 of the single modules 20 into the windows 26; the support elements 33 come into contact with the opposite faces of the heating element 8 and maintain the heating element 8 (the volume of which is illustrated by the dashed line in figure 3) at a distance from the lateral portions 28 of the edges 27 and thus from the perimeter edge 4, so that the heating element 8 is separated from the perimeter edge 4 by thermal insulation gaps 31.

[0032] Clearly, the support elements 33 can be shaped and arranged so as to form a different number of gaps
31 and/or gaps with a different shape, size and arrangement to that illustrated herein purely by way of example, for example a pair of opposite gaps extending substantially along the entire height of the heating element 8 (as shown for example in figure 4), or a plurality of gaps 31 arranged along one or both faces of the heating element 8.

Lastly, it is clear that further modifications and changes may be made to the radiator described and illustrated herein without departing from the scope of the attached claims.

Claims

1. Electric radiator (1) for heating rooms, comprising a body (2), provided with an internal cavity (3) delimited by a perimeter edge (4) and with at least one radiating wall (5, 6), and an electrically-powered heating element (8) housed in the cavity; the body (2) comprising a heat conduction structure (7) arranged between the heating element (8) and the radiating wall (5, 6); the radiator being characterized in that the structure (7) has thermal insulation openings (30) and/or gaps (31) arranged between the heating element (8) and the radiating wall (5, 6) to reduce heat conduction through the structure (7).

2. Radiator according to claim 1, characterized in that the structure (7) comprises a plurality of heat conducting plates (23) that connect the perimeter edge (4) of the cavity (3) to the radiating wall (5, 6); thermal insulation openings (30) being formed so as to pass through the heat conducting plates (23).

3. Radiator according to claim 2, characterized in that the heat conducting plates (23) are substantially orthogonal to the radiating wall (5, 6) and to the heating element (8).

4. Radiator according to one of the previous claims, characterized in that the structure (7) has openings (30) and/or gaps (31) elongated parallel to the radiating wall (5, 6).

5. Radiator according to one of the previous claims, characterized in that the structure (7) has a series of openings (30) separated from one another and arranged in a staggered fashion with respect to one another.

6. Radiator according to one of the previous claims, characterized in that the heating element (8) is supported in the cavity (3) by support elements (33) which project into the cavity from the perimeter edge (4) and maintain the heating element at a distance from the perimeter edge, so that the heating element is separated from the perimeter edge by thermal insulation gaps (31).

7. Radiator according to one of the previous claims, characterized in that the body (2) is provided with a pair of radiating walls (5, 6) that are substantially parallel and arranged on opposite sides of the heating element (8), and the structure (7) has thermal insulation openings (30) and/or gaps (31) arranged between the heating element (8) and each radiating wall (5, 6).

8. Radiator according to the previous claim, characterized in that the openings (30) are arranged symmetrically on opposite sides of the heating element (8).

9. Radiator according to one of the previous claims, characterized by being formed by a plurality of modules (20) arranged side by side and joined to form the body (2), each module having a central window (26), defining a portion of the internal cavity (3) of the body, and at least one end plate (22, 24) defining a portion of the radiating wall (5, 6) of the body.

10. Module (20) of a rooms heating electric radiator, comprising at least one end plate (22, 24) and one heating conduct plate (23) connected to the end plate (22, 24) and provided with a through window (26), delimited by an edge (27) and intended to house an electrically-powered heating element (8); the module being characterized in that having thermal insulation openings (30) and/or gaps (31), arranged between the edge (27) of the window (26) and the end plate (22, 24) to reduce heat conduction through the heat conducting plate (23).

11. Module according to claim 10, characterized in that thermal insulation openings (30) are formed so as to pass through the heat conducting plate (23).

12. Module according to claim 10 or 11, characterized in that the heat conducting plate (23) is substantially orthogonal with respect to the end plate (22, 24).

13. Module according to one of the claims from 10 to 12, characterized by being provided with openings (30) and/or gaps (31) elongated parallel to the end plate (22, 24).

14. Module according to one of the claims from 10 to 13, characterized by having a series of openings (30) separated from one another and arranged in a staggered fashion with respect to one another.

15. Module according to one of the claims from 10 to 14, characterized by comprising support elements (33) that project into the window (26) from lateral portions (28) of the edge (27) to support the heating element.
(8) and maintain the heating element at a distance from the edge, so that the heating element is separated from the edge by thermal insulation gaps (31).

16. Module according to one of the claims from 10 to 15, characterized by comprising a pair of opposite end plates (22, 24) that are substantially parallel and joined by the heat conducting plate (23); thermal insulation openings (30) and/or gaps (31) being arranged between the edge (27) of the window (26) and each end plate (22, 24).