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(54) **Modular element for the production of heating radiators and process for the manufacturing thereof**

(57) The invention provides a modular element for composing heating radiators comprising a die-casting finned structure of aluminium, defining one, two or more vertical conduits extending between two horizontal conduits, namely an upper and a lower, in which in the or each vertical conduit a tubular insert is disposed, of a metal with a higher mechanical strength and chemical

corrosion resistance than the material forming the finned structure. The inner surface of the upper and lower horizontal conduits in said structure is lined with a layer of anticorrosive material deposited thereon after casting the structure. The invention also relates to a process for manufacturing the modular radiator element.

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Description

Field of the Invention

[0001] The present invention relates in general to radiators for heating systems, and in particular to an innovative modular element for the production of such radiators, and to the radiators obtained.

State of the Art

[0002] Heating radiators are usually composed of modular elements which are fixed together in banks, side by side. According to a known art each modular radiator element has a body obtainable by a die-casting process in aluminium or its alloys, and comprises at least one vertical conduit which extends between, and connects together, two horizontal conduits spaced apart in height, on lower and one upper, to enable a thermovector fluid, generally water, to flow.

[0003] For specific uses, especially in localities where the thermovector fluid has a high corrosion level and/or is circulated at relatively high pressures, the chemical and physical resistance of aluminium may be insufficient. For these cases, it has already been proposed to insert into the vertical and horizontal conduits of the aluminium die-casting, by embedding them during the casting process itself, tubes of other metal such as iron or steel having a higher corrosion and pressure resistance. Radiators formed in this manner are also known as bimetal, the tubes inserted into their horizontal conduits being threaded to enable several modular elements to be connected together as a bank. However, the prior preparation of additional tubes to be embedded in each radiator modular element and their location on the die-casting die are relatively laborious and costly operations because they have to be repeated for each module, the tube insertion into the vertical conduits and horizontal conduits contributing to increasing the weight of the finished radiator.

Object and Summary of the Invention

[0004] The object of the present invention is to create the conditions for forming modular elements for manufacturing radiators of the stated type without embedding additional tubes in their horizontal conduits, while still protecting the tubular aluminium or aluminium-alloy structure against corrosion and high operating pressures, with the result of obtaining lighter modular elements than the known art.

[0005] The inventive object is attained by a modular element for composing heating radiators in accordance with the introduction to claim 1, characterised in that the upper and lower horizontal conduits of the finned structure are internally lined with a layer of anticorrosive material applied thereto by deposition following casting of said structure, before or after assembling the modular element side by side with others following a process

claimed in claim 2.

Brief Description of the Drawings

[0006] Further details of the invention will be apparent from the following description given with reference to the accompanying drawings, which are provided by way of non-limiting example and in which:

Figure 1 shows two modular radiator elements before assembly;
Figure 2 shows a tubular insert for the vertical conduit of each modular element; and
Figure 3 shows a longitudinal section through part of two assembled modular elements taken at the level of a horizontal conduit.

Detailed Description of the Invention

[0007] As shown, each modular radiator element comprises a finned structure 10 produced by die-casting in aluminium or the like and configured, in known manner, to define at least one vertical conduit 11 extending between two horizontal conduits, namely an upper 12 and a lower 13. A tubular insert 14 of another material, such as iron or steel, of higher mechanical strength and resistance to chemical corrosion than the aluminium forming the finned structure, is disposed in the vertical conduit 11. A lining layer 15 of a corrosion resistant substance is applied to each horizontal conduit 12, 13 to protect the aluminium parts in contact with the circulating thermovector fluid.

[0008] Each modular element is formed by a production process comprising, after providing the tubular insert and preparing a suitable die-casting die:

- locating the tubular insert 14 in the die,
- using a die-casting press, injecting molten aluminium into said die to form the finned structure 10 complete with vertical conduit 11 and horizontal conduits 12, 13 and with the tubular insert 14 embedded therein such that it is intimately integrated therewith, to cover the vertical conduit 11, and
- after solidification, extracting the structure 10 from the die.

[0009] Each modular element is then smoothed by mechanical grinding, and the ends of each horizontal conduit 12, 13 are threaded, after which, to form a bank, the modular element is connected to other modular elements by connectors engaged with the threads of the horizontal conduits, to compose a radiator 16 - Figure 3 - of the desired dimensions.

[0010] The inner surfaces of the horizontal conduits 12, 13 of the resultant radiator are then washed by various washing and drying steps to condition them for application of the anticorrosive lining layer 15 to protect the aluminium from chemical corrosion. This anticorrosive

lining layer 15 can be produced starting from a liquid or pulverulent substance applicable to the horizontal conduit surfaces by a spray gun applicator insertable and movable within the conduits.

[0011] The radiator 15 treated in this manner is then passed to a firing kiln to solidify and stabilize the anticorrosive lining layer. The radiator can then be painted.

[0012] It should be noted that, without leaving the scope of protection of the present invention, the lining layer can also be applied to each modular element individually prior to its assembly into a bank with others to form a radiator.

Claims

1. A modular element for the production of heating radiators comprising a die-casting finned structure of aluminium or the like, defining one, two or more vertical conduits extending between two horizontal conduits, namely an upper and a lower, in which in the or in each vertical conduit a tubular insert is disposed, of a metal with a higher mechanical strength and chemical corrosion resistance than the material forming the finned structure, **characterised in that** the inner surface of the upper and lower horizontal conduits in said structure is lined with a layer of anticorrosive material deposited thereon after casting the structure.
2. A process for manufacturing modular elements for the production of heating radiators, comprising the steps of:
 - providing a tubular metal insert and preparing a die for die-casting an aluminium modular element structure having at least one vertical conduit extending between two parallel horizontal conduits,
 - positioning the tubular insert in said die,
 - injecting molten aluminium into said die to form said structure complete with vertical conduit and horizontal conduits and with the tubular insert embedded therein to cover the vertical conduit,
 - after solidification, extracting said structure from the die,
 - smoothing said structure by mechanical finishing,
 - treating the inner surface of the horizontal conduits by depositing thereon a lining layer of a substance protecting the aluminium from corrosion at said horizontal conduits.
3. A process as claimed in claim 2, wherein deposition of the lining layer on the inner surface of the horizontal conduits of the modular element structure is preceded by washing and drying said surface before the modular element is connected to other elements

to compose a radiator.

4. A process as claimed in claim 2, wherein deposition of the lining layer on the inner surface of the horizontal conduits of the modular element structure is preceded by washing and drying said surface after the modular element is connected to other elements to compose a radiator.
5. A process as claimed in claim 2 or 3 or 4, wherein the lining layer on the inner surface of the horizontal conduits of the modular element is produced by spray-applying a liquid or pulverulent anticorrosive substance.

