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(54) **Protected carbon steel pipe for conveying flue gases in a heat exchange apparatus**

(57) A protected carbon steel pipe (1; 7) for conveying flue gases in a heat exchange apparatus, comprising an outer jacket (2; 8) made of carbon steel, which is provided internally with a plurality of contiguous sectors (3,

4, 5; 9) made of corrosion-resistant material and provided with variously shaped fins (3a, 4a, 5a; 9a), and a continuous layer (6; 10) made of corrosion-resistant material which is interposed and in contact between the outer jacket (2; 8) and the plurality of contiguous sectors (3, 4, 5; 9).

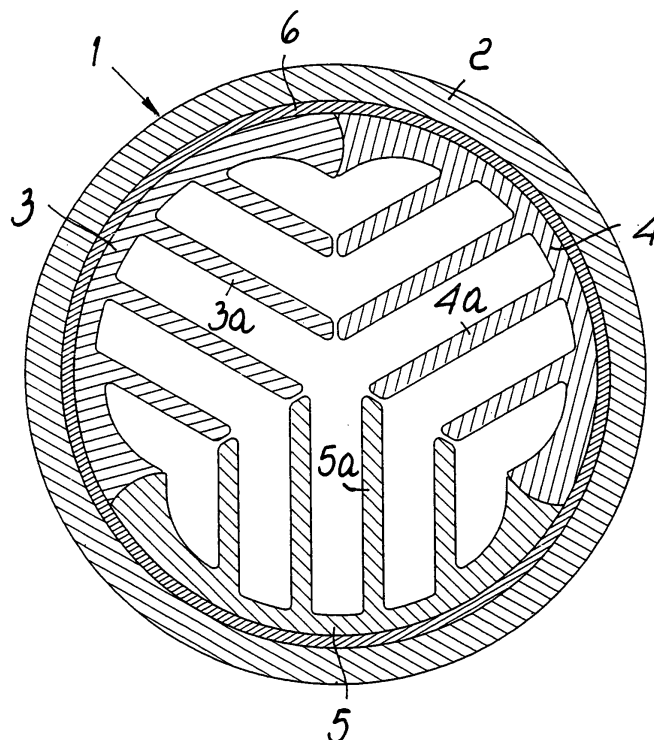


Fig. 1

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Description

[0001] The invention relates to a protected carbon steel pipe for conveying flue gases in a heat exchange apparatus.

[0002] It is known that there are heat exchange apparatuses, such as for example fire tube boilers for generating hot water or another heat transfer fluid, or different apparatuses of industrial thermal cycles, such as for example condensers, economizers, heat exchangers, which provide for the presence of pipes designed to convey flue gases produced by combustion in appropriately provided furnaces, inserted within a vessel which contains the fluid to be heated.

[0003] The pipes comprised within such apparatuses are made of carbon steel in order to ensure optimum quality of the welded joints between the pipes and the structures of the apparatuses, which are also made of carbon steel, and in the case of apparatuses such as for example condensing boilers, in which the water vapor contained in the flue gases condenses inside the flue gas conveyance pipes, forming corrosive condensation, the internal surface of the pipes is protected in different manners.

[0004] For example, pipes have been proposed which comprise an outer jacket which is made of carbon steel and is provided internally with a plurality of contiguous sectors which are made of corrosion-resistant material and are provided with variously shaped fins, but in this embodiment flue gases can penetrate between one sector and the other, with the consequent possibility of contact of such flue gas, which has cooled and therefore carries corrosive condensation, with the outer jacket, which accordingly is not protected fully.

[0005] The aim of the present invention is to provide a protected carbon steel pipe which comprises the elements described above and in which full protection of the outer jacket made of carbon steel is ensured.

[0006] The proposed aim is achieved by a protected carbon steel pipe for conveying flue gases in a heat exchange apparatus, according to the invention, comprising an outer jacket made of carbon steel, which is provided internally with a plurality of contiguous sectors made of corrosion-resistant material and provided with variously shaped fins, characterized by the presence of a continuous layer made of corrosion-resistant material which is interposed and in contact between said outer jacket and said plurality of contiguous sectors.

[0007] Further characteristics and advantages of the present invention will become better apparent from the description of two preferred but not exclusive embodiments of the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a transverse sectional view of the protected carbon steel pipe according to the invention; Figure 2 is a transverse sectional view according to a different embodiment.

[0008] With reference to Figure 1, the reference numeral 1 generally designates a pipe according to the invention, which comprises an outer jacket 2 made of carbon steel and provided internally with contiguous sectors 3, 4, 5 made of corrosion-resistant material, such as for example aluminum alloy or stainless steel, and which are provided with fins 3a, 4a, 5a respectively for the sectors 3, 4, 5.

[0009] An important feature of the invention is the presence of a continuous layer 6 made of corrosion-resistant material, which is interposed between the outer jacket 2 and the sectors 3, 4, 5 and adheres both to the jacket and to the sectors.

[0010] In this manner, the outer jacket 2 made of carbon steel has a complete protection against corrosion, because any infiltrations of flue gases between one sector and the other are blocked by the layer 6 and any contact between the flue gases and the jacket is thus prevented.

[0011] The embodiment of Figure 2 illustrates a pipe 7 in which the outer jacket 8 made of carbon steel is provided internally with a plurality of sectors 9 which are made of corrosion-resistant material and are provided with fins 9a, 9b, which are shaped so as to define a plurality of flue gas conveyance modules which are substantially shaped like sectors.

[0012] In the second embodiment, the reference numeral 10 designates the continuous layer made of corrosion-resistant material which, interposed so as to adhere between the outer jacket 8 and the plurality of sectors 9, provides full protection of the jacket against any infiltrations of flue gases which may occur between one sector and another.

[0013] The described invention is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0014] The disclosures in Italian Patent Application No. MN2006A000071 from which this application claims priority are incorporated herein by reference.

[0015] 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 protected carbon steel pipe (1; 7) for conveying flue gases in a heat exchange apparatus, comprising an outer jacket (2; 8) made of carbon steel, which is provided internally with a plurality of contiguous sectors (3, 4, 5; 9) made of corrosion-resistant material and provided with variously shaped fins (3a, 4a, 5a;

9a), **characterized by** the presence of a continuous layer (6; 10) made of corrosion-resistant material which is interposed and in contact between the outer jacket (2; 8) and said plurality of contiguous sectors (3, 4, 5; 9).

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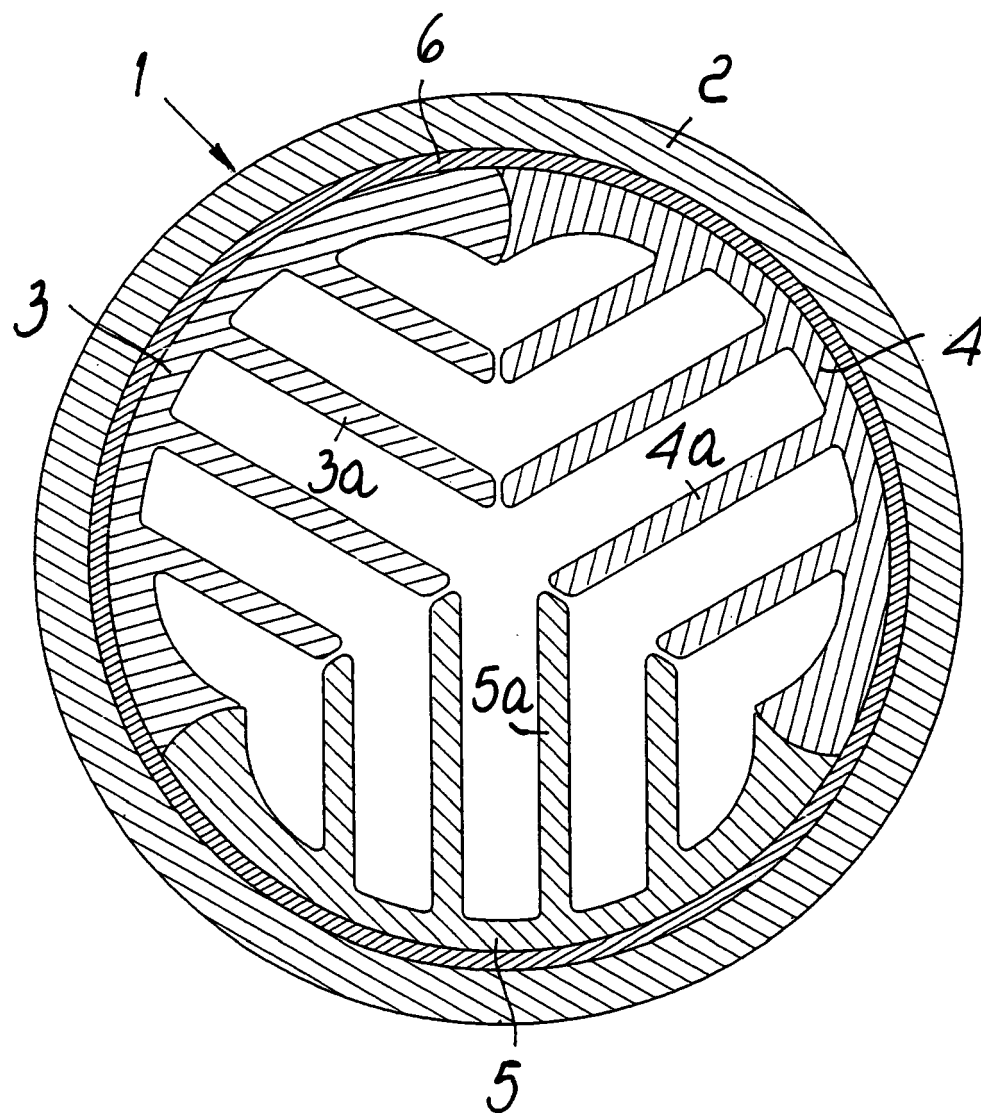


Fig. 1

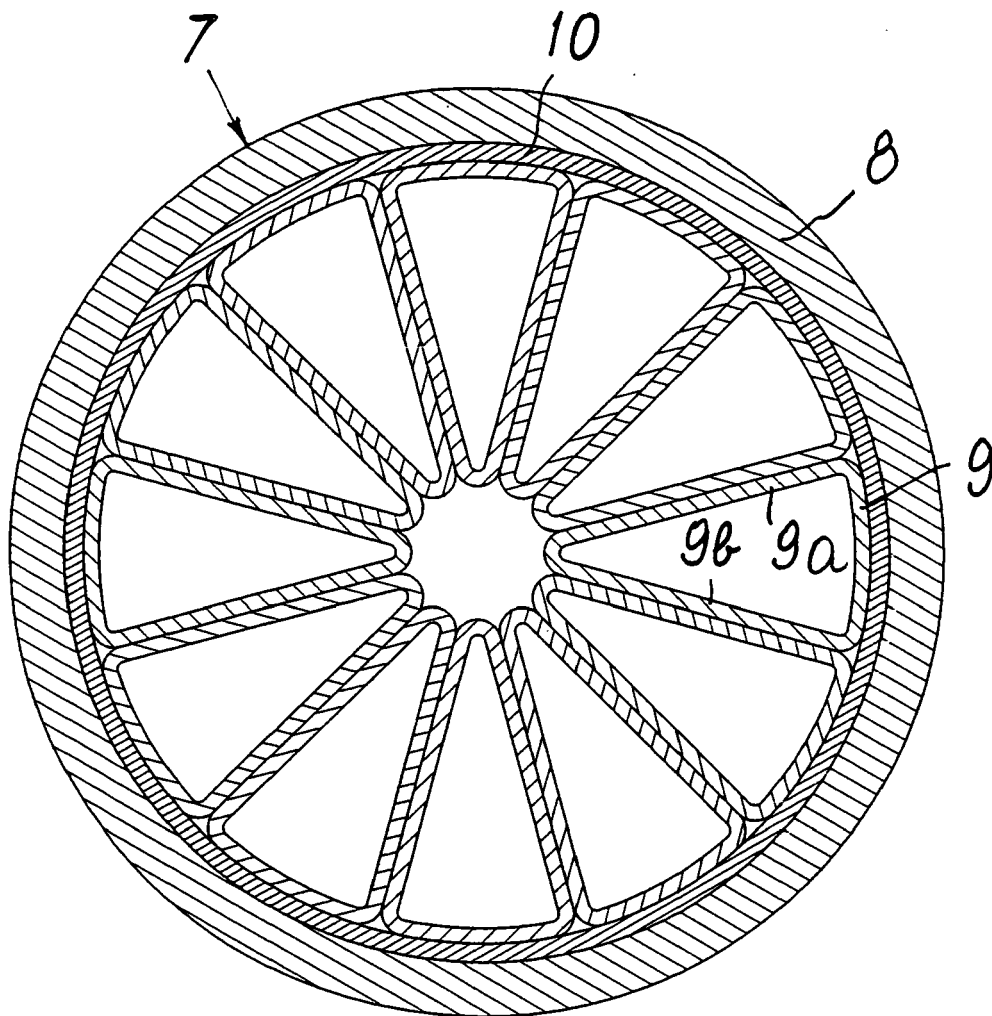


Fig. 2



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 02 3047

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
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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 4 March 2008	Examiner Martínez Rico, Celia
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 07 02 3047

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
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04-03-2008

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