

(19)



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(11)

EP 1 222 982 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

17.07.2002 Bulletin 2002/29

(51) Int Cl.7: **B22D 41/02**

(21) Application number: **02000486.7**

(22) Date of filing: **08.01.2002**

(84) Designated Contracting States:

**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**

Designated Extension States:

AL LT LV MK RO SI

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(30) Priority: **16.01.2001 IT BA010004**

(54) **Lining for ladles, tundishes and similar receptacles used in the iron and steel industry**

(57) One-piece lining for ladles, tundishes and similar receptacles used in the iron and steel industry characterised by an insulating and heat resistant stucco, with suitable thickness.

Said lining avoids as much as possible steel and/or

cast iron infiltrations in the ladles walls, causing a longer lifetime of the tundishes; reduces the oxidation of the walls; improves the refractory structure; finally, thanks to its "monolocity" and thermal insulation, it avoids the steel temperature reduction.

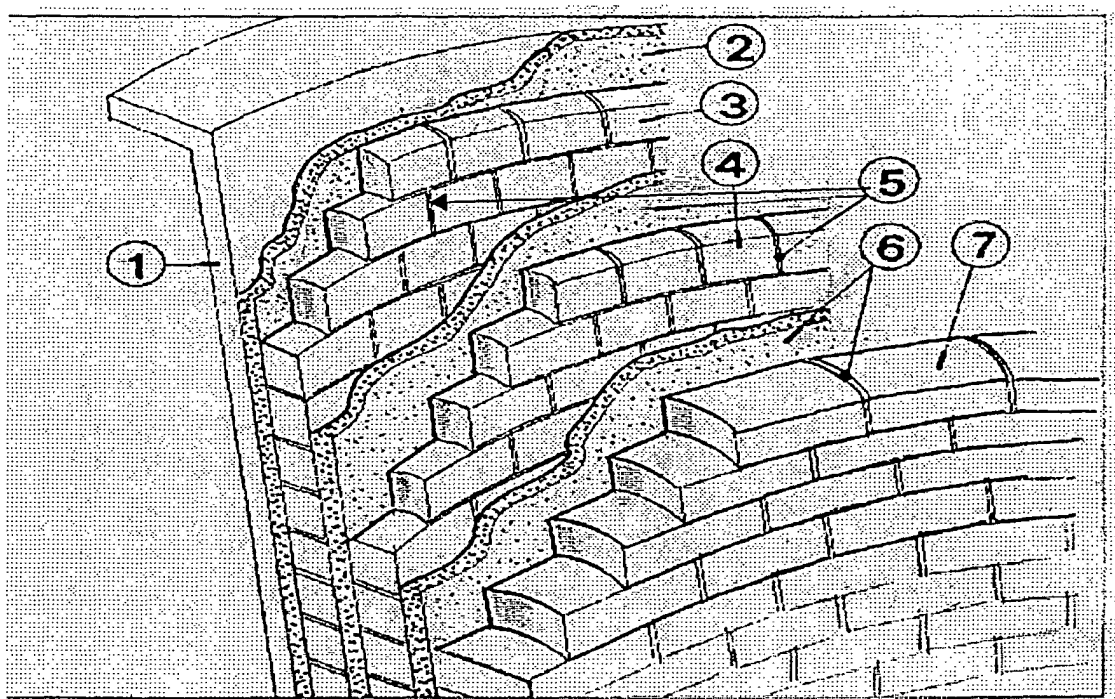


FIG. 1

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Description

Technical field

[0001] The present invention relates to one-piece lining for ladles, tundishes and similar receptacles used in iron and steel industry. It comprises one or more layers of refractory bricks, which are joined together on every contact surfaces with a low-expansion, heat resistant stucco, said stucco being treated with a carbon-based additive as the one described in the Italian patent No. 01243637.

[0002] As known, steel production process comprises several phases: molten metal from the blast furnace is taken to steel meting shop where further redution of impurities is done in converters. The liquid steel is taken into ladles and afterwards in other containers or tundishes. Ladles are metal receptacles lined with refractory bricks and a refractory wall, which is in contact with the molten metal and must be periodically replaced (rebrick-ing). Tundishes are containers made of steel and lined with some brick layers coated with 3-4 cm, highly refractory materials.

[0003] These containers have some drawbacks: steel infiltration into the refractory materials, persistent adhesion of steel to the ladles or buckets inner walls. Experts try to overcome these problems lining the ladles walls with special refractory bricks and binding materials, though without solving effectively solving the problem.

[0004] Moreover, said receptacles and, in particular, ladles and buckets are subjected to oxidation of the metal sheets with the consequent reduction of the wall thickness; lastly, also the carbon-based bricks subjected to slags attack, are oxidized. With time and at a temperature ranging between 800°C and 100°C, oxygen decarburizes the bricks, lowering their mechanical resistance, and causing wear and carbon release in the produced steel.

Disclosure of the invention

[0005] The invention solves the above mentioned problems being characterised as a one-piece lining comprising some layers of refractory bricks joined together with alumina- or zircon-based stuccos. These stuccos, treated with a carbon additive already described and claimed in the Italian patent No. 01243637, are thermal resistant and have a low coefficient of thermal expansion.

[0006] These and other advantages will be pointed out in the detailed description of the invention that will refer to the figures 1 and 2 of the tables 1/1. Both are exemplifying and not restrictive.

Way of carrying out the invention

[0007] Fig. 1 describes a practical, preferred but not

restrictive example, how said coating can be applied to a ladle surface.

[0008] The lining consists of a not penetrable wall pattern made of horizontal and vertical joints with suitable binding materials that makes a real barrier to the liquid steel. In figure 1, (1) is the ladle metal shell, on which a first 2-mm layer of protective, binding and insulating stucco (2) is applied. According to a preferred embodiment, this material can be composed of aluminum silicate, sand and ceramic fibers. Afterwards, a first protective layer (3) made of slabs or bricks (flat or with a proper curvature) is laid on said stucco (2) and joined together with the alumina- and/or zirconium-based, low expansion stucco (5). Before the next protective layer is laid, a further layer of the material (5) is applied on the bricks surface. Said stucco layer must be applied gradually, on small portions of the wall (some square meters), to avoid its complete hardening before the bricks are laied down. Then, the bricks (4) are laied down, joined with the same material (5). The most important part of the coating is a layer (6) made of the very same material of the layer (5). Said layer, which acts as a strong barrier to molten steel or cast iron infiltrations, can have a thicknes of approximately 2 mm and must be applied on the whole surface; then it must dry completely (about 4-8 hours, according to the external temperature) before laying the final layer of the wall (7).

[0009] Summarizing, the advantages of such coating system are: the reduction of infiltrations due to the stucco interlayers that cool down the molten steel which solidifies into thin sheets easily removable; reduction of maintenance time and longer lifetime of the refractory materials; reduction of ladles cracking and leakage; lower temperature of the shell external surface and, consequently, lower steel heat losses. Finally, the use of such insulating and heat resistant coating for such receptacles avoids the oxidation of the sheet metal walls, their thickness reduction and allows a lower carbon release in the produced steel, in particular if carbon bricks are used.

Claims

1. One-piece lining for ladles, tundishes and similar receptacles used in iron and steel industry, comprising one or more layers of refractory material and a working lining, and **characterised by** several layers of binding materials (5), (6), with suitable thickness, having high thermal insulation, low expansion coefficient and high temperature resistance, treated with a carbon-based additive as the one described in the Italian patent No. 01243637.
2. Lining according to the claim 1, **characterized by** the fact that said materials of layers (5), (6) are made of high content of alumina, zirconium silicate and/or other alkaline or acid elements with high re-

fractory properties and high heat resistance up to 1700 °C.

3. Lining according to the claim 1 or 2, **characterized by** the following composition: a first layer, of some millimeters thick, of protective and insulating material (2), based on ceramic or alumina fibers, applied on the ladles metal sheets as a binding stucco (1); a first protective brick layer (3), laied on the said material (2) and joined together by a material (5) **characterized by** a high content of alumina or zirconium and by a low expansion coefficient; a second layer of the same material (5), of some millimeters thick, applied as a binding stucco on the first layer of bricks; a further protective bricklayer (4), joined with the same material (5), having the above mentioned characteristics; a further layer (6) made of the same material of the layer (5); a final working lining (7).

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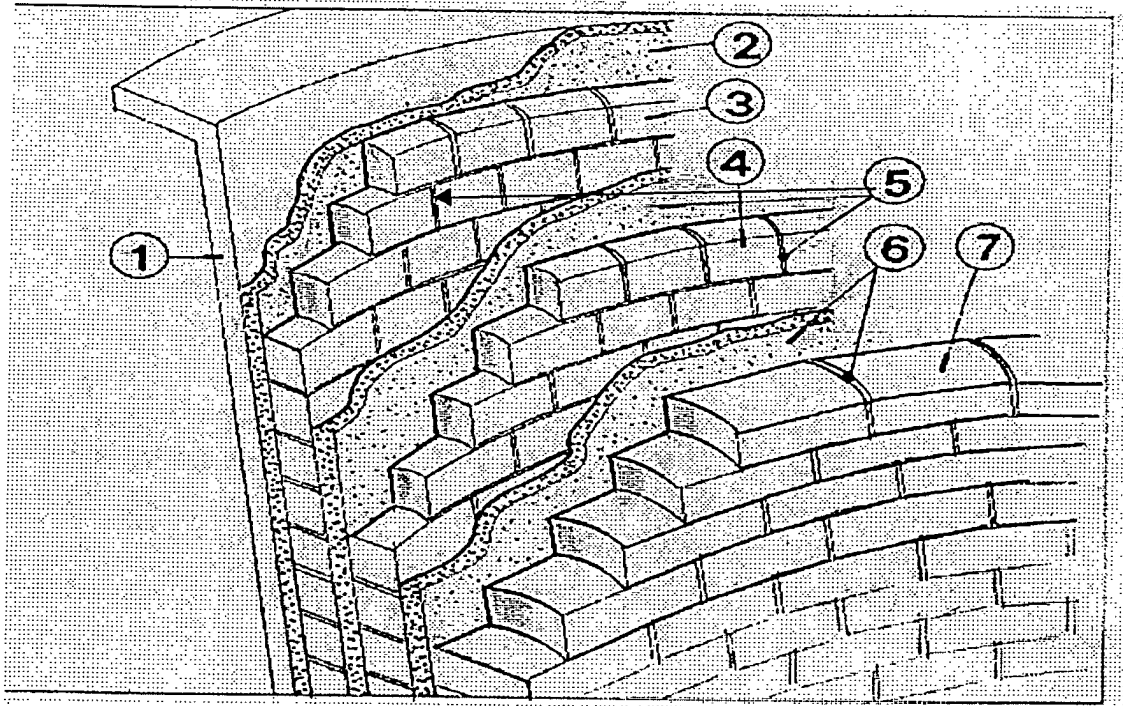


FIG. 1

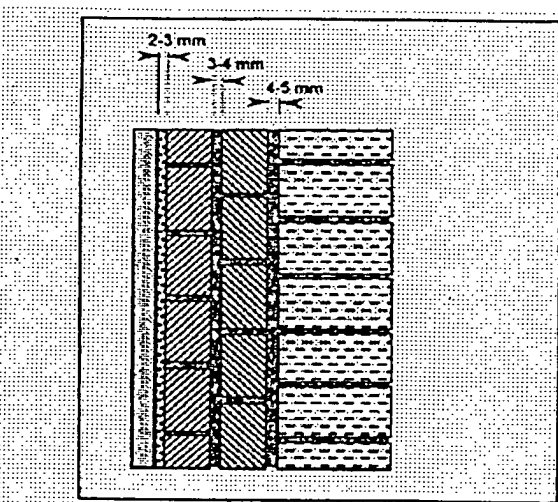


FIG. 2