INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

Applicants: LEHTINEN, Markku [FT/FT]; Brobackavagen 4 A 2, FT-21600 Pargas (FT).

WO 2008/148940 A1

Title: FTRE-SAFE VENTILATED STRUCTURE FOR A BUILDING

Abstract: The invention relates to a fire-safe ventilated structure (7) for a building, which as an inner wall cladding comprises a concrete element (1) and a mineral wool layer (8), which is bonded to an external side of the concrete element and which on its external side has a hardened windscreen coating (3) applied in a mortar state to the mineral wool layer and is permeable to moisture and non-inflammable, as well as a façade element (4) which is secured by means of fasteners (5) and spacers (6) through the windscreen coating (3) and the insulation (8) to the inner concrete cladding (1) so as to leave between the façade element (4) and the windscreen coating (3) an air gap (9) necessary for ventilation.

Fig. 1
Fire-safe ventilated structure for a building

The invention relates to a ventilated and fire-safe structure, equipped with a fire-safe windscreen and intended for buildings, such as e.g. apartment and commercial buildings, where non-inflammability is required of the windscreen.

Prior art

In prior art, it is known to provide protection against the wind by using so-called "non-woven" fabrics, i.e. fiber fabrics, as a windscreen for mineral wool products to be installed on external building walls.

In prior art solutions, the wind protection is comprised of a combination of fiber-glass felt and paint or of a special fabric alone. These prior art solutions are basically functional, but do involve shortcomings. First of all, they have poor fire characteristics, i.e. burn too easily. Secondly, the application thereof on the surface of an insulating material requires a separate gluing process, i.e. a separate glue matter. Accordingly, there is a demand for novel, sufficiently moisture-permeable wind-screens, which are non-inflammable, structurally simpler, and capable of being installeld on the surface of an insulating material in a simpler manner.

Description of the invention

A solution to the foregoing prior art problems has been provided by inventing a fire-safe ventilated structure for a building, which is characterized in that it as an inner wall cladding comprises a concrete element and a mineral wool layer, which is bonded to an external side of the concrete element and which on its external side has a hardened windscreen applied in a mortary state to the mineral wool layer and being permeable to moisture and non-inflammable, as well as a façade element which is secured by means of fasteners and spacers through the windscreen and the insulation to the inner concrete cladding so as to leave between the façade element and the windscreen coating an air gap necessary for ventilation.
The fire-safe ventilated structure for buildings, provided by the invention, fulfils the requirements regarding both adequate ventilation and fire safety. For apartment and commercial buildings, in particular, the solution presented by the invention provides an important service because of its non-inflammability. The risks of fire spreading and damage caused thereby are particularly high in apartment and commercial buildings and, thus, the structure of the invention serves a useful purpose especially in that type of buildings.

According to one preferred embodiment, the windscreen consists of a mineral-based material. In its preferred service as a coating, the windscreen is firmly attached to the fibers of the insulating material, conforming to the insulation material's surface, i.e. being laminated therewith. The air blocker coating used in a ventilated structure of the invention does not allow the entry of air flows in adverse amounts while, on the other hand, it does allow the passage of water vapor the way a proper windscreen is supposed to work.

According to another preferred embodiment, the windscreen material consists of backing coat plaster. Other material options include artificial-resin based, acrylic or organic adhesives.

All of the windscreen substances, mentioned above and useful in this invention, are non-inflammable and can be applied manually or with a spray gun and, regarding the material characteristics thereof, all these are elastic and contain fibers. According to one preferred option, the windscreen substance can be applied to the insulating material as early as in the concrete element casting process, by laying an amount of such material on the bottom of a mould, upon which is then placed a layer of insulating material, with a cast concrete layer being added on top of the latter. On the other hand, according to another embodiment, being applied manually or with a spray gun, the windscreen substance can be bonded to the surface of a concrete cladding element insulating material for example at the factory or worksite.

As stated above, the question is about a ventilated structure, the inner wall cladding of which comprises a concrete element and a rock wool product (a panel or a la-
mella, meaning that wool fibers are either parallel with the insulating panel's surface or orthogonal with respect to the insulation surface), preferably bonded thereto at the factory during the course of the casting process. Alternatively, of course, the insulation layer can be bonded to the concrete cladding element with a variety of fastening elements. A problem with such assemblies is that the surface of an unprotected thermal insulating material is exposed to flowing air and allows such air flows inside, thus affecting the product's heat insulation performance. In order to deal with this problem, the insulation layer is covered with a windscreen coating. In the event that a mineral wool insulating material, preferably rock wool, is coated with a windscreen coating at the factory, the coating of sealed joints will be performed consequently at the worksite by using the same substance. The actual façade is mounted either at the factory or at the worksite with separate fasteners and spacers through the insulating material and the windscreen to the inner concrete cladding, thus leaving between the façade element and the windscreen-coated insulation surface an air gap needed for ventilation.

Regardless of whether the windscreen is applied in a mould on the insulating material of concrete cladding elements to be cast during the casting of a concrete cladding element or on the surface of the insulating material at the factory or worksite after an embedding process of the concrete in the insulating material has been performed in a mould, this windscreen is nevertheless constructed without a separate core or without a separate gluing process and glue matter. This is possible because the windscreen coating, capable of being applied, sprayed or bonded in a mortary state (contains e.g. water), possesses gluiness/mortariness, whereby the bonding to the insulating material occurs during the course of its drying, thus establishing a uniform windproof surface/coating on the heat insulating material of mineral wool (e.g. rock wool). Notwithstanding its alkalinity, the windscreen material is apt for use with rock wool as rock wool has resistance to alkali. During its application process, the windscreen coating is a wet mortar substance as opposed to the currently available materials which consist of fabric or panel products.
Working example

The invention will now be described more specifically by way of example with reference to the figure 1 of principle, which shows a fire-safe ventilated building structure of the invention in a cross-sectional view as seen from the top of such a structure in an assembled condition. The presently described example is not to be construed as limiting our invention which is defined in the claims.

In a ventilated building structure 7 as shown in fig. 1, the inner wall cladding comprises a concrete element 1, to which is bonded, during the course of its casting, an insulation layer of rock wool 8, which consists of several lamellae of rock wool. The insulation layer 8 has its outer surface provided with a windscreen coating 3 made up of hardened backing coat plaster. This material, i.e. backing coat plaster, applicable as the windscreen coating 3, is bonded to the insulation layer 8 during the course of casting the concrete element 1 by first laying backing coat plaster for the layer 3 on the bottom of a mould, then on top of that the insulation layer 8 of rock wool lamellae, followed by casting the concrete layer 1 for a final and topmost layer.

Alternatively, the windscreen coating 3 is not bonded until after embedding of the concrete 1 with the insulation 8 has taken place in a mould, in which case the windscreen material is applied to the insulation layer by spraying or grinding it onto the insulation surface either at the fabrication plant of concrete elements or at the worksite.

In this example, the ventilated structure according to the invention is ultimately completed at the worksite, wherein an actual façade 4 is secured to the concrete element 1 included in an entity consisting, as described above, of the mutually bonded concrete cladding 1, the insulation 8, and the windscreen coating 3, through the insulation 8 and the windscreen coating 3 by means of suitable fasteners 5. Interposed between the windscreen coating 3 of the insulation 8 and the façade are suitable spacers 6 to provide a space between the façade 4 and the coating 3 for an air gap 9 needed for ventilation.
Air permeability test for mortar-coated rock wool products

1 Specimens and measuring method
Specimen size was 300 mm x 300 mm x specimen thickness. Top edges of the specimens were taped with duct tape to make the edges of specimens intact and to improve the compactness of specimens in a measuring apparatus. With such a procedure, the resulting surface area of a measured region was 0.0784 m² as opposed to normally employed 0.09 m².

The measurement was conducted by applying the EN 29053 method. Air flow rates used in the measurement of each specimen were 0.3 l/min, 0.7 l/min, and 1 l/min.

The employed products consisted of rock wool.

2 Results

<table>
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<th>Specimen</th>
<th>Wool weight/g</th>
<th>Coating weight/g</th>
<th>L-value $10^6$ m$^3$/m$^2$sPa</th>
<th>To be noted</th>
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<tr>
<td>1</td>
<td>509.3</td>
<td>392.2</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>542.0</td>
<td>662.1</td>
<td>17</td>
<td>Coating has a 10 cm crack</td>
</tr>
<tr>
<td>3</td>
<td>563.1</td>
<td>539.8</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>525.7</td>
<td>337.8</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>538.9</td>
<td>176.4</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>525.8</td>
<td>171.7</td>
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Thus, the results indicate that the mortar coating has an air permeability factor acceptable in buildings ($L$-value < $25 \times 10^{-6}$ m$^3$/m$^2$sPa) and that, consequently, it functions quite well as a windscreen in external wall structures, which are provided with a ventilation opening or gap between an insulating material coated with this windscreen and an actual façade.
Claims

1. A fire-safe ventilated structure (7) for a building, characterized in that it as an inner wall cladding comprises a concrete element (1) and a mineral wool layer (8), which is bonded to an external side of the concrete element and which on its external side has a hardened windscreen coating (3) applied in a mortary state to the mineral wool layer and being permeable to moisture and non-inflammable, as well as a façade element (4) which is secured by means of fasteners (5) and spacers (6) through the windscreen coating (3) and the insulation (8) to the inner concrete cladding (1) so as to leave between the façade element (4) and the windscreen coating (3) an air gap (9) necessary for ventilation.

2. A structure (7) as set forth in claim 1, characterized in that the windscreen coating (3) consists of a mineral-based material.

3. A structure (7) as set forth in claim 2, characterized in that the mineral-based substance consists of backing coat plaster.

4. A structure (7) as set forth in any of claims 1-3, characterized in that the insulation (8) is applied to the inner cladding element (1) of concrete during the course of casting the concrete element.
INTERNATIONAL SEARCH REPORT

A CLASSIFICATION OF SUBJECT MATTER

INV. E04C2/04

According to International Patent Classification (IPC) or to both national classification and IPC

B FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E04C E04B E04F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data Base and where practical search terms used)

EPO-Internal

C DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<tr>
<th>Category</th>
<th>Citation of document, with indication where appropriate of the relevant passages</th>
<th>Relevant to claim No</th>
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<td>A</td>
<td>DE 16 83 498 A (SPANNBETONWERK KOCH KG)</td>
<td>1, 4</td>
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<tr>
<td></td>
<td>21 October 1971 (1971-10-21)</td>
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<td>page 8, line 5 - page 10, line 13; figure 9</td>
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<tr>
<td>A</td>
<td>DE 35 35 372 A (KAUFMANN ET AL.)</td>
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<td>9 April 1987 (1987-04-09)</td>
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<td>column 2, line 21 - column 3, line 59; figures 1A, 2A, D</td>
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D Other documents are listed in the continuation of Box C

X See patent family annex

• Special categories of cited documents
  • 'A' document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search

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28/10/2008

Name and mailing address of the ISA/Authorized officer

European Patent Office
P.B. 5818 Palatinean 2
NL - 2280 HV Rijswijk
Tel (+31-70) 340-2040
Fax (+31-70) 340-3016

Mysliwetz, Wolfgang
<table>
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<tr>
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<tr>
<td>DE 1683498 A</td>
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<td>DE 3535372 A</td>
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