

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 865 549 B2

(12)

NEW EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the opposition decision:
27.04.2005 Bulletin 2005/17

(51) Int Cl.7: **E04B 1/94**
// E04B101:00

(45) Mention of the grant of the patent:
22.03.2000 Bulletin 2000/12

(86) International application number:
PCT/FI1996/000664

(21) Application number: **96941675.9**

(87) International publication number:
WO 1997/021884 (19.06.1997 Gazette 1997/26)

(22) Date of filing: **16.12.1996**

(54) **Lining panel, a method for manufacturing the same, and the use of a fire retardant composition or the panel**

Verkleidungspaneel, Verfahren zu dessen Herstellung, und Gebrauch einer feuerhemmenden
Komposition für das Paneel

Panneau de revêtement, procédé de fabrication associé, et utilisation d'une composition ignifugeante
pour le panneau

(84) Designated Contracting States:
BE DE DK ES FI FR GB GR IT NL PT SE
Designated Extension States:
RO

(74) Representative:
von Ahsen, Erwin-Detlef, Dipl.-Ing. et al
von Ahsen, Nachtwey & Kollegen
Postfach 10 77 40
28077 Bremen (DE)

(30) Priority: **14.12.1995 FI 956010**

(43) Date of publication of application:
23.09.1998 Bulletin 1998/39

(56) References cited:
EP-A- 0 114 965 EP-A- 0 263 570
EP-A- 0 485 867 EP-A- 0 533 382
WO-A-96/33866 BE-A- 886 016
DE-U- 8 532 239 US-A- 3 908 062
US-A- 4 003 752

(73) Proprietor: **KAEFER Isoliertechnik GmbH & Co.**
KG
28195 Bremen (DE)

(72) Inventor: **NYLANDER, Timo**
FIN-08500 Lohja as. (FI)

• **Ullmann's Encyclopedia of Industrial Chemistry,**
Fifth Completely Revised Edition, Vo. A23, pp
706-719

EP 0 865 549 B2

Description

[0001] The present invention relates to a fire-resistant lining panel according to the preamble of claim 1, said panel being comprised of mineral wool and a facing material.

[0002] The invention also concerns a method according to the preamble of claim 7 for manufacturing such a lining panel.

[0003] Housing and shipbuilding have a need for a lightweight and low-cost, fire-resistant insulation material which also readily accepts a coating system. Due to their easy handling, lining materials in sheet/board/panel form are preferred. However, conventional materials are hampered by inferior recyclability and presence of toxic emissions during their manufacture and under fire. For shipbuilding use, fire-resistant structures are usually made from thin sheet steel, behind which or inside a cladding cassette made thereof is adhered a sheet of mineral wool or other noncombustible material acting as a fire-resistant and heat-insulating layer. A problem with sheet-steel-clad structures has been their high weight and limited possibilities of altering the look of the wall. For instance, the joints between the installed panels remain visible in a disturbing manner. Steel panel structures are also relatively costly and difficult to manufacture, making them suited only for use in locations not critical to material costs. Special tooling is required for the manufacture and fabrication of current cladding materials and sheet steel panel structures. Hence, fabricated insulation materials developed for shipbuilding are not used for conventional building constructions, where reduced fire-resistance requirements apply and no extra costs to building investments are desirable. However, much improved fire safety of buildings could be achieved, that a cost-advantageous and easily usable fire-resistant material would be available.

[0004] United States patent 3,908,062 discloses a composite panel comprising a core of a rigid mineral fiber board and at least one layer of gypsum bonded to a surface of the fiber board. The surface of the fiber board is covered with a paper layer in order to form a good surface for finish coating like painting. The fire resistance of the gypsum is limited and the surface of the finished layer is soft and brittle. The purpose of the paper layer is also to decrease the brittleness of the gypsum surface.

[0005] Belgian publication No. 886.016 discloses a method for producing a heat proof cast consisting of magnesium oxide and magnesium chloride only. This mixture may be combined with some kind of reinforcement. The cured mixture has a disadvantage of being soft and tilthy, whereby it can not withstand abrasion or impacts, which limits its field of use.

[0006] European patent application 0 485 867 discloses a medium for fire protection comprising metal hydroxide and magnesium oxide and an use thereof. The medium can be used for manufacturing composite

panels wherein the medium binds the plates of the panels together or as a filling in hollow profiles. The suitability of this medium for surface coating of elements or materials is not demonstrated.

[0007] It is an object of the present invention to provide a fire-resistant insulation material featuring easy handling and capable of accepting a desired coating system after installation.

[0008] The goal of the invention is achieved by virtue of placing first a backing fabric on the mineral wool sheet and then applying on the backing fabric a fire-resistant binding material containing magnesium chloride, magnesium sulfate, sodium silicate and magnesium oxide in a sufficient amount to make the binding material fire-resistant after setting. The required amount of magnesium chloride in the fire-resistant material is at least 37 wt-%, advantageously at least 47 wt-%.

[0009] More specifically, the lining panel according to the invention is characterized by what is stated in the characterizing part of claim 1.

[0010] Furthermore, the method according to the invention is characterized by what is stated in the characterizing part of claim 7.

[0011] The invention provides significant benefits.

[0012] The lining panel according to the invention forms smooth and contiguous planar surfaces without visible seams, whereby the panel offers good insulation properties against heat, cold, sound and fire. The specific density of the panel is low, making it suitable for use in locations critical to the mass of the insulation such as fast-going ships, airplanes and containers used in, e.g., road transport of goods and materials. The surface of the material can be easily patterned to give an eye-pleasing look to the installed sheet. The sheet is easy to install due to its stiffness, whereby supplementary support structures are redundant. To attain a sufficient high fire rating, the panel can be made from a number of insulating layers, and for improved stiffness, the panel may be formed to exhibit a honeycomb structure. The panel has sufficient stiffness for erection of self-supporting space constructions. Under fire, the sheet releases no toxic gases and its basic components are recyclable.

[0013] The panel can be manufactured to a standard size, or alternatively, it may be made into modular sizes of predetermined dimensions, whereby the panel need not be trimmed during installation. The panel can be coated during manufacture with any conventional coating material, whereby the fire-resistant binding material acts as an adhesive. After manufacture, the panel can be coated in the same manner as any conventional covering material. The sheet also makes it possible to provide a water-tight joint between an erected wall and the floor.

[0014] In the following, the invention will be examined in more detail with the help of the attached drawings.

Figure 1 shows an insulation panel according to the invention comprised of a single insulating layer;

Figure 2 shows an insulation panel according to the invention comprised of two Insulating layers;

Figure 3 illustrates a wet space floor implemented using an insulation panel according to the invention; and

Figure 4 illustrates the joint between the floor of Fig. 3 and a wall.

[0015] In its simplest embodiment, the lining panel according to the invention comprises a single layer of insulation 1. Over the insulation layer is placed a reinforcing backing fabric 2 and a layer of a fire-resistant binding material 3. The insulation layer 1 is advantageously divided into pieces, and binding material is applied to the joints between the pieces, whereby the panel is provided with a number of transverse intermediate walls 4 that stiffen the insulating panel structure.

[0016] Referring to Fig. 1, the structure shown therein is manufactured by first spreading in a mould or simply on a flat surface a binding material layer on which a reinforcing fabric is placed, next applying another layer of the binding material and the reinforcing fabric. In this manner, a sufficient number of layers are laminated atop another in order to achieve a sufficient stiffness. Onto the exterior layer 2, 3, which is comprised of the alternating layers of the reinforcing fabric and the binding material, is placed an insulation layer 1 of mineral wool. The fibers of the wool may be aligned orthogonally or parallel to the plane of the panel, whereby the panel properties may be modified through varying the wool alignment in this manner. While an orthogonal orientation of the wool fibers renders the panel of a higher compressive strength, it on the other hand requires the assembly of the insulation layer to be made from thinner wool blocks. When assembling the panel from a number of blocks, the joints between the blocks are filled with the binding material. Thus, these binder-filled joints are made into compressive-strength-improving intermediate walls 4, whose contribution to the compressive strength of the panel is the greater the smaller the size of the wool blocks. If the insulation layer of the panel is made from a single sheet of wool, the compressive strength of the panel equals the compressive strength of the sheet itself.

[0017] After the first wool layer 1 is placed over the first exterior layer 2, 3, the second exterior layer is made by laminating layers of reinforcing fabric over the insulation layer using the binding material as an adhesive. Thus, the stiffness of the panel and its strength against point loads may be varied by altering the thickness and composition of the exterior layer, and the laying of the exterior layer can be implemented using conventional laminating techniques of composite structures, whereby the exterior layers of the panel may have different compositions. After both exterior layers of the panel are laminated, the panel is cured in a heated press at about 60

- 80 °C for about 15 minutes, whereby a stiff panel results.

[0018] The fire resistance of the lining panel according to the invention is based on a special binding material, while its stiffness and durability are due to the composite structure formed by the binding material and the reinforcing fabric. After setting, the fire-resistant binding material is rather brittle requiring support by a reinforcing fabric to prevent cracking of the binding material under transport or installation. While the composition of the binding material compound may vary, its fire-resistant properties are chiefly based on those of magnesium chloride. Other components of the binding compound are magnesium sulfate, sodium silicate, magnesium oxide, titanium oxide, aluminium hydroxide, and water. Titanium oxide and aluminium oxide are admixtures serving to improve the fire resistance of the compound and give it higher strength after setting. A further function of titanium oxide is to speed the drying of the composition after setting. The following formula has been found to have advantageous properties:

water	135 g
sodium silicate	120 g
magnesium sulfate	1000 g
magnesium chloride	2500 g
magnesium oxide	5000 g
aluminium hydroxide	800 g
titanium oxide	800 g

[0019] The total batch mass according to the above formula is 10355 g, of which the proportion of magnesium oxide is 48.3 %. The fire resistance of the mixture is based on the high amount of magnesium oxide. Magnesium sulfate and chloride make the compound hard and improve its fire resistance, while sodium silicate acts as a binder. Titanium oxide and aluminium hydroxide can be omitted from the formula, since they act as quality-improving admixtures only. If these admixtures are omitted, the amount of magnesium oxide in the formula rises to 57.1 %.

[0020] Obviously, the proportions of the components in the above formula may be varied. When expressed as mass percentages, the proportions of the components in the above formula are as follows:

water	1.3 %
sodium silicate	1.2 %
magnesium sulfate	9.7 %
magnesium chloride	24.1 %
magnesium oxide	48.3 %
aluminium hydroxide	7.7 %
titanium oxide	7.7 g

[0021] In principle, the amount of each component may be varied by about 20 % from the nominal value of

the formula. Accordingly, the amount of magnesium chloride in the formula could be in the range 2000 - 3000 g. The most important component of the formula is magnesium chloride, whose amount must be sufficiently high to obtain good fire resistance. Herein, the term fire resistance refers to the fire rating given by a test passed by an insulating panel designed to meet the requirements of the test, whereby the fire rating of a panel may be varied according to the needs of the intended application. However, the amount of magnesium chloride should not fall below the above stated minimum value of 37 - 38 %, and good fire resistance will not be attained until its amount is greater than 47 %.

[0022] The binding material/fire retardant described herein is suited in particular for a lining panel manufacturing implementing cold pressing techniques.

[0023] In addition to magnesium chloride and sodium silicate the composition also contains a reaction product of the sodium silicate and an acid. The composition is particularly well suited for hot pressing techniques but can also be used where cold pressing techniques are implemented.

[0024] The fire retardant composition according to the invention is achieved by separately producing a reaction product of sodium silicate and acid and an aqueous solution of magnesium chloride and by combining the reaction product with the aqueous solution in order to obtain a mouldable and ductile composition.

[0025] The reaction product of sodium silicate and acid is obtained by first admixing the sodium silicate with water and by then reacting it with an inorganic or organic acid. The amount of water is usually roughly equal to the amount of sodium silicate, i.e. with 100 parts by weight of sodium silicate, 50 to 150 parts by weight of water are used. Of the inorganic acids used in the reaction, boric acid, phosphoric acid, hydrochloric acid, and sulphuric acid may be named. The organic acids comprise formic acid, acetic acid, oxalic acid, tartaric acid, and citric acid. The molar ratio $\text{SiO}_2/\text{Na}_2\text{O}$ is advantageously about 1 to 3.5, preferably about 2 to 3.3.

[0026] The relative amounts of sodium silicate and acid depend on the silicon dioxide/sodium oxide ratio of the sodium silicate as well as on the acid used. Generally speaking, about 1 to 100 parts by weight of (100 %) acid are used for 100 parts by weight of sodium silicate.

[0027] The obtained reaction product which contains at least some precipitated silicon compounds is at least complemented by adding magnesium sulfate which like magnesium chloride hardens the completed composition. When added to the reaction product, magnesium sulfate increases the viscosity of the composition. Magnesium sulfate is advantageously added in an amount of 10 to 5000 parts by weight, preferably 500 to 1000 parts by weight for 100 parts by weight of sodium silicate.

[0028] The magnesium chloride is first dissolved in water, whereby 10 to 1000, preferably 50 to 200 parts by weight of magnesium chloride are dissolved into 100

parts by weight of water. In order to enhance the dissolution of the magnesium chloride, the temperature of the water can be kept at a higher value than room temperature, e.g. at about 30 to 90 °C, preferably about 40 to 80 °C. After the dissolution of the magnesium chloride, magnesium oxide can be added into the aqueous solution. For 100 parts by weight of magnesium chloride, 10 to 1000 parts by weight of magnesium oxide are used, advantageously 100 to 500 parts by weight, preferably 150 to 250 parts by weight. As is well known, magnesium oxide is not easily soluble in water, wherefore the addition of this component results in a fluid.

[0029] Next, the sodium silicate and magnesium chloride compositions can be combined. The sodium silicate composition is advantageously added into the magnesium chloride composition under vigorous stirring. A viscous, processible composition is obtained. The composition contains about 10 to 10000 parts by weight, advantageously about 100 to 5000 parts by weight, and preferably about 500 to 3000 parts by weight of magnesium chloride for 100 parts by weight of sodium silicate. The composition contains about 100 to 10000 parts by weight, advantageously about 200 to 2000 parts by weight, and preferably about 500 to 1500 parts by weight of water for 100 parts by weight of sodium silicate.

[0030] Titanium oxide can be added to the composition in order to improve its strength properties; furthermore, metal oxides generally used in fire retardant compositions, such as aluminium hydroxide, can be admixed.

[0031] The dry matter in the fire retardant composition prepared in accordance with the invention contains

- 0.1 to 10 % by weight of sodium silicate and acid and a reaction product thereof,
- 1 to 25 % by weight of magnesium sulfate,
- 10 to 60 % by weight of magnesium chloride, and
- 10 to 60 % by weight of magnesium oxide.

[0032] In addition, the composition may contain about 0.1 to 10 % by weight of aluminium hydroxide and/or, correspondingly, titanium dioxide.

[0033] Now referring to Fig. 2, a panel structure is shown comprised of two layers of insulating material and three layers of reinforcing fabric 2 laid with the binding compound. Such a multilayer structure results in a panel of higher stiffness and durability than is achievable by a single-layer structure, and in practice, the multilayer structure is preferred in applications requiring a substantial thickness of the insulating material. If a single sheet of thick insulating material were used herein, the strength of the panel would be essentially reduced, whereby supporting the panel to the underlying structure to be covered with the help of, e.g., penetrating fixing means might become necessary. By contrast, the multilayer structure manufactured according to the invention is sufficiently stiff for use even as a self-support-

ing wall. In such a structure, it is advantageous that the compressive-strength-improving intermediate walls 4 are misaligned to avoid their coincidence.

[0034] The invention provides easy insulation in special applications. In the diagram is shown one such example in which the floor and wall insulation of a wet space are implemented using a lining panel according to the invention. The floor is made from a cladding panel having the insulation layer 1 contoured slanted to provide the slope required by the floor construction, and at the lowest point of the slope, a drain 5 is located. The slanted floor panel can be manufactured by way of lamination in the same manner as a planar wall panel, whereby the drain 5 and its conduit feedthroughs are attached to the panel by means of the binding compound.

[0035] Referring to Fig. 3, a structural arrangement is shown for a water-tight corner joint between the floor and a wall. In this structure, the floor panel edge is provided with a steel angle 6 whose one side is bonded under the panel and the other side is extended in plane of the floor panel edge slightly above the floor top level. Thus, the angle 6 protects the insulation at the edge of the floor panel and stiffens the joint. The floor panel top surface is coated with a continuous tile covering comprised of a backing material with ceramic tiles 9 laid thereon. Such a tile covering 8 is commercially available as a standard-size plate, or alternatively, cut to size according to the site to be floored. The tile covering 8 may be adhered on the floor panel already during the manufacture of the floor panel.

[0036] The panel forming the wall of the wet space is fixed onto the steel angle 6, and the lower edge of the wall panel is supported stiffly to the steel angle 6 by means of a protective angled steel section 7 passing over the edge of the wall panel and extending over its lower edge up to the steel angle 6. The steel angle 6 and the protective steel section 7 form a stiff support structure fixing the floor and the wall in place. In the interior of the wet space, the wall panel is covered at least around the lower edge of the wall with a prefabricated tile row 8 placed such that the lower edge of the tiles 8 rests on the tiles 8 of the floor covering. In this fashion, a water-tight wall-to-floor corner joint is easily accomplished.

[0037] The panel according to the invention has a plurality of applications. For instance, it provides for the manufacture of prefabricated door panels for shipbuilding and housing, walls and floors in general, and covering thereof, and design of various manhole covers. Furthermore, the panel is suited for making conical window framings, openings and feedthroughs as well as construction of wet spaces such as bathrooms. The invention also makes it possible to manufacture noncombustible structural insulation panels for the interiors of aircraft and trains as well as for the insulation of ship interior spaces against heat, sound, cold and fire.

[0038] Besides those described above, the present

invention may have alternative embodiments. The reinforcing backing fabric may be selected from the group of woven cloths or chopped-fiber felts, and within the scope of the invention, it is also feasible in some applications to blend the binding compound with reinforcing elements such as chopped fiber, whereby the reinforcing element and the binding compound may be applied in blended form during the manufacture of the panel. In principle, the exterior surface layer or the backing layer of the panel may be made using any reinforcing elements and techniques of fabrication that are conventionally employed in the manufacture of composite structures. However, glass fiber is the most cost-advantageous choice as a reinforcing material due to its low price and advantageous properties. After manufacture, the panel edges can be provided with metallic protective strips attached thereto.

Claims

1. A fire-resistant lining panel comprising

- at least one insulating layer (1) of mineral wool, and
- an exterior layer (2, 3) on both sides of said insulating layer,

characterized in that said exterior layer is comprised of

- a binding material (3) containing
 - 10 to 60 % by weight of magnesium chloride,
 - 1 to 25 % by weight of magnesium sulfate,
 - 10 to 60 % by weight of magnesium oxide,
 - 0,1 to 10 % by weight of sodium silicate and acid and a reaction product thereof,
- and

- at least one reinforcing component (2).

2. A lining panel as defined in claim 1, **characterized in that** said reinforcing element is a fabric (2) and at least two layers of said fabrics are laminated together with the help of said binding material to form said exterior surface layer.

3. A lining panel as defined in any of the foregoing claims, **characterized in that** fibres of said mineral wool of said insulating layer (1) are aligned orthogonally to the plane of the panel.

4. A lining panel as defined in any of the foregoing claims, **characterized in that** said insulating layer

(1) is comprised of blocks and the interblock seam joints are adhered with the help of said binding material which forms intermediate walls (4) spanned between said exterior layers (2, 3).

5. A lining panel as defined in any of the foregoing claims, **characterized in that** the number of said insulating layers (1) is at least two.

6. A lining panel as defined in any of the foregoing claims, **characterized by** a protective strip attached to at least one of the edges of said panel.

7. A method of manufacturing a lining panel, in which method at least the following steps are carried out:

- a first exterior layer (2, 3) is laid,
- onto the first exterior layer (2, 3) is placed an insulating layer (1) of mineral wool, and
- onto said insulating layer (1) is laid a second exterior layer,

characterized in that

- a binding material compound is prepared containing
 - 10 to 60 % by weight of magnesium chloride,
 - 1 to 25 % by weight of magnesium sulfate,
 - 10 to 60 % by weight of magnesium oxide,
 - 0,1 to 10 % by weight of sodium silicate and acid and a reaction product thereof,

and

- each exterior surface (2, 3) is made as a composite of said binding material compound and a reinforcing material.

8. A method as defined in claim 7, **characterized in that** said insulating layer (1) is assembled from blocks and the interblock joints are filled with said binding material compound.

9. The use as a binding agent for a fire-resistant lining panel according to claim 1 of a fire retardant composition containing

- 10 to 60 % by weight of magnesium chloride,
- 1 to 25 % by weight of magnesium sulfate,
- 10 to 60 % by weight of magnesium oxide,
- 0,1 to 10 % by weight of sodium silicate and acid and a reaction product thereof.

Patentansprüche

1. Feuerfeste Auskleidungsplatte mit

- wenigstens einer Isolierschicht (1) aus Mineralwolle, und
- einer äußerer Schicht (2, 3) auf beiden Seiten der Isolierschicht,

dadurch gekennzeichnet, daß die äußere Schicht aus

- einem Bindemittel (3) welches
 - 10 bis 60 Gew.% Magnesiumchlorid,
 - 1 bis 25 Gew.% Magnesiumsulfat,
 - 10 bis 60 Gew.% Magnesiumoxid,
 - 0,1 bis 10 Gew.% Natriumsilicat und Säure und ein Reaktionsprodukt derselben

enthält, und

- wenigstens einer Bewehrung (2) besteht.

2. Auskleidungsplatte nach Anspruch 1, **dadurch gekennzeichnet, daß** die Bewehrung ein Textilerzeugnis (2) ist und wenigstens zwei Lagen des Textilerzeugnisses mit Hilfe des Bindemittels zu den äußeren Oberflächenschichten laminiert sind.

3. Auskleidungsplatte nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** Fasern der Mineralwolle der Isolierschicht (1) senkrecht zur Ebene der Platte gerichtet sind.

4. Auskleidungsplatte nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** die Isolierschicht (1) aus Blöcken gebildet ist und Zwischenblocknahtfugen mit dem Bindemittel verklebt sind, so daß sich Zwischenwände (4), die sich zwischen den äußeren Lagen (2, 3) erstrecken, bilden.

5. Auskleidungsplatte nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** wenigstens zwei Isolierschichten (1) vorgesehen sind.

6. Auskleidungsplatte nach einem der vorhergehenden Ansprüche, **gekennzeichnet durch** ein Schutzstreifen an wenigstens einer Kante der Platte.

7. Verfahren zur Herstellung einer Auskleidungsplatte, mit wenigstens folgenden Verfahrensschritten:

- wenigstens eine äußere Schicht (2, 3) wird abgelegt,
 - auf die erste äußere Schicht (2, 3) wird eine Isolierschicht (1) aus Mineralwolle gelegt, 5
 - auf die Isolierschicht (1) wird eine zweite äußere Lage gelegt,
- dadurch gekennzeichnet, daß** 10
- ein Bindemittel hergestellt wird, welches
 - 10 bis 60 Gew.% Magnesiumchlorid,
 - 1 bis 25 Gew.% Magnesiumsulfat, 15
 - 10 bis 60 Gew.% Magnesiumoxid,
 - 0,1 bis 10 Gew.% Natriumsilicat und Säure und ein Reaktionsprodukt derselben
 - aufweist, und 20
 - jede äußere Schicht (2, 3) als Verbundwerkstoff aus dem Bindemittel und einer Bewehrung hergestellt ist.
8. Verfahren nach Anspruch 7, **dadurch gekennzeichnet, daß** die Isolierschicht (1) aus Blöcken zusammengestellt und Zwischenblockfugen mit dem Bindemittel ausgefüllt sind. 25
9. Verwendung eines Bindemittels für eine feuerfeste Auskleidungsplatte nach Anspruch 1 aus einer feuerfesten Zusammensetzung mit 30
- 10 bis 60 Gew.% Magnesiumchlorid,
 - 1 bis 25 Gew.% Magnesiumsulfat, 35
 - 10 bis 60 Gew.% Magnesiumoxid,
 - 0,1 bis 10 Gew.% Natriumsilicat und Säure und ein Reaktionsprodukt derselben.
- Revendications** 40
1. Paneau de revêtement ininflammable comprenant
- au moins une couche isolante (1) de laine minérale, et 45
 - une couche extérieure (2, 3) sur les deux côtés de ladite couche isolante,
- caractérisé en ce que** ladite couche extérieure est composée de 50
- un matériau liant (3) comprenant :
 - 10 à 60 % en poids de chlorure de magnésium, 55
 - 1 à 25 % en poids de sulfate de magnésium,
- 10 à 60 % en poids d'oxyde de magnésium,
 - 0,1 à 10 % en poids de silicate de sodium et acide et de produit de réaction, et au moins un élément de renforcement.
2. Paneau de revêtement tel que défini dans la revendication 1, **caractérisé en ce que** ledit élément de renforcement est un tissu (2) et au moins deux couches desdits tissus sont stratifiés ensembles avec l'aide dudit matériau liant pour former ladite couche de surface extérieure.
3. Paneau de revêtement tel que défini selon l'une quelconque des revendications précédentes, **caractérisé en ce que** des fibres de ladite laine minérale de ladite couche isolante (1) sont alignées orthogonalement par rapport au plan du panneau.
4. Paneau de revêtement tel que défini selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ladite couche isolante (1) est composée de blocs fixés au niveau des lignes de jonction interblocs par ledit matériau liant qui forme de parois intermédiaires (4) enjambées entre lesdites couches extérieures (2, 3).
5. Paneau de revêtement tel que défini selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le nombre desdites couches isolantes (1) est au moins de deux.
6. Paneau de revêtement tel que défini selon l'une quelconque des revendications précédentes, **caractérisé par** une bande de protection fixée à au moins un bord dudit panneau.
7. Procédé de fabrication de panneau de revêtement, dans lequel sont réalisées au moins les étapes suivantes :
- pose d'une première couche extérieure (2, 3),
 - revêtement sur la première couche extérieure (2, 3) d'une couche isolante (1) de laine minérale, et
 - pose d'une deuxième couche extérieure sur ladite couche isolante (1),
- caractérisé en ce que**
- 10 à 60 % en poids de chlorure de magnésium,
 - 1 à 25 % en poids de sulfate de magnésium,
 - 10 à 60 % en poids d'oxyde de magnésium,
 - 0,1 à 10 % en poids de silicate de sodium et acide et de produit de réaction, chaque couche extérieure (2, 3) est faite comme une composition de ladite composition de matériau liant et

de matériau de renforcement.

8. Procédé tel que défini dans la revendication 7, **caractérisé en ce que** ladite couche isolante (1) est assemblée à partir de blocs et les jonctions inter-blocs sont remplies avec ladite composition de matériau liant. 5

9. Utilisation comme agent liant pour un panneau de revêtement ininflammable selon la revendication 1 d'une composition ignifuge contenant - 10 à 60 % en poids de chlorure de magnésium, 10

10)- 1 à 25 % en poids de sulfate de magnésium, 15

11)- 10 à 60 % en poids d'oxyde de magnésium, - 0,1 à 10 % en poids de silicate de sodium et acide et de produit de réaction.

20

25

30

35

40

45

50

55

