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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) Self-supporting sandwich panel of plasterboard with polyurethane core

(57) IMPROVED AUTO LOAD-BEARING "SANDWICH" TYPE PANEL, APPLICABLE AS THERMAL AND ACOUSTIC INSULATION AND PROCESS FOR ITS OBTAINING, constituted by an external part (2) shaped by plaster or laminated plaster in one or two layers and, optionally, additional insulating materials, and by an internal part (3) formed by a mixture of liquid polyol and isocyanate, with a solid fill or mineral, synthetic and/or vegetal origin, obtained by beating the fill with pre-mixed polyurethane components, pouring the compound between the external layers into a mould, expansion of the beaten mixture into the mould and, after 15-20 minutes, auto flattening of the compound, sealing and gluing of the same with the external layers. The fill of mineral, synthetic and/or vegetal origin constitutes a 60% of the mixture; the liquid polyurethane component used is polyol and isocyanate, each of them constituting 20%.

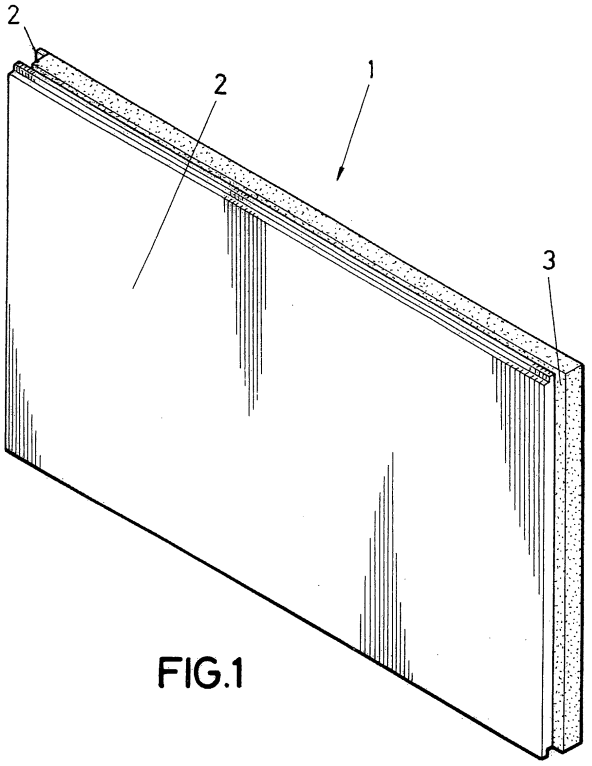

FIG.1

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Description

OBJECT OF THE INVENTION

[0001] The invention refers to, as expressed on the wording of this descriptive report, an auto load-bearing "sandwich" type panel, applicable as thermal and acoustic insulation, and to the process for its obtaining.

[0002] Specifically, the object of the invention consists of a panel for construction essentially composed by an external part made of:

- An external part (2) formed by a material mainly manufactured with plaster or laminated plaster in one or two layers and, optionally, additional insulating materials such as acoustic blanket, rock wool, acoustic sheet, etc., and an internal part made of a mixture of polyol and isocyanate and a mineral, synthetic and/or vegetal filling element, which may vary depending on the physical characteristics desired.

FIELD OF APPLICATION

[0003] The field of application of this invention is the sector of the industry dedicated to the manufacturing of materials for construction.

BACKGROUND OF THE INVENTION

[0004] It is well known the existence of fibre boards able to be used in the construction sector, in different places as insulation against external agents.

[0005] The use of polyurethane as insulating agent is also known, although it has been traditionally used projected or injected.

[0006] On the other hand, we know about a patent related to an application similar to the one herein presented, specifically, patent # 2167226, referred to an improved panel applicable as thermal and acoustic insulation with, however, certain limitations where its application is concerned, which are improved by means of this invention. More precisely, the mentioned patent advocates a pressing process whilst this invention presents a contention of the chemical reaction, meaning a substantial improvement of the process mechanization and a reduction of production costs, besides of implying an essential change since in this case we advocate the industrial production of a "sandwich" type panel finished for direct installation.

[0007] It has to be mentioned also that the applicant is not aware of the existence of any other load-bearing "sandwich" type panel applicable as thermal and acoustic insulation or process for its obtaining which offers technical, structural and configuration features similar to the one herein presented.

ERPLANATION OF THE INVENTION

[0008] Thus, the improved panel proposed by the invention means an evident innovation within its application field thanks to a series of advantages which require a detailed explanation.

[0009] Firstly, it is pertinent to stress that it allows the achievement of a more effective insulation against noise or thermal fluctuations, using lighter elements.

[0010] Consequently, it is necessary to mention that using panels with thickness similar to the conventional ones but with a lower weight, a higher degree of protection is provided, being such aspect the pillar which supports the key of the invention.

[0011] The mixture of polyurethane components is well known by industry long since, being applied nowadays mainly injected or projected over a surface. The object of the invention is to have controlled the mixture so that it can be made by casting (poured in a mould), adding any type of fill which boosts, increases and improves its insulating physical characteristics.

[0012] Specifically, the mixture is beaten, then poured between the external pre-formed layers of plaster, laminated plaster and/or insulating material, into a mould. Such mixture expands within and after a period of time when an expansion occurs due to the chemical reaction of the mixture of polyol and isocyanate, which is controlled by such mould. Once this process is finished, the interior layer auto flattens with the two external layers, sealing and gluing the external layers with the internal one resulting in a "sandwich" type panel.

[0013] The mould admits multiple shape designs so the thickness, width and length of the piece obtained may be varied according to the target intended.

[0014] The new "sandwich" type auto load-bearing panel applicable as thermal and acoustic insulation and its obtaining process represent, consequently, an innovation of structural and constitutive features unknown so far to such end, reasons which together with its practical utility, provide the invention enough ground to obtain the privilege of the exclusivity requested.

DESCRIPTION OF THE DRAWINGS

[0015] In order to complement the description being made and to help a better comprehension of the characteristics of the invention, attached to this descriptive report, and as a part of the same, is a set of layouts on which the following was represented with illustrative non-limitative character:

Figure number 1.- It shows a perspective sight of an example of the making of the load-bearing "sandwich" type panel applicable as thermal and acoustic insulation, where we can see the parts composing it as well as its configuration and disposition.

Figure number 2.- It shows a detail of a section sight

of the panel represented in figure 1.

PREFERENTIAL EXECUTION OF THE INVENTION

[0016] In the light of the descriptive figures, and according to their numbering, it may be seen that the panel (1) in question formed by:

- An external part (2) formed by a material mainly manufactured with plaster or laminated plaster in one or two layers and, in some cases, additional insulating materials (acoustic blanket or sheet, rock wool, fibre glass, etc.).
- And an internal part (3) made with a mixture of:

  Polyol, in an approximate percentage of 20%.
  Isocyanate, in an approximate percentage of 20%

  Fill (expanded perlite, expanded clay, polystyrene, graphite, fibres or any other mineral, vegetal and/or synthetic fill or a mixture of them, depending on the intended physical features), in an approximate percentage of 60%.

[0017] It has to be mentioned that the internal part (3) is formed by the pre-mixture of polyol and isocyanate. Once the mixture of the two mentioned components is produced, it has to be immediately beaten with the fill.

[0018] The percentages may vary depending on the type of fill to be used.

[0019] After this operation, the compound, in the conditions determined by the previous steps, is poured between the two external layers (2) into a mould, which is closed in order to contain the expansion produced by the chemical reaction of the polyurethane.

[0020] Once 15-20 minutes approximately have elapsed, the internal layer and the external ones auto flatten, seal and glue, without the intervention of any other type of additive.

[0021] Consequently, at that moment the formation of the plaques which develop the function of thermal and acoustic insulation takes place.

[0022] The resulting width of the "sandwich" panel (1) depends on the insulation required by each specific circumstance and, consequently, the mould used shall depend on the same.

[0023] In the internal part (3) of the panel (1), the use of one material or another as fill, or the mixture of several of them, shall be determined by the characteristics required in each case, for example:

[0024] In order to improve fire resistance: Use of fireproof materials with very high melting and softening points (expanded clay, vermiculite, expanded perlite) or which protect the mixture as a whole due to its intrinsic properties (graphite).

[0025] In order to improve the acoustic insulation: Use of materials which break the sound waves by means of superimposed layers of mineral, vegetal and/or synthetic fibres (fibre glass, rock wool, etc.), and/or use of materials which, due to its porous nature, act as acoustic insulators (expanded perlite, expanded clay, etc.).

[0026] In order to improve the thermal insulation: Use of materials which join the considerable thermal insulation inherent to polyurethane, either due to their fibrous composition (rock wool, fibre glass) or their porous nature (expanded perlite, expanded clay, etc.).

[0027] Although for certain situations, when additional levels of insulation are required, specific materials to such end will be used in the external layers, thus achieving higher thermal and/or acoustic insulation, as well as more fire, impact, humidity resistance, etc.

[0028] The invention advocated may be directly used as partition wall and for the insulation of the floor or ceiling of a house.

[0029] Its load-bearing character is also advocated since the density of the material achieved during the process allows its installation without need of frame structural elements.

[0030] Having described the nature of this invention as well as the way to put it into practice, it is not considered necessary to extend further its explanation for an expertise in the field to understand its reach and derived advantages, indicating that, within its essentiality, it might be put in practice under other ways of making differing in detail from the one stated as an example, which will also be covered by the protection applied for provided that its fundamental principle is not altered, changed or modified.

Claims

1. AUTO LOAD-BEARING IMPROVED "SANDWICH" TYPE PANEL, APPLICABLE AS THERMAL AND ACOUSTIC INSULATION, AND PROCESS FOR ITS OBTAINING, **characterized by** the fact of being formed by an external part (2)shaped by a material mainly manufactured from plaster or laminated plaster in one or two layers and, in some cases, additional insulating materials (acoustic blanket or sheet, rock wool, fibre glass, etc.), and by an internal part (3) made with the mixture of liquid polyol and acocyanate with a solid fill of mineral origin (expanded perlite, vermiculite, expanded clay, graphite, rock wool, fibre glass), synthetic origin (synthetic fibres, polystyrene) and/or vegetal origin; for which obtaining of the same internal part (3) the following operations have to be developed:

   - Beating of the fill with components of the premixed polyurethane.
   - Pouring of the compound between the external layers (2) into a mould.
   - Expansion of the beaten mixture contained by the mould.

- After 15-20 minutes, auto flattening of the compound, as well as sealing and gluing of the same with the external layers (2), resulting in the "sandwich" type panel.

2. Improved auto load-bearing "sandwich" type panel applicable as thermal and acoustic insulation, as per the first claim, **characterized by** the fact that the fill of mineral, synthetic and/or vegetal origin constitutes approximately 60% of the total mixture.

3. Improved auto load-bearing "sandwich" type panel applicable as thermal and acoustic insulation, as per the first claim, **characterized by** the fact that the liquid polyurethane component used is polyol and it constitutes approximately 20% of the total mixture.

4. Improved auto load-bearing "sandwich" type panel applicable as thermal and acoustic insulation, as per the first claim, **characterized by** the fact that the liquid polyurethane component used is isocyanate and it constitutes approximately 20% of the total mixture.

Amended claims in accordance with Rule 137(2) EPC.

1. AUTO LOAD-BEARING IMPROVED "SANDWICH" TYPE PANEL, APPLICABLE AS THERMAL AND ACOUSTIC INSULATION, of the type constituted by an external part (2) shaped by a material mainly manufactured from plaster or laminated plaster and, in some cases, additional insulating materials, such as acoustic blanket or sheet, rock wool, fibre glass, etc.; and by an internal layer made with the mixture of polyol and isocyanate, **characterized by** the fact that the external part (2) is formed by one or two faces and that the internal part (3) is auto load-bearing, it is made like casting by pouring on mould, and is made from the mixture of liquid polyol and isocyanate with a solid fill of mineral origin, such as perlite, vermiculite, expanded clay, graphite, rock wool, fibre glass; synthetic origin, such as synthetic fibres, polystyrene; and/or vegetal origin; or from a mixture of the same, according to the desired physical characteristics.

2. AUTO LOAD-BEARING IMPROVED "SANDWICH" TYPE PANEL, APPLICABLE AS THERMAL AND ACOUSTIC INSULATION, as per the first claim, **characterised by** the fact that the mineral, synthetic and/or vegetal fill of the internal part (3) constitutes approximately 60% of the total mixture.

3. AUTO LOAD-BEARING IMPROVED "SANDWICH" TYPE PANEL, APPLICABLE AS THERMAL AND ACOUSTIC INSULATION, as per the first claim, **characterised by** the fact that the component of liquid polyurethane used, the polyol, constitutes approximately 20% of the total of the mixture of the internal part (3).

4. AUTO LOAD-BEARING IMPROVED "SANDWICH" TYPE PANEL, APPLICABLE AS THERMAL AND ACOUSTIC INSULATION, as per the first claim, **characterised by** the fact that the component of liquid polyurethane used, the isocyanate, constitutes approximately 20% of the total of the mixture of the internal part (3).

5. PROCESS FOR THE OBTAINING OF AN AUTO LOAD-BEARING IMPROVED "SANDWICH" TYPE PANEL, APPLICABLE AS THERMAL AND ACOUSTIC INSULATION, as per claims 1 to 4, **characterised by** the fact of consisting of:

- Firstly, a pre-mixture of polyol with isocyanate is made.
- Immediately then, such pre-mixture is beaten with the fill.
- Afterwards, the mixture obtained is poured like casting over the layer or between the external layers (2), within a mould which is closed to restrain the expansion produced by the chemical reaction of the polyurethane.
- After approximately 15-20 minutes, the internal and external layers get compact, sealed and stuck, without any type of additive.

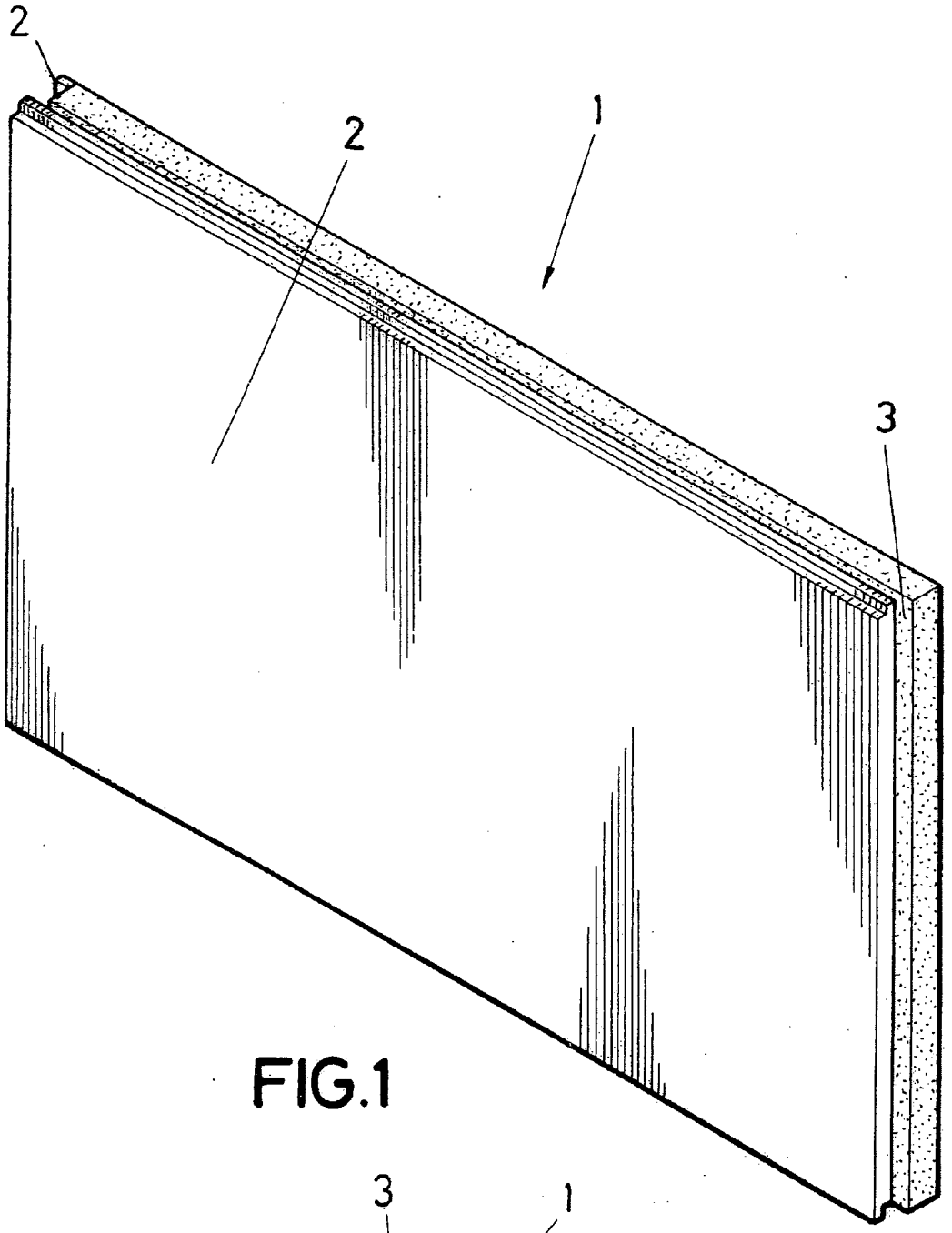

FIG.1

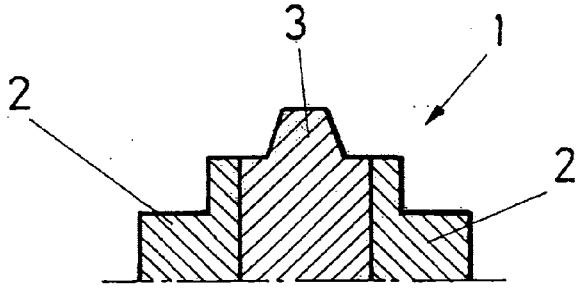

FIG.2

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EUROPEAN SEARCH REPORT

Application Number
EP 07 38 0247

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 025 687 A (WOOLER ALAN METCALF ET AL) 24 May 1977 (1977-05-24)	1	INV. E04C2/296 E04C2/288 E04C2/20
A	* column 1, line 19 - column 2, line 7 *	2-4	
X	DE 198 49 135 A1 (D.D.C. PLANUNGS-, ENTWICKLUNGS- UND MANAGEMENT AG) 27 April 2000 (2000-04-27)	1	
A	* page 2, line 45 - page 3, line 56; figure 1 *	2-4	
A	FR 1 539 431 A (A. MURER) 13 September 1968 (1968-09-13) * abstract; figure 1 *	1-4	
A	GB 1 173 627 A (BPB INDUSTRIES LTD [GB]) 10 December 1969 (1969-12-10) * claims 1-3; figure 1 *	1	

TECHNICAL FIELDS SEARCHED (IPC)

E04C
C04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 June 2008	Khera, Daljit

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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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
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 38 0247

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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09-06-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4025687 A	24-05-1977	BE 834099 A1	01-04-1976
		DE 2540016 A1	22-04-1976
		DK 447775 A	09-04-1976
		FI 752441 A	09-04-1976
		FR 2287334 A1	07-05-1976
		GB 1470066 A	14-04-1977
		IT 1042001 B	30-01-1980
		JP 51063517 A	02-06-1976
		LU 73526 A1	09-02-1977
		NL 7510437 A	12-04-1976
		NO 753207 A	09-04-1976
		SE 423203 B	26-04-1982
		SE 7511201 A	09-04-1976
DE 19849135 A1	27-04-2000	NONE	
FR 1539431 A	13-09-1968	NONE	
GB 1173627 A	10-12-1969	BE 712281 A	15-07-1968
		DE 1704525 A1	03-06-1971
		FR 1565579 A	02-05-1969
		LU 55694 A	04-06-1968
		NL 6803747 A	18-09-1968

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82