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(71) Applicant: **Vesterby Træteknik A/S**
6862 Tistrup (DK)

(72) Inventor: **Vesterby, Tage**
6862 Tistrup (DK)

(74) Representative: **Budde Schou A/S**
Dronningens Tvaergade 30
1302 Copenhagen K (DK)

(54) **FIRE RETARDING AND ACOUSTIC BUILDING PANEL AND FIRE RETARDING AND ACOUSTIC BUILDING PANEL SYSTEM**

(57) The present invention relates to a fire retarding and acoustic building panel and a panel system for use as a cladding panel to cover at least a part of an existing building surface, such as an inner wall surface or a ceiling surface. The building panel comprises a number of elongated panel elements having a first elongated panel part and a second elongated panel part where the second elongated panel part extends parallel to the first elongated panel part and in a longitudinal direction and extending a predetermined distance from an inner surface of the first elongated panel part. The building panel further comprises a number of elongated insulation elements of sound absorbing and fire retarding material which are arranged in parallel between the second elongated panel parts of two neighboring panel elements. The surface of the elongated insulation element comprises a fire retardant sound cloth.

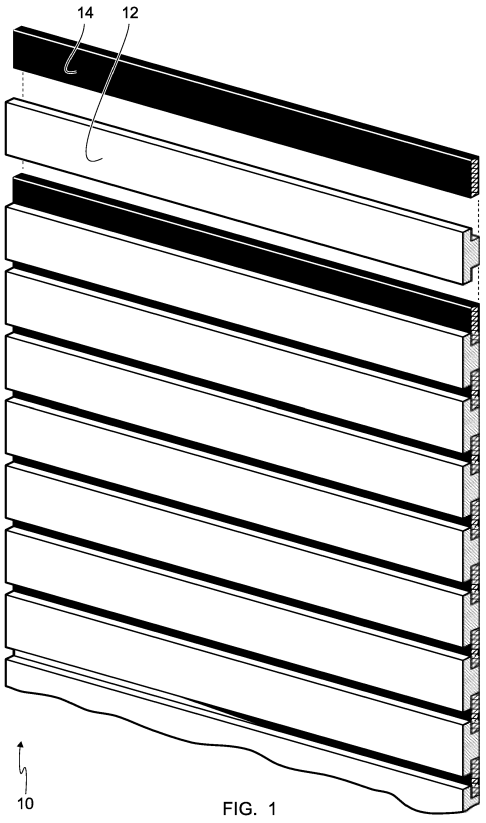

FIG. 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a fire retarding and acoustic building panel, and a fire retarding and acoustic building panel system.

[0002] The Fire retarding and acoustic building panel according to the present invention provides a building structure with approved fire retarding as well as sound absorbing properties, which is flexible, lightweight and can be adapted to various building construction surfaces.

BACKGROUND OF THE INVENTION

[0003] When constructing buildings, both for private and commercial use, it is known to construct the walls and ceilings of a building with fire retarding and sound absorbing properties, both when erecting the building and in a retrofitting process.

[0004] One example of prior art systems is disclosed in EP 2335916 B1. The referred document discloses an acoustic panel, which is constructed as a laminate and comprises a plurality of openings in contact with an intermediate space comprising a sound absorbing material. This acoustic panel is however premanufactured, time consuming to produce, and leaves the installation process with very limited degrees of variation, and further provides for limited fire protection.

As the panel is mainly manufactured from wood, the panel is heavy and leaves a need for improvement of the overall fire retarding and sound absorbing properties.

[0005] Other ceiling/wall systems disclose acoustic panels in which wooden laths are attached to a mounting panel prior to installing the panel to the wall or ceiling, where the laths are fastened to the panels by screws extending from the back of the panel, through the panel and into the laths.

[0006] The above-mentioned systems are heavy, time consuming to construct and install, and therefore costly in terms of labour, and further has limited overall fire retarding and sound absorbent properties.

[0007] It is an object of the invention to provide a fire retardant and acoustic building panel, which is suitable for being mounted to a ceiling/wall surface, where the building panel is lightweight, easy to mount, provides enhanced fire retarding properties, and creates a surface having visual and sound absorbing properties.

[0008] The above object and advantages, together with numerous other objects and advantages, which will be evident from the following description of the present invention, are according to a first aspect of the present invention obtained by:

A fire retarding and acoustic building panel for use as a cladding panel to cover at least a part of an existing building surface, such as an inner wall surface or a ceiling surface of a room, hereby enhancing the fire retarding and acoustic properties of the wall or ceiling, the building panel comprising:

a first main surface, defining an exterior surface for facing an interior of the room, and

a second main surface, defining an interior surface for facing the inner wall surface or the ceiling surface, the building panel further comprising:

- a first number of elongated panel elements,
- a second number of elongated insulation elements of sound absorbing and fire retarding material arranged parallel with the first number of elongated panel elements, and
- at least one backing panel defining part of the second main surface and arranged on the building panel for defining a contact surface between the building panel and the inner wall or ceiling surface,

the first number of elongated panel elements having a specific density and being substantial T-shaped and having a first elongated panel part and a second elongated panel part, the first elongated panel part having an outer surface defining part of the first main surface, and an inner surface facing the backing panel,

the second elongated panel part extending between the first elongated panel part and the backing panel, hereby arranging the inner surface at a predetermined distance from said backing panel,

the second number of elongated insulation elements being non-loadbearing and having an outer surface defining part of the first main surface, an inner surface for facing the backing panel, and two side surfaces extending between the inner and outer surfaces of the insulation elements, the second number of elongated insulation elements extending between the second elongated panel parts of two neighboring panel elements and between the backing panel and the inner surface of at least one elongated panel element such that the first number of elongated panel elements and the second number of elongated insulation elements are arranged in a parallel relationship and the first elongated panel part and the second number of elongated insulation elements partly overlaps each other,

the second number of elongated insulation elements being made of a sound absorbing and fire retarding material having a density being lower than the density of the first number of elongated panel elements, the density of the second number of elongated insulation elements being between 120-190 (kg/m3), preferably between 150-180 (kg/m3).

[0009] The fire retarding and acoustic building panel, which in the following description also will be referred to as "building panel", is in a preferred embodiment used in a retrofitting process, where fire retardant properties,

also called flammability, and acoustic performance of a wall and/or ceiling need to be enhanced.

[0010] The second elongated panel part of the elongated panel elements may be arranged with any desired dimension, such that the building panel provides for a thicker dimension of the elongated insulation element.

[0011] The backing panel is preferably connected to the elongated panel elements via suitable fastening means, such as screws, nails, adhesives, etc., which arranges the insulation elements in a mechanical locked engagement between the elongated panel elements and the backing panel. This has the technical effect that the insulation material can be changed and the fire retardant and acoustic performance of the building panel can be adopted to various needs.

[0012] The density of the elongated insulation elements influences the sound absorbing properties, structural strength, weight, as well as the flammability of the overall panel. Experiments performed by the applicant has shown that by arranging the elongated insulation elements with a density being lower than the density of the first number of elongated panel elements and between 120-190 (kg/m3), it is possible to arrange a building panel significantly more lightweight than the known building panels comprising massive elements ranging higher densities, while at the same time giving the building panel excellent and improved sound absorbing properties. Further, the workability of the elongated insulation elements when assembling the building panels is sufficient compared to elements having lower densities with lower compression strengths, such as densities below 120 (kg/m3).

[0013] Preferably, the density of the elongated insulation elements is between 150-180 (kg/m3), which surprisingly has shown resulting in the best compromise between the sound absorbing properties, structural strength, weight, as well as the flammability.

[0014] According to a further embodiment of the first aspect of the invention, the first number of elongated panel elements and the second number of elongated insulation elements defining an average density, the density of the second number of elongated insulation elements being less than 50% of the average density.

[0015] The average density of the first number of elongated panel elements and the second number of elongated insulation elements can be calculated by the density of each panel type multiplied by each panel types percentage of the entire volume of the panels.

[0016] Both the first number of elongated panel elements and the second number of elongated insulation elements influence the above-mentioned properties of the overall building panel. However, as the building panel is manufactured off-site and should be suitable for retrofitting purposes, also the overall structural strength of the building panel is important, which means that the first number of elongated panel elements, which supports the non-loadbearing elongated insulation elements needs to be arranged with sufficient structural strength, which results in the material of the first number of elongated panel elements having a higher density compared to the density of the elongated insulation elements. Experiments have shown that arranging the density of the second number of elongated insulation elements being less than 50% of the average density, the building panel has the best combination of sound absorbing properties, structural strength, weight, as well as the flammability.

[0017] According to a further embodiment of the first aspect of the invention, the first number of elongated panel elements comprises a wooden material and the first number of elongated panel elements has a density between 500-800 (kg/m3), preferably 760-800 kg/m3.

[0018] According to a further embodiment of the first aspect of the invention, the wooden material being plywood.

[0019] The elongated panel elements are in a preferred embodiment manufactured from plywood preferably a plywood which may be impregnated with a fire retardant substance. Such impregnation can be performed under both vacuum or pressure and in vacuum or pressure chambers, where the fire retardant substance is forced into the cell structure of the wooden material and not just coating the surface thereof. Hereby, the best results in withstanding fire and extremely high temperatures are achieved. Other types of used wooden based materials may be Medium-density fiberboard (MDF) impregnated in the same fashion.

[0020] According to a further embodiment of the first aspect of the invention, the second number of elongated insulation elements comprises compressed fiberglass, ceramic fibers, or stone wool having a density between 160-170 (kg/m3), and wherein the density of the second number of elongated insulation elements is between 20-50% such as between 23-46% of the average density and preferably 27-46% of said average density.

[0021] The elongated insulation elements are preferably manufactured from stone wool, and may be compressed stone wool, but may in an alternative be expanded polystyrene, fire retardant impregnated paper wool or perlite covered with a sound cloth.

[0022] As described above, the density of the elongated insulation elements should be below 50% of the average. When manufacturing the elongated insulation elements from stone wool, test results by the applicant surprisingly shows, that the best compromise between sound absorbing properties, structural strength, weight, as well as the flammability arranges the density of the elongated insulation elements between 23-46% and preferably 27-46% of the average density.

[0023] According to a further embodiment of the first aspect of the invention, the backing panel, when the building panel is mounted onto an existing building surface, arranges a distance between the building surface and the inner surface of the second number of elongated insulation elements, the distance being substantial equal to a thickness of the backing panel, hereby arranging a ventilating space between the building panel and the building surface.

[0024] In order to ensure sufficient moisture transport of the building wall the building panel is arranged with a ventilating space between the wall surface and the building panel, when the building panel is arranged on the wall.

[0025] According to a further embodiment of the first aspect of the invention, the second number of elongated insulation elements comprises a fire retardant sound cloth on the outer surface.

[0026] The insulation elements are in a preferred embodiment covered sound cloth, which may be fire impregnated.

[0027] Flammability standards for sound cloths are a matter of preventing fires and saving lives. Unfortunately, there is no single international flammability standard and instead a range of different standards, regulations and test methods are in force internationally. The fire retarding and acoustic building panels according to the present invention meet the international flammability standards and are submitted to a range of test methods which cover the most important international flammability standards, including: European EN 13501-1E, German DIN 4102 - B1, French M1 NF P 92-503-507, Austrian ONORM A3800-1 and B 3825, Italian Class Uno - UNI 9175 Class 1.IM, British BS 5852, and USA -CA TB 117-2013.

[0028] The type of sound cloth used may be one ordinarily known to the skilled person and may be impregnated with a fire retardant, such as the one produced under the trademark "Burnblock". Other types of flame retardant substances may be used.

Further, as the sound cloth comes in a variety of colors, the visual appearance of the entire building panel can be changed accordingly.

[0029] According to a further embodiment of the first aspect of the invention, the backing panel comprises a recess for engaging a fastening means such as a screw in said building surface

[0030] Arranging the backing panel with means for connection with the wall eliminates the necessity of fastening means such as nails or screws to be driven through the panel and into the wall surface.

[0031] According to a second aspect of the present invention, the above objects and advantages are obtained by:

A fire retarding and acoustic building panel system comprising a number of fire retarding and acoustic building panels.

[0032] The building panels in the above defined panel system comprise in a preferred embodiment four side edges, where a first edge comprises a projection, defined by part of the outermost arranged elongated insulation element, and the opposite side edge of the panels is arranged with a groove, defined by a spacing between the opposite and outer most arranged elongated panel element and the backing panel. Hereby, the defined panel system can be easily assembled, and as the building panels may comprise a different number of elongated panel elements and elongated insulation elements, hereby providing the building panels in various sizes, the panel system can be adopted to any specific dimension of a wall or ceiling, on which the panel system is to be arranged.

Fig. 1 is a perspective view of the fire retarding and acoustic building panel.

Fig. 2 is a cross-sectional view of a fire retarding building panel system.

[0033] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. The invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like reference numerals refer to like elements throughout. Like elements will thus not be described in detail with respect to the description of each figure.

[0034] Fig. 1 is a perspective view of the fire retarding and acoustic building panel 10. The building panel 10 is constructed from a number of elongated panel elements 12, preferably made from impregnated plywood (density between 500-800 kg/m3), and a number of insulation elements 14 fabricated from a fire retardant material, such as compressed stone wool having a density between 150-190 (kg/m3) for example 160 (kg/m3).

[0035] The building panel comprises a number of T-shaped elongated panel elements 12 dimensioned such that the elongated panel elements 12 defines approx. 60% of the total volume of the panel elements 12 and the insulation elements 14, and the insulation elements 14 are dimensioned such that the volume of these defines approx. 40% of the above defined total volume. The building panel with panel elements 12 having a plywood with a density of approx. 700 (kg/m3), arranges the panel elements 12 and insulation elements 14 with an average density of 484 (kg/m3) resulting in the density of the insulation elements being approx. 33% of the average density.

[0036] The elongated panel elements 12 and elongated insulation elements 14 are arranged in a parallel and overlapping relationship, and the elongated panel elements 12 are fastened to a backing panel 18 via suitable fastening means (not shown). The building panel 10 comprises at least one elongated backing panel 18 arranged at the inner surface of the building panel 10, such that the longitudinal direction of the backing panel 18 is substantially perpendicular to the longitudinal direction of the elongated panel elements 12. The backing panel 18 preferably comprises a number of recesses (not shown) suitable to engage with fastening means such as screws, driven into the wall. This leaves out the necessity for driving the fastening means through the building panel 10 and into the wall.

[0037] The building panel 10 may, however, be connected to a building construction, such as a wall or ceiling surface, by driving suitable fastening means such as screws, nails, bolts, glue or similar means known to the skilled person through the backing panel 18 and into the construction. The fastening means are in this situation preferably driven through the insulation elements and the backing panel 18, such that the fastening means do not penetrate the elongated panel elements 12.

[0038] In the shown example, each elongated insulation panel 14 comprises a layer of fire-retardant sound cloth 16, which covers the outer surface and each side surface of an insulation material 22. In a preferred embodiment, the sound cloth 16 only covers the outer surface of the insulation panels 14. The sound cloth 16 improves the fire retarding and acoustic performance of the building panel 10, and as the sound cloth 16 comes in a variety of colours, the visual impression of the building panel 10 may be arranged as desired. The sound cloth 16 in the illustrated embodiment does not cover the inner surface of the elongated insulation elements 14. However, the sound cloth 16 may in a further embodiment also cover the inner surface of the elongated insulation elements 14, or in an alternative embodiment also be arranged as a continuous sheet of sound cloth 16, which extends continuously between a plurality of elongated panel elements 12 and a plurality of elongated insulation elements 14. Hereby, the overall fire-retardant properties of the building panel 10 is enhanced. Further, the continuous sound cloth 16 provides a mechanical damping of vibrations between the elongated panel elements 12 and the backing panel 18.

[0039] Fig. 2 is a cross sectional view of a fire retarding building panel system. The figure illustrates part of a building panel system comprising two building panels 10. The sound cloth 16 described in relation to figure 1 is also understood to be applied to the building panels 10 illustrated in figure 2.

[0040] Fig. 2 shows a first lower building panel 10 and a lower part of an upper similar building panel 10. It is clearly illustrated that a lower edge of the upper building panel 10 comprises a groove 26, which is defined by a spacing between the backing panel 18 and the lowermost elongated panel element 12. The lower building panel comprises at an upper edge an insulation element projection 24 defined by part of an elongated insulation element 14. The lower and upper building panels 10 are mated by joining the groove 26 and insulation element projection 24, hereby creating a continuous unbroken building panel surface.

List of reference numbers

[0041]

10 Building panel
12 Elongated panel element
14 Elongated insulation element
16 Sound cloth
18 Backing panel
20 First main surface gap
22 Insulation material
24 Insulation element projection
26 Groove
28 First elongated panel part
30 Second elongated panel part
32 Outer surface of first elongated panel part
34 Inner surface of first elongated panel part

Claims

1. A fire retarding and acoustic building panel (10) for use as a cladding panel to cover at least a part of an existing building surface, such as an inner wall surface or a ceiling surface of a room, hereby enhancing the fire retarding and acoustic properties of said wall or ceiling, said building panel comprising:

a first main surface defining an exterior surface for facing an interior of said room, and
a second main surface defining an interior surface for facing said inner wall surface or said ceiling surface, said building panel (10) further comprising:

a first number of elongated panel elements (12),
a second number of elongated insulation elements (14) of sound absorbing and fire retarding material arranged parallel with said first number of elongated panel elements (12), and
at least one backing panel (18) defining part of said second main surface and arranged on said building panel (10) for defining a contact surface between said building panel (10) and said inner wall surface or said ceiling surface,

said first number of elongated panel elements (12) having a specific density and being substantial T-shaped and having a first elongated panel part (28) and a second elongated panel part (30), said first elongated panel part (28) having an outer surface (32) defining part of said first main surface, and an inner surface (34) facing said backing panel (18),
said second elongated panel part (30) extending between said first elongated panel part (28) and said backing panel (18), hereby arranging said inner surface (34) at a predetermined distance from said backing panel (18),
said second number of elongated insulation elements (14) being non-loadbearing and having an outer surface defining part of said first main

surface, an inner surface for facing said backing panel (18) and two side surfaces extending between said inner and outer surfaces of said insulation elements (14), said second number of elongated insulation elements (14) extending between said second elongated panel parts (30) of two neighboring panel elements (12) and between said backing panel (18) and said inner surface of at least one panel element (12), such that said first number of elongated panel elements (12) and said second number of elongated insulation elements (14) are arranged in a parallel relationship and said first elongated panel part (28) and said second number of elongated insulation elements (14) partly overlap each other,
said second number of elongated insulation elements (14) being made of a sound absorbing and fire retarding material having a density being lower than the density of said first number of elongated panel elements (12), said density of said second number of elongated insulation elements (14) being between 120-190 (kg/m3), preferably between 150-180 (kg/m3).

2. A fire retarding and acoustic building panel (10) according to claim 1, wherein said first number of elongated panel elements (12) and said second number of elongated insulation elements (14) defining an average density, said density of said second number of elongated insulation elements (14) being less than 50% of the said average density.

3. A fire retarding and acoustic building panel (10) according to claim 2, wherein said first number of elongated panel elements (12) comprises a wooden material and said first number of elongated panel elements (12) having a density between 500-800 (kg/m3), preferably between 760-800 (kg/m3).

4. A fire retarding and acoustic building panel (10) according to claim 3, wherein said wooden material is plywood.

5. A fire retarding and acoustic building panel (10) according to any of claims 2-4, wherein said second number of elongated insulation elements (14) comprises compressed fiberglass, ceramic fibers, or stone wool having a density between 160-170 (kg/m3), and wherein said density of said second number of elongated insulation elements (14) is between 20-50%, such as between 23-46% and preferably 27-46% of said average density.

6. A fire retarding and acoustic building panel (10) according to any of the previous claims, wherein said backing panel (18), when said building panel (10) is mounted onto an existing building surface, arranges a distance between said building surface and said inner surface of said second number of elongated insulation elements (14), said distance being substantial equal to a thickness of said backing panel (18), hereby arranging a ventilating space between said building panel and said building surface.

7. A fire retarding and acoustic building panel (10) according to any of the previous claims, wherein said second number of elongated insulation elements comprises a fire retardant sound cloth on said outer surface.

8. A fire retarding and acoustic building panel according to claim 6, wherein said backing panel (18) comprises a recess for engaging a fastening means such as a screw in said building surface.

9. A fire retarding and acoustic building panel system comprising a number of fire retarding and acoustic building panels according to any of claims 1-8.

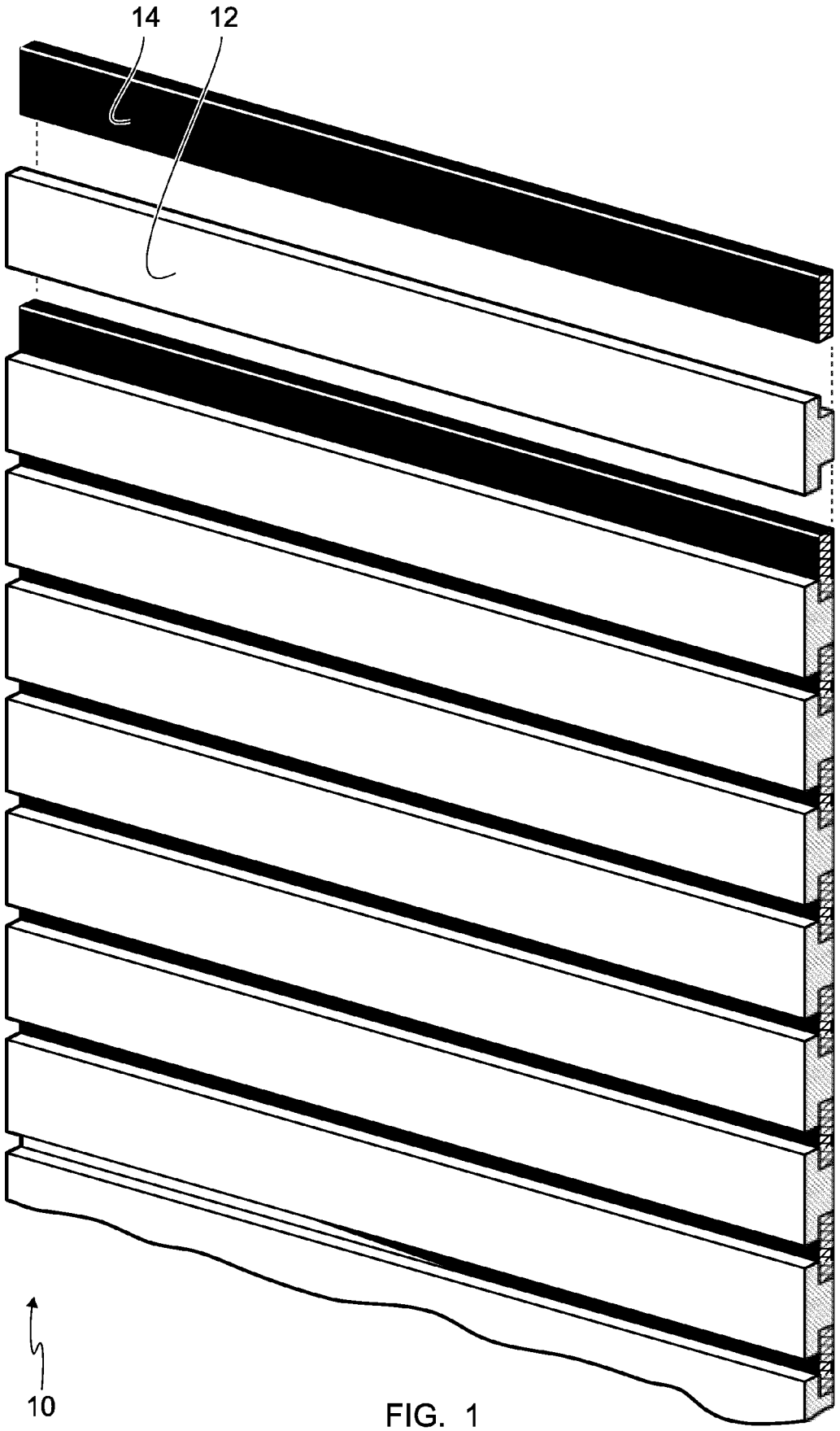

FIG. 1

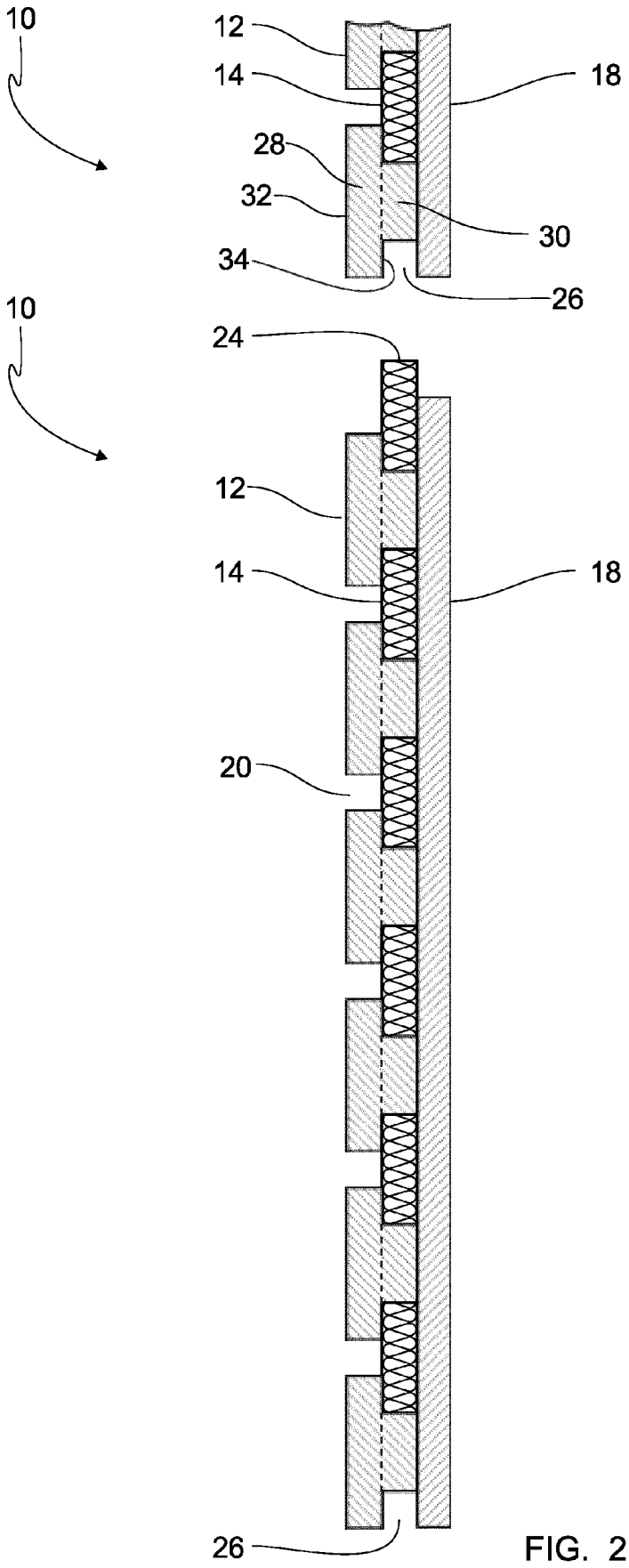

FIG. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 20 17 2684

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	DE 101 22 265 A1 (LIGNOTREND AG [DE]) 14 November 2002 (2002-11-14) * paragraph [0019] - paragraph [0031]; figures 1, 2 *	1-9	INV. E04B1/86 E04B1/94 E04B9/00
X	US 4 821 841 A (WOODWARD BRUCE [US] ET AL) 18 April 1989 (1989-04-18) * column 4, line 9 - column 5, line 68; figures 1, 2, 6, 8 *	1-9	ADD. E04B1/84
A	EP 3 467 230 A1 (HILTI AG [LI]) 10 April 2019 (2019-04-10) * claim 1; figure 1 *	1	
A	US 4 960 184 A (WOODWARD BRUCE [US] ET AL) 2 October 1990 (1990-10-02) * column 2, line 19 - line 42; figure 1 *	1	

TECHNICAL FIELDS SEARCHED (IPC)

E04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30 September 2020	Galanti, Flavio

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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30-09-2020

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EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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