Abstract:

Composite panel (1) and method for manufacturing it, as well as a composite-panel combination. The composite panel contains at least two wood-based panels (10, 20) and an insulation layer (30) fitted between them. According to the invention, the insulation layers (40, 50) are fitted on both sides of the wood-based panels (10, 20), and the said wood-based panels and insulation layers are attached to each other by gluing, with the aid of a single pressing.
Composite Panel, Method of Producing the same and a Composite Panel Combination

The present invention relates to a composite panel according to the preamble to Claim 1.

Such a panel consists of two wood-based panels or veneers and an insulation layer fitted between them.

The present invention also relates to a composite-panel combination according to the preamble to Claim 10, which consists of a first composite panel according to the invention and a second composite panel according to the invention, which can be arranged next to it.

The invention further relates to a manufacturing method for the composite panel according to the preamble to Claim 12, as well as a use according to Claim 14.

The manufacture of composite panels is conventional technology. Thus, various types of composite panel are previously known, which are manufactured by combining a wood-based material and at least one other material. In the manufacture of composite panel, an attempt is made to maximize the materials' good properties and minimize their bad properties. Composite panels are manufactured by combining different raw materials - i.e. components consisting of wood and non-wood raw materials - in order to create a composite panel. Composite panels are also manufactured by surfacing, for example, wood panels with various materials. The use of various types of compression methods in the manufacture of various types of composite panels is also previously known.

Plywood panels have been used in floor structures as basepanels for various types of surface layers, such as parquet. Such parquet panels are usually attached to each other by tongue-arid-groove joints. A drawback is that parquet panels have rather poor sound-insulation ability; parquet "clatters". In addition, when installed in place parquet often creaks when someone steps onto it. This is partly due to the fact that a wood-based parquet structure is not completely dimensionally stable, but lives according to the atmospheric humidity.
The present invention is intended to eliminate the drawbacks associated with the prior art and create a new type of composite panel. The invention is particularly intended to create a composite panel, which is suitable for use, for example, as a component of parquet.

The invention is also intended to create a composite panel that can be easily attached to adjacent composite panels, for example with the aid of tongue-and-groove joints, in order to achieve a composite-panel combination (i.e. a sub-structure carrying the surface layer of a floor), which is sturdy and well-insulated both acoustically and thermally. One particular aim is then to create a sub-structure, which will not creak when someone steps onto it, or as a result of variations in humidity.

The invention is also intended to create a composite panel containing a layer, which has an ability to insulate in terms of sound, heat, or moisture, or a combination of these.

In addition, the intention is to create a method suitable for manufacturing base plywood for parquet or a corresponding component of parquet.

The invention is based on the idea of forming a composite panel, which contains at least two wood-based panels and an insulation layer fitted between them. According to the invention, insulating layers are arranged on at least one side of the wood-based panels of the composite structure, preferably on both sides of at least one wood-based panel.

According to an especially preferred embodiment, at least one insulation layer extends over the wood layer in such a way that can press tightly against the edge of another composite panel fitted next to the composite panel.

In the preferred embodiment, there is thus a first part, for example the female or male part, of a tongue-and-groove joint formed in at least one edge of the composite panel, so that the said insulation layer extends into this part of the tongue-and-groove joint.

The invention also relates to a composite-panel combination, which includes a first composite panel and a second composite panel to be fitted next to it. According to the invention, the composite panels are attached to each other with the aid of a tongue-and-groove joint, preferably the locking arrangement of a tongue-and-groove joint.
The invention additionally relates to a method for manufacturing a composite panel. The method is characterized by adhesive layers being introduced between the panel's wood-panel or veneer layers and the insulation layers and the layers being stacked on top of each other in a preselected order and joined together during the same pressing.

More specifically, the composite panel according to the invention is characterized by what is stated in the characterizing portion of Claim 1.

For its part, the composite-panel combination according to the invention is characterized by what is stated in the characterizing portion of Claim 10.

The method according to the invention for manufacturing a composite panel is characterized by what is stated in the characterizing portion of Claim 12.

Considerable advantages are gained by means of the invention. Thus, the present composite panel, when used as base plywood, has excellent insulation ability in terms of sound, heat, and/or moisture. The insulation layers attenuate especially effectively the sounds that arise due to the mutual movement of adjacent panels, for example when someone steps on installed parquet. In addition to this, the insulation layers attenuate sounds of steps (clatter), as well as effectively reducing the penetration of moisture into the base structure. A composite structure is created, which is considerably more dimensionally stable than conventional ones.

In the following, the invention will be examined with the aid of a detailed description, with reference to the accompanying drawing.

Figure 1 shows a cross-section of the construction of two composite panels according to the invention to be attached to each other.

Figure 1 shows the construction of two composite panels 1 and 2 according to the invention.

The composite panel 1 contains two wood-based panels 10 and 20, between which an insulation layer 30 is fitted. The wood-based panel 10 and/or 20 can be a ready plywood panel, which consists of several, typically at least three, wood veneers 10a, 10b, 10c; 20a,
20b, 20c, glued to each other, or a solid wood panel, chippanel, wood-fibre panel, or any
other wood-based panel whatever. Alternatively, the wood-based panel (10 and/or 20) can
be a stack formed of separate wood veneers 10a, 10b, 10c; 20a, 20b, 20c.

Insulation layers 40, 50 are fitted on both sides of the wood-based panels 10, 20. The
composite panel is manufactured in such a way that the wood-based panels 10, 20 (or the
wood-veneer packages 10a, 10b, 10c; 20a, 20b, 20c forming the panels 10 and/or 20) and
the insulation layers (30, 40, 50) are equipped with adhesive layers (not shown in the
figure), stacked on top of each other in the order shown, and joined to each other by a
single pressing.

The wood veneers 10a, 10b, 10c; 20a, 20b, 20c are suitably deciduous-wood veneers (birch
veneers) or coniferous-wood veneers, which are either long-fibre or short-fibre. In the
figure, the veneers 10b and 20b can be, for example, short-fibre and the other veneers long-
fibre.

The insulation layers 30, 40, and 50 can consist of the same material or of different
materials. The most important aspect is that they act as sound and thermal insulations, and
possibly also as moisture barriers. If the composite panel is intended to form a component
of the base structure carrying the surface layer of a floor, such as parquet, cork or cork-
rubber will be a very suitable insulation material.

In the composite panel 2, the reference numbers 11 and 21 refer respectively to wood-
based panels; the reference numbers 11a, 11b, 11c; 21a, 21b, 21c refer to wood veneers,
and the reference numbers 31, 41, and 51 refer to insulation layers.

Some suitable adhesives for joining wood-based panels, insulation layers, and possibly
separate wood veneers to each other are thermoplastic or thermosetting plastic resins, such
as phenolformaldehyde (pf), melaminformaldehyde (mf), ureaformaldehyde (uf),
polyurethane (pu), methylenediphenylid-isocyanate (mdi), polymeric methylene-diphenylid-
isocyanate (pmdi), edmi, or edfi, or some mixture of the aforementioned.

A good moisture barrier is created, for example, by means of a urethane-adhesive joint
between the lowest insulation layer (50 or 51) and the layer that comes on top of it.
The actual surface layer, such as parquet blocks or similar, is fitted on top of the composite panels 1 and 2 and the insulation layers 40 and 41.

It can be further seen from Figure 1 that the first composite panel 1 can be attached to a second, adjacent composite panel 2 with the aid of a tongue-and-groove joint 3. The female profile of the tongue-and-groove joint is arranged in the first side edge 1a of the composite panel 1. In this profile there is a groove 4, into which the male-profile protrusion 5 of the tongue-and-groove joint, in the second side edge 2b of the adjacent composite panel 2, can be fitted. The tongue-and-groove joint shown in the figure is a so-called locking tongue-and-groove, which is created in such a way that a protuberance 4a is formed (for example, by machining) in the outer edge of the groove 4 of the composite panel. In connection with the protrusion 5 of the adjacent composite panel 2, a protuberance 5a is formed, in such a way that the width of the protuberance 5 corresponds to the width of the bottom of the groove 4. The elements 4, 4a and 5a then form a locking arrangement for the tongue-and-groove joint 3. Joined together in this way, the composite panels 1 and 2 form a composite-panel combination that will remain a securely cohesive composite-panel combination.

In the opposite side edge (not shown in the figure) of the composite panel 1, the male profile of a tongue-and-groove joint is suitably arranged, so that the composite 1 can be fitted to a second adjacent composite panel, in the side edge of which there is a corresponding female profile.

According to one embodiment, the composite panel 1 can have a tongue-and-groove joint completely around it; in such a way that the end edges too are equipped with tongue-and-groove joint profiles (this solution is not shown in the figure). Thus, the first end edge of the composite panel can be equipped with the male profile of a tongue-and-groove joint and the end edge opposite to it can be equipped with the female profile of a tongue-and-groove joint.

It can be further seen from the figure that, at the side edge 1a, the successive layers 10a, 10b, 10c, 30,... of the composite panel 1 are arranged to overlap and extend for different distances into the tongue-and-groove joint 3. Correspondingly, at the side edge 2b of the composite panel 2, the successive layers 11a, 11b, 11c, 31.... of the composite panel are arranged to overlap and extend for different distances into the tongue-and-groove joint 3. Thus, all the edges of the adjacent layers 10a and 11a, 10b and 11b ...., particularly the
edges of the insulation layers 30 and 31 meet, when the composite panels 1 and 2 are
joined together.

The tongue-and-groove joint described above gives the structure several advantages. The
insulation layers 30, 31 run through the tongue-and-groove joint, and a tight seam is
formed between them. Because the successive layers are arranged to overlap, the vertical
seams between the adjacent layers will also be located in such a way that, for example, the
seam of the uppermost pair of layers (e.g., 10a, 11a) will not be directly aligned above the
seam between the lower pair of layers (e.g., 10b, 11b). If a gap arises between a specific
pair of layers, such a gap will remain isolated inside the structure. Thus, a channel running
through the structure from the surface to the bottom will not arise. This is important in
terms of sound insulation, heat insulation, and fire safety. Sound or creaking arises at the
point of contact in the wood(veneer)-wood(veneer) combination. This sound or creaking is
avoided, if a contact arises at critical points between the wood(veneer)-cork/sound-insulation
material, because cork is extremely flexible and elastic and recovers well from
compression. When wood becomes wet or dries the change in the moisture gradient causes
deformations and these deformations can cause sound or creaking.

The sound-insulation layer also attenuates the sound of steps and prevents, for example,
sound in an upper-storey floor coming from the side of the storey beneath.

The composite panel according to the invention is manufactured in such a way that a stack
is formed of wood-based panels, or stack is formed of wood-based panels (i.e. a "wood-
veneer package"), adhesive layers are introduced between the layers, and the layers are
stacked on top of each other in a preselected order, and are joined together by the same
pressing (i.e. by a "single pressing").

If desired, a composite panel created in the manner described above can be cut into
composite panels with a size of the desired surface area. Tongue-and-groove joints of the
desired shape can afterwards be machined into the straight edges of the composite panel.

The composite panel according to the invention can also contain several wood-based
panels or wood veneers, several insulation layers of different types, and other structures.
According to one embodiment, the final surface layer can be fitted to the upper surface of
the composite panel.
The thickness of the composite panel is preferably about 3 - 50 mm, particularly about 10... 25 mm; most suitably about 12 mm.

A layer, which is, for example, of wood or polymer material, forming a parquet surface, can be fitted to the upper surface of the composite panel. The thickness of the layer is about 1 - 15 mm, typically about 1 - 10 mm. According to a preferred embodiment, the layer forming the parquet surface is arranged especially on top of an insulation layer.

In one embodiment, the invention comprises a composite panel of a type, on the upper surface of which, immediately against an insulation layer, is a wood layer, a polymer layer, or a layer consisting of a composite of wood and polymer material, forming a parquet surface.

The invention is not intended to be restricted to only the embodiments described by way of example. The invention is intended to be applied widely, within the scope of protection of the Claims presented hereinafter.
Claims:

1. Composite panel (1), which comprises at least two wood-based panels (10, 20) and an insulating layer (30) fitted between them, characterized in that insulating layers (40, 50) are fitted on both sides of the wood-based panels (10, 20), and said wood-based panels and insulating layers are attached to each other by gluing with the aid of a single pressing.

2. Composite panel according to Claim 1, characterized in that the wood-based panel (10, 20) is
   - a veneer layer (10a, 10b or 10c; 20a, 20b or 20c),
   - a plywood panel, which comprises several, typically at least three, wood-veneer layers (10a, 10b, 10c; 20a, 20b, 20c) glued to each other,
   - a solid wood panel,
   - chippanel,
   - a wood-fibre panel or similar wood-based panel, or
   - the wood-based panel (10, 20) is a stack formed of separate wood veneers (10a, 10b, 10c; 20a, 20b, 20c).

3. Composite panel according to Claim 1 or 2, characterized in that the insulation layers (30, 40, and 50) are sound-insulation layers, and possibly also thermal-insulation layers or moisture-barrier layers.

4. Composite panel according to Claim 3, characterized in that the insulation layers (30 - 50) all consist of the same material and are preferably of cork, cork-rubber, or rubber, or a similar flexible material, which has a sound, heat, or fire-insulating effect.

5. Composite panel (1) according to any of the above Claims, characterized in that it is arranged to be attached to an adjacent composite panel (2) with the aid of a tongue-and-groove joint (3).

6. Composite panel (1) according to any of the above Claims, characterized in that in the first side edge (1a) of the composite panel (1) the female profile of a tongue-and-groove joint is arranged, in which there is a groove (4), into which the protrusion (5) of a tongue-and-groove joint arranged in the second edge side (2b) of an adjacent composite panel (2) can be fitted.
7. Composite panel (1) according to Claim 6, **characterized** in that in the opposite side edge of the composite panel (1) the male profile of a tongue-and-groove joint is arranged, so that the composite panel (1) can be fitted to a second adjacent composite panel, in the side edge of which there is a corresponding female profile.

8. Composite panel (1) according to any of Claims 5 - 7, **characterized** in that at the side edge (la) the successive layers (10a, 10b, 10c, 30) of the composite panel (1) are arranged to overlap each other and extend for different distances into the tongue-and-groove joint (3).

9. Composite panel (1) according to any of the above Claims, **characterized** in that in its upper surface there is a wood or polymer layer forming a parquet surface.

10. Composite-panel combination, which comprises a first composite panel (1) according to any of Claims 5-8 as well as a second composite panel (2) to be fitted next to it, **characterized** in that the composite panels (1, 2) can be attached to each other by means of a tongue-and-groove joint (3), particularly with the aid of the locking arrangement (4, 4a, 5a) of a tongue-and-groove joint (3).

11. Composite-panel combination according to Claim 10, **characterized** in that
   - at the side edge (la) of the first composite panel (1) the successive layers (10a, 10b, 10c, 30 ...) of the composite panel (1) are arranged to overlap each other and extend for different distances into the tongue-and-groove joint (3), and
   - at the side edge (2b) of the second composite panel (2) the successive layers (11a, 11b, 11c, 31 ...) of the composite panel (2) are arranged to overlap each other and extend for different distances into the tongue-and-groove joint (3), in which case the edges of the adjacent layers (10a and 11a, 10b and 11b ...), particularly the edges of the insulation layers (30 and 31), meet when the composite-panel combination is assembled.

12. Method for manufacturing a composite panel according to any of Claims 1 - 9, **characterized** in that
   - the wood-based panels, or stack formed of wood-based panels, and the insulation layers are equipped with adhesive layers,
- the panels or stack, as well as the insulation layers, are stacked on top of each other in a preselected order, after which
- the panels or stack and the insulation layers are attached to each other by means of a single pressing.

13. Method according to Claim 12, characterized in that the composite panel obtained is further possibly cut into a composite panel with the desired size of surface area, and that tongue-and-groove joint profiles of the desired shape are machined into the edges of the composite panel.

14. Use of a composite panel according to any of Claims 1 - 9 or a composite-panel combination according to Claim 10 or 11 as a plywood base for parquet, especially floor parquet.
A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

IPC: B27M, B32B, E04C, E04F

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

FI, SE, NO, DK

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

EPO-Internal, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C. See patent family annex.

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## DOCUMENTS CONSIDERED TO BE RELEVANT

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### CLASSIFICATION OF SUBJECT MATTER

Int.Cl.

- **B32B 21/04** (2006.01)
- **E04C 2/12** (2006.01)
- **E04F 15/02** (2006.01)
- **B27M 3/04** (2006.01)