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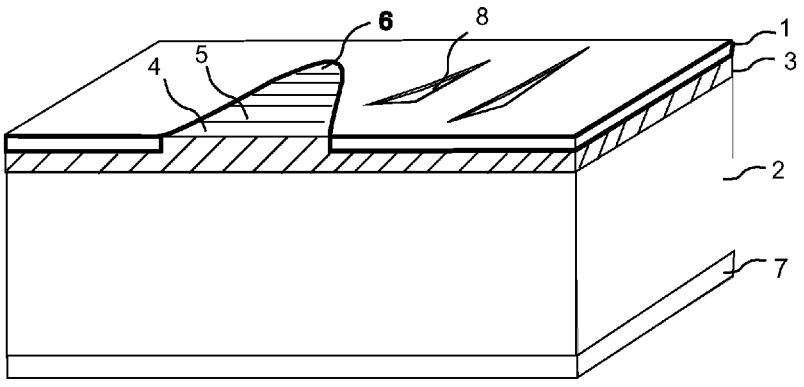
(54) Title: WOOD FIBRE BASED PANEL WITH A SURFACE LAYER

Fig. 1



(57) Abstract: A building panel with a surface layer (1) comprising a wood veneer, a wood fibre based core (2) and a sub-layer (3) between the surface layer (1) and the core (2). The sub-layer (3) comprises wood fibres (4) and a binder (5). The surface layer (1) has surface portions (6) comprising material from the sub-layer (3). The surface portions (6)comprising material from the sub-layer (3) extend into the wood veneer.

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WOOD FIBRE BASED PANEL WITH A SURFACE LAYER

Technical Field

The disclosure generally relates but is not limited to the field of wood fibre based building panels with a surface layer, preferably floor panels, wall panels and furniture components.

Technical Background

Embodiments of the invention are particularly suitable for use in floating floors, which are formed of floor panels with a wood fibre core and a decorative wear resistant surface. The following description of known technique, problems of known systems and objects and features of the disclosure will therefore, as a non-restrictive example, be aimed above all at this field of application and in particular at floorings which are similar to traditional wood fibre based laminate floorings.

It should be emphasized that the embodiments of the invention can also be used in other applications as, for example, wall panels, ceilings, furniture components, and similar.

Known Technique and Problems thereof

Several technologies are used to provide a floor panel, which is a copy of a solid floor panel. The reason is that copies may be produced more cost efficient and a floor with a separate layer attached to a core of for example HDF or plywood is more moisture stable than solid wood floors.

Wood fibre based direct pressed laminated flooring usually comprises a core of a 6-12 mm fibre board, a 0.2 mm thick upper decorative surface layer of laminate and a 0.1 -0.2 mm thick lower balancing layer of laminate, plastic, paper or like material.

A laminate surface generally comprise two paper sheets, a 0.1 mm thick printed decorative paper and a transparent 0.05-0.1 mm thick overlay intended to protect the decorative paper from abrasion. The transparent overlay, which is made of a-cellulose fibres, comprises small hard and transparent aluminium oxide particles, which gives the surface layer a high wear resistance.

The printed decorative paper and the overlay are impregnated with melamine resin and laminated to a wood fibre based core under heat and pressure. The two papers have prior to pressing a total thickness of about 0.3 mm and they are after pressing compressed to about 0.2 mm.

Other common surface materials are wood veneer and foils, which are glued to a core. The surface may also be a powder layer comprising wood fibres, melamine resins, colour pigments and aluminium oxide particles.

Wood veneers may provide the most natural copies. The disadvantage is that a wood veneer generally has a lower impact resistance than laminate floors and the production cost is high when high quality veneers may be used.

It is known that a wood veneer may be pressed on a powder layer as described above and that such a powder layer may provide increased impact resistance. This will not solve the cost problems.

US 2,831 ,793 discloses a composite wood veneer panel. A thin veneer is applied to a composite fibrous core of ligno-cellulose particles and binder and openings of the veneer are filled with core material when pressed together to form the composite panel. In the manufacture of the plywood or veneered panels according to this document, the plugging of the surface layer opening defects is done simultaneously with the formation of the board.

Summary

The objective of at least certain embodiments of the present invention is to provide a building panel, such as a floor panel, with a wood based surface

layer, which has a more attractive surface design and/or better surface properties and/or cost structure than present known floorings.

At least some of these and other objects and advantages that will be apparent from the description have been achieved by a building panel comprising a surface layer comprising a wood veneer, a wood fibre based core, and a sub-layer arranged between the surface layer and the wood fibre based core. The sub-layer comprises wood fibres and a binder. The surface layer has surface portions comprising material from the sub-layer. The surface portions comprising material from the sub-layer may extend into the wood veneer.

By extending into the wood veneer is meant that the material from the sub-layer extends, for example, at least into 1/3 of the thickness of the wood veneer. In one embodiment, the material of the sub-layer extends completely through the wood veneer.

The surface portions may extend to the upper part of the surface layer.

The surface portions comprising material from the sub-layer may be flush with a remainder of the surface layer.

In an embodiment, the core may be a wood-based board, for example, a wood-fibre based board such as MDF or HDF, or plywood. The core may be a Wood Plastic Composite (WPC). In an embodiment, the core may be a mineral composite board, a fibre cement board, a magnesium oxide cement board, a ceramic board, or a plastic board such as a thermoplastic board.

Preferably, the core is a pre-fabricated core.

In an embodiment, the veneer layer may be a wood veneer, a cork veneer, or a stone veneer.

In an embodiment, the sub-layer may comprise a filler and a binder. The fillers may be particles or fibres, for example wood fibres or particles, or mineral particles or fibres. The wood particles may be lignocellulosic particles and/or cellulosic particles. The wood particles may be at least partially bleached. The fillers may be rice, straw, corn, jute, linen, flax, cotton, hemp,

bamboo, bagasse or sisal particles or fibres. The filler may be starch such as maize starch, potato starch, etc.

The thickness of the veneer may be in the range of about 0.2 mm to about 1 mm.

The building panel may be provided with a thinner veneer than known building panels with veneer, since the sub-layer reinforces the veneer.

The building panel may be provided with a partly broken veneer that comprises holes, such as cracks, through the veneer. The sub-layer may protrude through the holes and level the surface layer. The sub-layer may be used as an alternative for putty for a building panel with a broken surface layer. Material from the sub-layer may fill holes, such as cracks, of the veneer.

The veneer may also be pre-treated prior to pressing, for example, be brushed.

The surface layer may comprise embossed portions and a part of the sub-layer may be more compressed under an embossed portion than under a non-embossed surface portion.

The embossed portions may be naturally occurring after pressing. For wood veneers having a porous structure, such as hard wood (e.g., angiosperm), porous portions of the veneer form embossed portions after pressing, since these portions do not spring back from their compressed state when the pressure is released. These porous portions are filled with the binder of the sub-layer during pressing. Then the binder cures and/or hardens, the binder locks the position of the porous portions in the compressed state. The portions of veneer having high density, i.e. being non-porous, are compressed during pressing but spring back when the pressure is released, thus forming protrusions of the surface layer. The high-density portions do not absorb enough binder from the sub-layer to be locked by the hardened binder after pressing.

For wood veneer having a non-porous structure, such as soft wood (e.g., gymnosperm), the summer wood annual rings (also called late wood annual

rings), having high density, are not compressible during pressing. Instead, the summer wood annual rings are pressed into the sub-layer such that the sub-layer is compressed. The summer wood annual rings form embossed portions of the surface layer. The spring wood annual rings (also called early wood annual rings) are compressible during pressing. During pressing, the spring wood annual rings are compressed. Then the pressure is released, the spring wood annual rings spring back, and form protrusions.

The embossed portions of the surface layer may also be formed by pressing by an embossed pressing device, such as an embossed press plate.

The building panel may comprise a powder based balancing layer. The powder based balancing layer may comprise cellulose or lignocellulosic particles and a binder. In one embodiment, the building panel comprises a balancing layer comprising a resin impregnated paper, preferably impregnated with a thermosetting binder.

The building panel may be a floor panel comprising a powder based balancing layer. The powder based balancing layer may comprise cellulose or lignocellulosic particles and a binder. In one embodiment, the floor panel comprises a balancing layer comprising a resin impregnated paper, preferably impregnated with a thermosetting binder.

The binder in the sub-layer may be a thermosetting resin.

The binder in the sub-layer may be a melamine resin. The binder in the sub-layer may be an amino resin, such as melamine formaldehyde resin, urea formaldehyde resin, phenol formaldehyde resin, or a combination thereof.

The binder in the sub-layer may be a thermoplastic binder. The thermoplastic binder may be polyvinyl chloride (PVC), polyethylene (PE), polypropylene (PP), polyurethane (PU), polyvinyl alcohol (PVOH), polyvinyl butyral (PVB), and/or polyvinyl acetate (PVAc), or a combination thereof.

The binder may be wood mastic, wood filler or any other type of putty-like paste.

The sub-layer may be substantially or completely formaldehyde free.

The wood fibres in the sub-layer may be lignocellulosic and/or cellulosic particles. The wood fibres may be at least partially bleached.

The sub-layer may comprise wear resistant particles.

The sub-layer may further comprise colour pigments and/or a colorant. The colour pigment may be of dark colour, or may be white, such as Ti02.

The wood veneer may comprise holes and/or cracks, wherein the sub-layer fills the holes and/or cracks of the wood veneer.

The surface layer may further comprise a protective overlay, comprising wear resistant particles, arranged on the wood veneer.

The sub-layer may comprise a foaming agent. Additives such as blowing agents may be included in the sub-layer. The blowing agents may be physical foaming agents such as Expancel® and/or chemical blowing agents such as AIBN (azoisobutyronitrile) or ADC (azodicarbonamide).

The surface layer may be a cork layer.

The building panel may be a floor panel, a wall panel, a ceiling panel, a furniture component, skirting boards, mouldings, edging profiles etc.

An alternative to the veneer may be a paper or a plastic foil provided with apertures that extends through the paper or the plastic foil.

A second aspect of the invention is a method to produce a building panel, comprising the step of:

- applying a wood fibre powder and a binder on a wood fibre based core, to obtain a sub-layer;
- applying a wood veneer, comprising holes through the veneer, on the sub-layer,
- applying heat and pressure to bond the veneer, the sub-layer and the wood fibre based core together, wherein a portion of the wood fibre powder and the binder is pressed into the holes.

The method preferably comprises the step of applying a foaming agent. The foaming agent may facilitate the displacement of the wood fibre powder and the agent into the holes.

The wood fibre powder may comprise lignocellulosic particles or cellulose particles.

The method may comprise the step of applying different colour pigments, such that the colour of the visible sub-layer portion varies along the building panel, or such that the portion of the sub-layer in the holes forms a pattern.

After applying pressure, the surface layer may comprise embossed portions, and wherein a part of the sub-layer is more compressed under an embossed surface portion than under a non-embossed surface portion.

The method may further comprise applying a protective overlay with wear resistant particles on the wood veneer, preferably prior to pressing.

The sub-layer may further comprise colour pigments and/or a colorant.

The sub-layer may comprise wear resistant particles.

According to a third aspect of the invention, a building panel is provided. The building panel comprises a surface layer comprising a wood veneer, a core, and a sub-layer arranged between the surface layer and the core. The surface layer has surface portions comprising material from the sub-layer extending into the wood veneer.

Preferably, the core is a wood fibre based core.

Preferably, the sub-layer comprises wood fibres and a binder.

Brief Description of the Drawings

The present invention will by way of example be described in more detail with reference to the appended schematic drawing, which shows an embodiment of the present invention.

Figure 1 illustrates a building panel according to an embodiment of the invention.

Detailed Description

Figure 1 shows a building panel with a surface layer 1 comprising a wood veneer, a core 2, and a sub-layer 3 arranged between the surface layer 1 and the core 2. The core 2 may be wood fibre based board such as MDF, HDF, particle board, plywood, OSB etc. The core 2 may be a WPC (Wood Plastic Composite). The core 2 may in one embodiment be a mineral board. The building panel may be a floor panel, a wall panel, a ceiling panel, a furniture component, skirting boards, mouldings, edging profiles, etc.

A low quality wood veneer is used as a surface layer 1. The veneer comprises cracks and other similar defects. The veneer is pressed against the core 2 with a powder based sub-layer 3 comprising wood fibres 4 and a binder 5 such that the powder floats and fills the cracks. The panel comprises after pressing a surface layer 1 with surface portions 6 comprising material from the sub-layer 3. The surface portions 6 comprising material from the sub-layer 3 extend into the wood veneer. The surface portions comprising material from the sub-layer may be flush with a remainder of the surface layer. A "surface portion" is a portion of the surface layer that is visible on the exposed surface of the surface layer facing away from the core.

In one embodiment, the sub-layer 3 comprises a binder applied in liquid form.

The panel may be pressed against an embossed press plate such that a part of the sub-layer 3 is more compressed under an embossed portion 8 than under a non-embossed surface portion.

Preferably the building panel is a floor panel that may have a powder based balancing layer 7. A powder based balancing layer 7 may also be applied on any other type of building panel. The powder based balancing layer 7 may comprise lignocellulosic particles or cellulose particles and a binder, preferably a thermosetting binder, more preferably an amino resin such as melamine formaldehyde resin. The binder may also be applied in powder form, the sub-layer 3 being a dry powder layer. In one embodiment, the sub-layer 3 is a pre-pressed layer, wherein the binder has not completely cured during the pre-pressing.

The binder of the sub-layer 3 may be a thermosetting resin, such as, for, example a melamine formaldehyde resin. The sub-layer 3 may also comprise colour pigments and wear resistant particles such as aluminium oxide particles. The wood fibres of the sub-layer 3 may be lignocellulosic particles or cellulose particles. The wood fibres of the sub-layer 3 may be at least partially bleached. The sub-layer may comprise a foaming agent. The wood veneer may be replaced by a cork veneer or a stone veneer.

The sub-layer 3 may be applied in an amount of 200-600 g/m2, preferably 300-500 g/m2 such as about 400 g/m2. The amount of binder applied for the sub-layer 3 may be 100-300 g/m2, preferably 150-250 g/m2 such as about 200 g/m2. The sub-layer 3 may comprise the binder in an amount of 30-80 wt%, preferably in an amount of 40-60 wt% such as about 50 wt%.

In an embodiment, a produced building panel may be 6-25 mm thick, preferably 8-15 mm thick after pressing, while the core may be 5-22 mm thick, preferably 7-14 mm thick. The sub-layer may be 0.1-2 mm thick after pressing.

Using a protective overlay with wear resistant particles applied on the veneer is not excluded and this could increase the wear resistance of a wood veneer. Dry and wet overlays, which are produced by production methods where for example thermosetting resins in dry or wet form are mixed with aluminium oxide, without any fibres could also be used. Aluminium oxide particles mixed with melamine powder could for example be applied on a wood veneer prior to pressing and a wear resistant surface could be obtained without any surface coating after pressing. Dry and wet overlays may be applied on the surface layer prior to pressing. Wax may be applied, for example, as a powder, prior to pressing on the veneer. A lacquer may also be applied on the surface layer after pressing. A protective foil may also be applied on the veneer prior to pressing or on the surface layer after pressing.

It is also contemplated that the building panel is provided with a second surface layer (not shown) comprising a wood veneer of the above described

type. A sub-layer of the above described type is arranged between the second surface layer and a second surface of the core of the above described type. The second surface layer has surface portions comprising material from the sub-layer extending into the wood veneer. The second surface of the core faces away from the surface layer described above with reference to fig. 1. In this embodiment, the surface layer described above with reference to fig. 1 is considered as first surface layer.

The building panel may be produced by a method comprising the step of:

- applying a wood fibre powder and a binder on a wood fibre based core, to obtain a sub-layer;
- applying a wood veneer, comprising holes through the veneer, on the sub-layer,
- applying heat and pressure to bond the veneer, the sub-layer and the wood fibre based core together, wherein a portion of the wood fibre powder and the binder is pressed into the holes.

The method preferably comprises the step of applying a foaming agent. The foaming agent may facilitate the displacement of the wood fibre powder and the agent into the holes.

The wood fibre powder may comprise lignocellulosic particles or cellulose particles.

The method may comprise the step of applying different colour pigments, such that the colour of the visible sub-layer portion varies along the building panel, or such that the portion of the sub-layer in the holes forms a pattern.

CLAIMS

1. A building panel comprising:

a surface layer (1) comprising a wood veneer,

a wood fibre based core (2), and

a sub-layer (3) arranged between the surface layer (1) and the wood fibre based core (2), wherein the sub-layer (3) comprises wood fibres (4) and a binder (5),

wherein the surface layer (1) has surface portions (6) comprising material from the sub-layer (3) extending into the wood veneer.

2. The building panel as claimed in claim 1, wherein the surface portions (6) comprising material from the sub-layer (3) are flush with a remainder of the surface layer (1).

3. The building panel as claimed in claim 1 or 2, wherein the surface layer (1) comprises embossed portions (8) and wherein a part of the sub-layer (3) is more compressed under an embossed portion (8) than under a non-embossed surface portion.

4. The building panel as claimed in any one of the preceding claims, wherein the sub-layer (3) comprises colour pigments and/or a colorant.

5. The building panel as claimed in any one of the preceding claims, wherein the sub-layer (3) comprises wear resistant particles.

6. The building panel as claimed in any one of the preceding claims, wherein the building panel is a floor panel comprising a powder based balancing layer (7).

7. The building panel as claimed in any one of the preceding claims, wherein the wood veneer comprises holes and/or cracks, wherein the sub-layer (3) fills the holes and/or cracks of the wood veneer.

8. The building panel as claimed in any one of the preceding claims, further comprising a protective overlay comprising wear resistant particles arranged on the surface layer (1).

9. The building panel as claimed in any one of the preceding claims, wherein the binder in the sub-layer (3) is a thermosetting resin.

10. The building panel as claimed in any one of the preceding claims, wherein the binder (19) in the sub-layer (3) is a melamine formaldehyde resin.

11. The building panel as claimed in any one of the preceding claims, wherein the sub-layer (3) comprises a foaming agent.

12. The building panel as claimed in any one of the preceding claims, wherein the surface layer is a cork layer.

13. A building panel comprising:

a surface layer (1) comprising a wood veneer,

a wood fibre based core (2), and

a sub-layer (3) arranged between the surface layer (1) and the wood fibre based core (2), wherein the sub-layer (3) comprises wood fibres (4), a binder (5) and wear resistant particles,

wherein the surface layer (1) has surface portions (6) comprising material from the sub-layer (3) extending into the wood veneer.

14. A building panel comprising:

a surface layer (1) comprising a wood veneer,

a wood fibre based core (2), and

a sub-layer (3) arranged between the surface layer (1) and the wood fibre based core (2), wherein the sub-layer (3) comprises wood fibres (4), a binder (5) and colour pigments and/or a colorant,

wherein the surface layer (1) has surface portions (6) comprising material from the sub-layer (3) extending into the wood veneer.

15. A building panel comprising:

a surface layer (1) comprising a wood veneer,

a wood fibre based core (2), and

a sub-layer (3) arranged between the surface layer (1) and the wood fibre based core (2), wherein the sub-layer (3) comprises wood fibres (4) and a binder (5), and

wherein the surface layer (1) has surface portions (6) comprising

material from the sub-layer (3) extending into the wood veneer, and

wherein the surface layer (1) comprises embossed portions (8), and wherein a part of the sub-layer (3) is more compressed under an embossed portion (8) than under a non-embossed surface portion.

16. A method to produce a building panel, the method comprising:

- applying a wood fibre powder and a binder on a wood fibre based core (2), to obtain a sub-layer (3);
- applying a wood veneer, comprising holes through the veneer, on the sub-layer (3),
- applying heat and pressure to bond the veneer, the sub-layer (3) and the wood fibre based core (2) together, wherein a portion of the wood fibre powder and the binder is pressed into the holes.

17. The method as claimed in claim 16, further comprising applying a foaming agent in the sub-layer (3).

18. The method as claimed in clam 16 or 17, wherein the wood fibre powder comprises lignocellulosic particles or cellulose particles.

19. The method as claimed in any one of claims 16-18, further comprising applying different colour pigments, such that the colour of the visible sub-layer portion varies along the building panel, or such that the portion of the sub-layer in the holes forms a pattern.

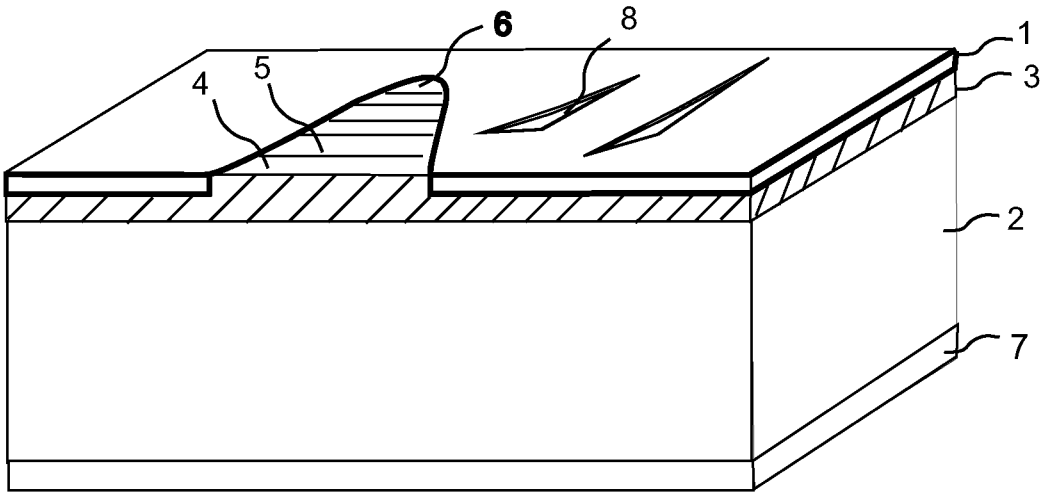
20. The method as claimed in any one of claims 16-19, wherein after applying pressure, the wood veneer comprises embossed portions (8), and wherein a part of the sub-layer (3) is more compressed under an embossed surface portion (8) than under a non-embossed surface portion.

21. The method as claimed in any one of claims 16-20, further comprising applying a protective overlay with wear resistant particles on the wood veneer, preferably prior to pressing.

22. The method as claimed in any one of claims 16-21, wherein the sub-layer (3) comprises colour pigments and/or a colorant.

23. The method as claimed any one of claims 16-22, wherein the sub-layer (3) comprises wear resistant particles.

Fig. 1



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE201 5/050007

A. CLASSIFICATION OF SUBJECT MATTER

IPC: 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: B27D, B32B, B44C

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

SE, DK, FI, NO classes as above

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

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2009065769 A2 (VAELINGE INNOVATION BELGIUM BV ET AL), 28 May 2009 (2009-05-28); abstract; page 13, line 15 - page 14, line 11; page 34, line 15 - line 28; figures 10a-c --	1-23
Y	US 2720478 A (HOGG JAMES H), 11 October 1955 (1955-10-11); column 4, line 21 - column 5, line 15; column 7, line 1 - line 16; figures 1-4 --	1-23
Y	US 2831 794 A (ELMENDORF ARMIN), 22 April 1958 (1958-04-22); column 4, line 14 - line 53; column 5, line 19 - line 29; figure 1; claims 1-11 --	1-23

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search	Date of mailing of the international search report
17-04-201 5	17-04-201 5

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE201 5/050007

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5059472 A (PARTEK AB), 7 May 1987 (1987-05-07); abstract; column 1, line 8 - line 63; column 3, line 31 - line 61; column 4, line 3 - line 11; column 5, line 28 - line 54; column 8, line 24 - line 59; column 9, line 23 - line 31; figures 1-3	1-23
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A	WO 201 1087423 A1 (CERALOC INNOVATION BELGIUM ET AL), 21 July 201 1 (201 1-07-21); abstract; page 6, line 1 - page 7, line 10; figures 2a-b	19
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A	US 4093766 A (SCHER HERBERT I ET AL), 6 June 1978 (1978-06-06); abstract; column 3, line 49 - column 4, line 3; column 7, line 3 - column 8, line 24; figures 1-2	19
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A	US 2831 793 A (ELMENDORF ARMIN), 22 April 1958 (1958-04-22); whole document; figures 1-4	1-23
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A	US 2634534 A (OWEN BROWN), 14 April 1953 (1953-04-1 4); figures 1-3,6; claims 1-7	1-23
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A	US 2630395 A (VERNON MCCULLOUGH KENNETH ET AL), 3 March 1953 (1953-03-03); figures 1-2; claims 1-5	1-23
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