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(54) **NOISE ABSORBING WALL OR CEILING ELEMENT AND METHOD OF FORMING A NOISE-ABSORING WALL OR CEILING**

(57) The invention relates to a wall element or ceiling element for an interior wall or ceiling respectively. The invention also relates to methods of forming an interior wall or interior ceiling. The wall element is a sound absorbing wall element and is formed as a plate having at least two layers. A first layer is a substrate (1)

comprising recycled textile. The first layer has an average thickness of at least 4 mm. The recycled textile is bonded with a binder, resulting in a self-supporting layer. A second layer (2) is a layer of acoustic plaster or stucco that is put on the substrate comprising recycled textile.

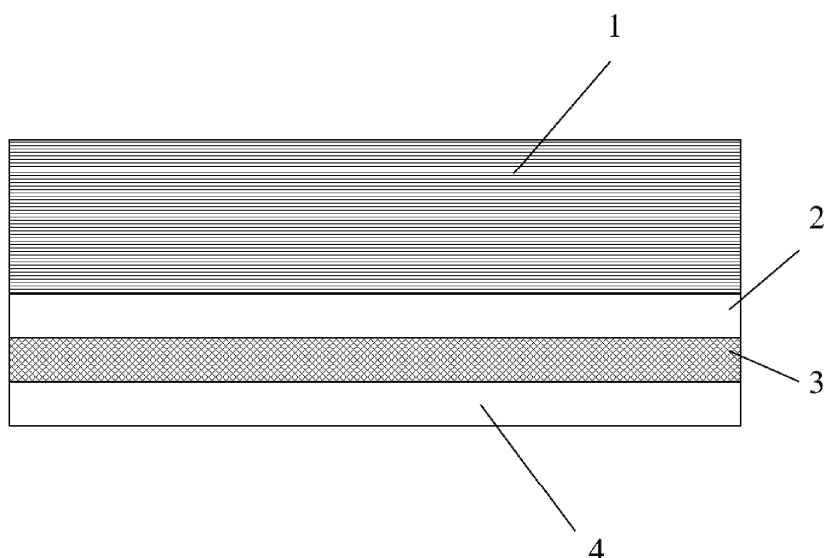


Figure 1

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Description

[0001] The invention relates to a wall element or ceiling element for an interior wall or ceiling respectively. The invention also relates to methods of forming an interior wall or interior ceiling.

BACKGROUND OF THE INVENTION

[0002] Wall elements are well known and are used in the construction of interior walls and ceilings in buildings. The wall element is a tile or panel and is usually mounted on e.g. a brick wall as the most interior wall of a wall and thus acts as the wall that is visible by the user of the room. The wall element is self-supporting, which in the context of this application means that it has enough rigidity to be lifted and mounted into position maintaining its generally flat plate like shape. This allows using wall elements as a panel to be mounted onto a wall or ceiling.

[0003] Noise nuisance is a daily struggle in many people's lives. People's health and quality of life decreases drastically by excessive noise. Insulation is often used to decrease noise nuisance, coming from neighbors or other surroundings. However, only insulation is often not enough. Sound waves bounce back and forth against bare walls. This is why an empty room always echoes so much. This diminishes slightly when things are placed in the room, but often the acoustics remain suboptimal.

[0004] NL2017678B1 discloses a noise absorbing wall element. This wall element comprises sheep wool. Sheep wool has many advantages. Sheep wool has unique properties, as mentioned in the prior art, such as good insulation. Sheep wool is durable. Sheep wool is relatively expensive. Sheep wool is a natural product, but the production thereof still has impact on natural resources.

[0005] WO2017/017537A1 discloses noise absorbing wall elements comprising recycled textile with aggregating polymer sandwiched between substrates of wood fibre panels.

[0006] So, there is a need to improve noise absorbing wall elements. An object of the invention is to provide a noise-absorbing wall element at lower costs, preferably lower impact on natural resources.

BRIEF SUMMARY OF THE INVENTION

[0007] The present invention relates to a wall element for an interior wall or can be mounted to a ceiling. The wall element can be a panel to be used as a wall or ceiling cover in interior rooms of a building. In some embodiments, the wall element is for an exterior wall.

[0008] The wall element of the invention comprises a substrate formed from recycled material. The wall element comprises a substrate from recycled material. A substrate made from recycled clothing is advantageous

as the fashion industry accounts for a substantial part of global greenhouse emissions. Used textiles end up on landfills and are often burned. To make the process more sustainable, textile can be used to make other products when exceeding its lifespan as regular clothing. The easiest way to re-use old textile is to fiberize the textile. This can be used as filler in various applications. One of the applications is for construction material. The substrate of recycled textile preferably forms the self-supporting layer of the wall element. The recycled textile in the substrate can comprise the fibers of mattresses, clothing, bedding and furniture fabrics. The material of the fibers differs from batch to batch of recycled textile material. The recycled textile can comprise cotton. Old or used textile cut into smaller pieces. These smaller pieces may be fiberized. This makes the mixture of different types of textile fibers more homogeneous through the wall element. Besides recycled wool, cotton has good technical properties of the wall element too. The recycled textile substrate has sound-dampening properties as the recycled textile substrate is air permeable and/or porous for air.

[0009] The beneficial properties of the substrate of recycled textile comprising at least 5%, more preferably at least 10%, cotton in wall elements are:

- insulation: the primary function of insulation in the winter is to keep the cold out and the heat inside, in order for energy costs to remain limited; the insulating effect is also important in the summer; the heat accumulating properties of cotton are the same as traditionally used fiberglass; in summer, it therefore remains pleasantly cooler inside the construction and less thermal fluctuations in the construction are observed, reducing the risk of structural damage such as crack formation;
- Air permeability: cotton has a good breathing capacity. It makes the wall element more durable, because there is no crack formation in and in between wall elements.
- Environmentally friendly: the fibers originate from textile waste streams. The use of waste in the textile layer reduces the emission of the wall element. Moreover, producing cotton requires huge amounts of water. This water is saved by using fibers comprising cotton, instead of using newly produced cotton.
- Humidity control: cotton is known for great moisture absorption. This lowers the humidity in the surroundings. It results in a nice atmosphere in the buildings and making the buildings less susceptible for mold, which is often the result of high humidity.
- Human friendly: glass and stone fibers are commonly used for thermal insulation, filtration and noise proofing. From the viewpoint of healthcare, these fibers can cause itching/pruritus, pulmonary fibrosis and/or eczema/contact dermatitis, and may

contribute to the sick building syndrome. Some types of glass wool are also known to cause cancer. The use of fibers comprising cotton originating from textile waste streams has the same characteristics as building material, but not the downsides.

[0010] Generally, the wall element has a flat shape extending in a length and width direction with a predetermined average thickness and surface area. A rectangular plate is preferred. The wall element can be 60, 90 or 120 centimeters wide or have a width between 50 and 130 centimeters. The panels can be 50-320cm, preferably 60-310cm and more preferably 80-300cm, in length. The thickness of a wall element can be 9.5 to 35 millimeters, more preferably 10mm to 25mm.

[0011] Preferably more than 30%, more preferably at least 40%, of the substrate is formed by recycled clothing. In embodiments, at least 5% of the recycled textile fraction is formed by protective work clothing.

[0012] In preferred embodiments, at least 10%, more preferably at least 15% and most preferably at least 20%, of the recycled textile fraction is formed by protective work clothing. Using protective work clothing as part of the recycled clothing fraction in the substrate results in added strength of the substrate, as fibers from protective work clothing are relatively sturdier. Also, protective work clothing can comprise fire retardants, which are recycled into the substrate of recycled textile, providing fire retardant properties to the wall element.

[0013] In embodiments, the recycled textile substrate has a weight of 1500-4000 gr / m², preferably 2400-3800 gr / m², more preferably 2800-3400 gr/m². Wall elements having a substrate of recycled textile having a thickness of about 15-28 mm, preferably 16-26mm, in embodiment about 23 mm result in the desired weight / m².

[0014] In preferred embodiments, the air permeability of the recycled textile substrate is between 50 - 400 m³/m²·h, measured according to ISO 9237 at a pressure difference of 200 Pa. Such air permeability is significantly higher than prior art wall elements. Air permeability of 50-400 m³/m²·h at 200Pa increases the sound absorption for 0.7 to 1000Hz according to ISO 354. The porous structure results in dampening of the sounds in the wall element. In embodiments, the air permeability is between 60 - 350 m³/m²·h, between 200 - 325 m³/m²·h

[0015] In an embodiment, the substrate of recycled textile has an average thickness of at least 4 mm, preferably at least 8 mm, more preferably at least 12 mm, and most preferably the thickness is 9.5 to 25 millimeters.

[0016] Protective work clothing is sturdy and often impregnated to protect workers from fire. By adding fibers from protective work clothing, those chemicals are recycled, and it is prevented that those chemicals

are released into the atmosphere. Moreover, the resultant substrate with recycled protective work clothing will require less treatments for fire safety. As protective work clothing has more rigidity than normal everyday clothing, protective clothing is more difficult to process.

[0017] The recycled textile in the substrate can comprise the fibers of mattresses, clothing, bedding and furniture fabrics. The material of the fibers differs from batch to batch of recycled textile material. The recycled textile can comprise cotton. Old or used textile cut into smaller pieces. These smaller pieces may be fiberized. This makes the mixture of different types of textile fibers more homogenous through the wall element. Besides recycled wool, cotton has good technical properties of the wall element too.

[0018] In an embodiment, the textile fibers in the recycled clothing substrate are bound by each other by mechanically intertwining. Preferably, the mechanical intertwining comprises needlepunching or needlefelt-ing.

[0019] In an embodiment, the recycled textile substrate comprises a binder. The binder binds the textile fibers of the recycled clothing. The binder provides rigidity to the recycled textile substrate. Preferably, the binder is a low-temperature binder. This results in a liquid binder when it is heated to its melting temperature. The low-temperature binder makes it possible to reach the curing temperature without burning the fibers. The binder can comprise polyethylene terephthalate, bioplastics, polylactide, resins (e.g. epoxy), polyester, bismaleimides, vinyl esters, and polyamides. Preferably, the binder is made from recycling waste streams. More preferably, the binder comprises recycled polyethylene (PE) or polyethylene terephthalate (PET).

[0020] Using PET or other low temperature binders sourced from waste streams lowers the costs corresponding with the wall element. This makes noise absorbing systems affordable for more people, increasing their quality of life. Moreover, sourcing materials from waste streams results in less waste in the environment and prevents increasing waste, because new binder does not have to be made specially for the wall element.

[0021] In embodiments, the method comprises mixing textile fibers and binder and heating the mixture. In embodiments, the method comprises curing the mixture to form a substrate of recycled textile. The curing and forming of the substrate can comprise forming layers from the mixture paste in an oven. The substrate forming can comprise needle punching for intertwining textile fibers. The substrate forming can comprise rolling to flatten the substrate.

[0022] To form the substrate for a wall element of the recycled textile fibers, preferably comprising protective work clothing, the fibers are mixed with the binder. If the binder is sourced from waste streams, the binder material is shredded into small pieces. This saves energy when heating the binder. Before adding the fibers, the

binder is heated up to its melting temperature. This forms a viscose liquid to which the fibers are added. This is mixed until the fibers are even distributed through the liquid binder.

[0023] After mixing, a layer is formed by layering the mixture. In embodiments, warm mixture layers of 0.01 to 10 mm thick are stacked on top of each other. This is repeated until the predetermined thickness is reached, which can be between about 2 to 15 cm, preferably around 8 cm.

[0024] After reaching the predetermined thickness, the layer of binder and recycled textile fibers is put in a heated mold or heated rolling machine. The mold or rolling machine is heated to a temperature above the curing temperature of the used binder. Typically, this is between 100 °C and 400 °C degrees Celsius, preferably between 150 °C and 300 °C degrees Celsius, more preferably between 175 °C and 225 °C. Using a mold or rolling machine that is heated up to above the curing temperature of the binder makes the outer layer of the layer comprising recycled textile fibers and binder harder than the inner layer, due to reduced heat penetration to the core of the layer. The difference in rigidity throughout the layer comprising recycled textile fibers and binder adds strength without increasing the risk of cracking. Furthermore, it decreases the thickness of the layer by more than 50%.

[0025] After heating, the mixture of recycled textile and binder is cured to form a wall-shaped substrate of recycled textile having a top and bottom side and having a circumference. As part of the curing process, the heated layer comprising recycled textile fibers and binder is cooled off, e.g. in a cooled mold or rolling machine. The obtained substrate of recycled textile with binder has advantageous acoustic sound dampening properties. A step of shaping the circumference, e.g. by cutting, can be part of the method. This allows obtaining substrate of the desired size and having the desired circumference.

[0026] Embodiments of the method include forming and densifying the substrate of recycled textile in mold or by rolling in a rolling machine. The rolling may be part of heating or part of cooling of the substrate. By pressurizing the heated mixture of textiles and binder, increased density is obtained and the textile substrate become self-supporting.

[0027] In embodiments, the method comprises cutting the formed substrate of recycled textile in desired shapes and dimensions. By cutting, the circumference of the substrate is formed. The cutoff parts can be fed to the mixture of new recycled textile fibers and binders to be formed once again into a substrate of recycled textile.

[0028] After the curing process, the heated layer comprising recycled textile fibers and binder is cooled off. The obtained substrate of recycled textile with binder has advantageous acoustic sound dampening properties.

[0029] In embodiments, a membrane is laminated onto the bottom side of the cured substrate. The bottom side is to face to a wall of the room in which the wall element is to be installed. The bottom side faces away from the interior of the room in which the wall element is installed. The membrane on the bottom side of the substrate has low air permeability, preferably has no air permeability. This bottom side prevents the forming of a pressure difference across the substrate. The size of the bottom side membrane corresponds with the size of the substrate.

[0030] In embodiments, a membrane is provided on a top side is air permeable according to any of the embodiments disclosed herein. The membrane can be laminated. The air permeability results in sound dampening properties of the side of the wall element facing the inside of the room. The top side membrane preferably is a fiberglass matting.

[0031] The layer is cooled before the acoustic stucco or plaster is added. The layer of acoustic stucco or plaster can be added without primer or other fixing agents.

[0032] To increase the noise absorbing properties, an acoustic stucco or plaster is used as a further layer onto the substrate, preferably on the upper layer of the substrate that will face the interior of the room. This stucco or plaster will have a hollow or porous structure, which dampens the reflection of noise waves off the walls. This composition ensures good acoustics in the room and reduces noise pollution. Because of the use of cheaper materials, it is more affordable for consumers. Furthermore, recycled materials are used, which is good for the circular economy. It also prevents more textiles from being burned in landfills.

[0033] In embodiments, the acoustic plaster or stucco layer forms the layer of the wall element that is turned to the viewer, that is towards the interior of the room. In embodiments, the stucco or plaster is not covered by a further layer and the stucco/plaster layer will be the visible layer of the finished wall or ceiling.

[0034] The acoustic stucco or plaster forms the layer of the end product that is turned to the viewer. The acoustic stucco or plaster increases the noise absorbing properties of the wall element. This makes a room reverberate less, there is less nuisance for neighbors. Overall, the quality of life in general goes up for the consumer. It can also be used in rooms and/or buildings, where acoustics are of great importance. Buildings that fall under this include theaters, music bars, cinemas, etc. It can also make the working environment more pleasant, for example, in factory halls where machines make very high levels of noise. This makes workers less likely to suffer serious hearing damage.

[0035] In embodiments, the acoustic plaster comprises perlite. The perlite has a diameter between 0.001 and 10 mm, preferably between 0.03 and 2 mm. The technical characteristic of perlite is that is hollow. This results in the stucco or plaster having an optimal

air permeability, which creates good acoustic properties.

[0036] In embodiments, the acoustic plaster comprises marble polish. The marble polish has a diameter between 0.001 and 10 mm, preferably between 0.03 and 2 mm. The hollow nature of marble polish is a key technological feature in this application. The hollowness of the marble polish in the stucco or plaster results in optimal air permeability, which creates good acoustic properties.

[0037] The layer of stucco or plaster is typically fabricated by spraying, even spreading of the material and subsequent polishing. Depending on the desired properties of the final product, this sequence of steps - spraying, spreading and polishing - is carried out once, twice or three times. The stucco can also be evenly spread on the layer comprising textile fibers and binder with other tools. For example; a paintbrush, a roller, spackle knife, plasterer's spatula, etc..

[0038] In embodiments, the stucco or plaster comprises cellulose. Such stucco or plaster increases the sustainability of the combination plate.

[0039] In an embodiment, reinforcement mesh can be added on top of the stucco/plaster layer. Another stucco or plaster layer will then again be added on top of the reinforcement mesh. This increases the stability of the wall element and noise absorption.

[0040] In embodiment, the wall element is finished with mineral paint. This paint is porous, which ensures that the acoustic property of the stucco is maintained despite a layer of paint.

[0041] A further aspect of the invention is providing a method of forming a wall element. The wall element can be formed with any of the previous features. In embodiments the method comprises providing textile, preferably comprising protective work clothing and providing a binder.

[0042] In embodiments of the method is directed at recycling clothing. The textile is processed the textile to obtain textile fibers. In embodiments the binder includes recycled polyethylene (PE) or polyethylene terephthalate (PET), preferably from PET bottles. For recycling the PET bottles are processed to obtain binder chips.

[0043] In embodiments, the method comprises mixing textile fibers and binder and heating the mixture. In embodiments, the method comprises curing the mixture to form a substrate of recycled textile. The curing and forming of the substrate can comprise forming layers from the mixture paste in an oven. The substrate forming can comprises needle punching for intertwining textile fibers. The substrate forming and curing can comprise rolling of the layer of recycled substrate between rollers to flatten the substrate.

[0044] To obtain a wall element according to the invention, the method comprises forming a layer of acoustic plaster or stucco on the substrate of recycled textile. The acoustic plaster or stucco preferably in-

cludes perlite and/or marble polish and/or cellulose.

[0045] In embodiments, the method further comprises providing a reinforced mesh and applying the reinforced mesh in the layer of acoustic plaster or stucco and applying a further layer onto the wall element with reinforced mesh.

[0046] Aspects of the invention relate to a method for forming an assembly of wall elements. This allows forming a wall in a room from wall elements or a dropped ceiling.

[0047] This method for forming an assembly can used any of the wall elements disclosed herein. The assembly can be formed from different wall elements.

[0048] Embodiments of the method include aligning two wall elements by aligning the top sides. Preferably the edges of the substrates are aligned. Preferably rectangular wall elements are used.

[0049] In embodiments, a membrane strip is applied over the abutting circumferences of two installed wall elements. The membrane strip connects to the two sides of abutting edges of two wall elements. The membrane strip provides strength to the plate like substrates and wall elements across the assembly of wall elements. This increases the strength and durability of the formed assembly.

[0050] In embodiments, preceding the application of the membrane strip, a seam between two adjacent wall elements is filled. The method can comprise applying a layer of acoustic plaster or stucco on the wall elements. The acoustic plaster or stucco preferably includes perlite and/or marble polish and/or cellulose.

[0051] Further aspects of the invention provide a kit of parts. The kit allows forming a dropped ceiling including several wall elements according to any of the embodiments disclosed herein. The kit also includes a suspension system that allows suspending the wall elements close to the ceiling of a room where the dropped ceiling is to be installed.

[0052] In the following a preferred embodiment of the wall element will be described. It will be clear that the preferred embodiment can have more or less features as described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0053]

Figure 1 shows schematically an embodiment of a wall element comprising two layers of acoustic plaster with reinforcement mesh in between.

Figure 2 shows schematically an embodiment of a wall element comprising one layer of acoustic plaster.

Figure 3 schematically shows a method for forming a wall element according to an embodiment of the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

[0054] Figure 1 shows a cross section of an embodiment of the wall element according to the invention. The wall element will be formed as a panel, mostly rectangular, e.g. 60cm wide and 240cm length.

[0055] The recycled textile fibers are combined with a binder to form substrate 1 of about 20mm thickness. The substrate 1 comprises a cured mixture of binder and textile fibers from recycled clothing, preferably including a fraction of protective work clothing to add strength and fire-retardant chemicals to the substrate.

[0056] An acoustic stucco or plaster layer 2 is formed on top of substrate 1. The acoustic stucco or plaster 2 can comprise hollow chips, such as perlite, marble polish and other expanded building materials such as polystyrene. The layer 2 can be sprayed on top of the substrate 1.

[0057] In embodiments a further layer is present between substrate 1 and acoustic stucco or plaster 2

[0058] For extra rigidity, a reinforcement mesh 3 is put on top of the first stucco layer of plate 2.

[0059] On top of the reinforcement mesh 3, another stucco layer is added to the wall element. This is layer 4. Together this forms an embodiment of the wall element.

[0060] Figure 2 shows an embodiment of the wall element. The recycled textile fibers combined with a binder forms substrate 5. An acoustic stucco or plaster layer 6 is formed on top of plate 5.

[0061] A further mineral paint can be used to cover the acoustic plaster or stucco layer.

[0062] In use, the wall element can be connected to a wall of a room. A glue or further plaster can be used. Preferably the side of the wall with the substrate is facing the wall of the room.

[0063] FIG. 3 a method of forming a wall element. The wall element can be formed with any of the previous features. In embodiments the method comprises providing textile, preferably comprising protective work clothing and providing a binder.

[0064] In step 41, the textile is processed. To form the recycled textile substrate of the wall element, preferably comprising protective work clothing, old textile is processed to obtain textile fibers or chips. Embodiments of the method are directed at recycling clothing. The textile is processed 41 the textile to obtain textile fibers.

[0065] In step 42, the textile fibers are mixed with the binder. This is mixed until the fibers are even distributed through the liquid binder. In embodiments the binder includes polyethylene (PE), polyethylene terephthalate (PET), preferably from PET bottles. Also in step 42, the mixed textile fibers and binder are heated.

[0066] In step 43, the mixture is cured to form a substrate of recycled textile. The curing and forming of the substrate can comprise forming layers from the mixture paste in an oven. Multiple layers can be formed and

combined on top of each other. The substrate forming can comprises needle punching for intertwining textile fibers. The substrate forming can comprise rolling to flatten the substrate. In step 42 the layer is formed with a thickness of about 8 cm. Further in step 43, the substrate can be cut to a generally desired size with a circumference.

[0067] In a next step 44, the formed substrate comprising binder and recycled textile fibers is put in a heated mold or heated rolling machine. The mold or rolling machine is heated to a temperature above the curing temperature of the used binder. Typically, this is between 100 °C and 400 °C degrees Celsius. Using a mold or rolling machine that is heated up to above the curing temperature of the binder makes the outer layer of the layer comprising recycled textile fibers and binder harder than the inner layer, due to reduced heat penetration to the core of the layer. The difference in rigidity throughout the layer comprising recycled textile fibers and binder adds strength without increasing the risk of cracking. Furthermore, it decreases the thickness of the layer by more than 30%. This results in the textile substrate being self-supporting, not requiring a further substrate, such as wooden plates.

[0068] Still in step 44, after heating, the mixture of recycled textile and binder is cured and is cut to form a rectangular substrate of recycled textile having a top and bottom side and having a circumference. As part of the curing process, the heated layer comprising recycled textile fibers and binder is cooled off, e.g. in a cooled mold or rolling machine. The obtained substrate of recycled textile with binder has advantageous acoustic sound dampening properties. A step of shaping the circumference, e.g. by cutting, can be part of the method. The cut parts of the substrate in step 43 and 44 can be fed to the mixture of textile and binder in step 42 to be re-used.

[0069] In step 45, an optional membrane is provided onto the top side. The membrane is a sheet. The membrane is air permeable / porous. The membrane is preferably sized to correspond with the circumference of the substrate, but slightly smaller than the formed substrate of step 44.

[0070] In step 45, a fiberglass membrane is laminated on the top side of the cured substrate, wherein the circumference of the membrane is positioned at a distance of at least 1 cm inward from the circumference of the wall-shaped substrate, such that an uncovered strip is formed on the top side.

[0071] The laminating of the membrane sheet comprises heating the already formed substrate. In embodiments, in a first step the wall-shaped substrate is formed and in a second step the membrane is laminated on the formed wall-shaped substrate. The same rolling method can be used for both the first and second step.

[0072] In embodiments, a further membrane is laminated onto the bottom side of the cured substrate. The

membrane on the top side is air permeable according to any of the embodiments disclosed herein, resulting in sound dampening properties of the side of the wall element facing the inside of the room.

[0073] Secondary ceilings are well known. 5
Dropped ceilings and ceiling tiles therefore have been used in to improve acoustics of spaces for years. Well-known dropped ceilings will comprise a suspension frame for carrying rectangular plates as secondary ceiling element. The secondary ceiling element is self-supporting, 10
which in the context of this application means that it has enough rigidity to be lifted and mounted into position maintaining its generally flat plate like shape. This allows using ceiling element as a panel to be mounted onto a ceiling.

[0074] A further aspect of the invention relates to a secondary ceiling element, such as a tile or panel, comprising a substrate formed from recycled material. The secondary ceiling element comprises a substrate from recycled material and has at least one more layer. 15
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[0075] The following clauses provide preferred embodiments of this further aspect of the invention that can be combined with any of the features disclosed herein.

Clause 1. A secondary ceiling element for an interior wall or ceiling, wherein the secondary ceiling element is formed as a self-supporting plate, comprising:

- a substrate that includes recycled textile bonded with a binder; and
- a membrane laminated on the substrate.

Clause 2. Secondary ceiling element according to clause 1, or according to any of the clauses or according to any of the claims or having any of the features disclosed herein, wherein the recycled textile substrate comprises at least 30% recycled textile, preferably at least 40% recycled textile, more preferably at least 50%, most preferably at least 60% recycled textile 35
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wherein the recycled textile substrate has an average thickness of at least 4 mm, preferably at least 8 mm and more preferably at least 12 mm, and most preferably the thickness is 9.5 to 25 millimeters, 45

wherein the secondary ceiling element is generally flat and rectangular shaped and preferably has a length in the range of 35cm-95cm, preferably combined with a width of 35cm-95cm, or has a length in the range of 95cm-145cm, preferably combined with a width of 35cm-95cm, wherein more preferably the secondary ceiling element is about 0,6 m × 0,6 m or 0,6 m × 1,2 m. 50
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Clause 3. Secondary ceiling element according to clause 1 or 2, or according to any of the clauses or according to any of the claims or having any of the features disclosed herein, wherein the recycled textile comprises at least 5% protective work clothing, preferably at least 10% protective work clothing, more preferably at least 15% protective work clothing, most preferably at least 20% protective work clothing.

Clause 4. Secondary ceiling element according to any of the previous clauses, or according to any of the clauses or according to any of the claims or having any of the features disclosed herein, wherein the recycled clothing substrate includes at least 5% cotton, preferably at least 10% cotton, more preferably at least 15% cotton, most preferably at least 20% cotton.

Clause 5. Secondary ceiling element according to any of the previous clauses, or according to any of the clauses or according to any of the claims or having any of the features disclosed herein, wherein the binder is a low-temperature binder,

wherein preferably the binder comprises polyethylene terephthalate, bioplastics, polylactide, resins (e.g. epoxy), polyester, bismaleimides, vinyl esters, and polyamides, wherein preferably the binder is made from recycling plastic waste, wherein more preferably the binder comprises recycled polyethylene terephthalate (PET).

Clause 6. Secondary ceiling element according to any of the previous clauses, or according to any of the clauses or according to any of the claims or having any of the features disclosed herein, wherein the textile fibers from recycled textile are mechanically intertwined, preferably needlepunched or needlefelted, before adding the binder.

Clause 7. Secondary ceiling element according to any of the previous clauses, or according to any of the clauses or according to any of the claims or having any of the features disclosed herein, wherein the membrane includes cellulose and/or PET and/or glass fibres.

Clause 8. Method of forming a secondary ceiling element, comprising:

- providing textile, preferably comprising protective work clothing,
- processing the textile to obtain textile fibers,
- providing a binder, preferably a low-temperature binder, wherein the binder preferably includes polyethylene terephthalate (PET), more preferably PET bottles, wherein preferably the binder is processed to obtain binder chips,
- mixing textile fibers and binder and heating the mixture

- curing the mixture to form a substrate of recycled textile
- providing a membrane;
- laminating the membrane on the substrate of recycled textile to obtain the secondary ceiling element.

Clause 9. Method according to clause 8, or according to any of the clauses or according to any of the claims or having any of the features disclosed herein, wherein the method further comprises needlepunching the mixture of textile fibers and binder to intertwine fibers.

Clause 10. A kit of part for a dropped ceiling including:

- secondary ceiling elements according to any of the clauses 1-7 or formed according to clauses 8 or 9, or according to any of the clauses or according to any of the claims or having any of the features disclosed herein; and
- parts for a suspension frame.

Clause 11. Dropped ceiling comprising several secondary ceiling elements according to any of the clauses 1-7 or formed according to clauses 8 or 9, or according to any of the clauses or according to any of the claims or having any of the features disclosed herein.

Claims

1. A wall element for an interior wall or ceiling, wherein the wall element is formed as a self-supporting substrate that includes recycled textile bonded with a binder;

wherein the recycled textile substrate comprises at least 30% recycled textile,
 wherein the recycled textile substrate has an average thickness of at least 8 mm,
 wherein the recycled textile comprises at least 5% protective work clothing,
 wherein the recycled textile substrate has a weight of 1500-4000 gr / m²,
 wherein air permeability of the recycled textile substrate is between 50 - 400 m³/m²·h, measured according to ISO 9237 at a pressure difference of 200 Pa.

2. Wall element according to claim 1, wherein the recycled textile substrate comprises at least 40% recycled textile, preferably at least 50%, more preferably at least 60% recycled textile

wherein the recycled textile substrate has an average thickness of at least 12 mm, and pre-

ferably the thickness is 9.5 to 25 millimeters, wherein the wall element is generally flat and rectangular shaped and preferably has a width between 50 and 130 centimeters and more preferably is about 60, 90 or 120 centimeters wide and the wall element is preferably 240 - 300 centimeters in length.

3. Wall element according to claim 1 or 2, wherein the recycled textile comprises at least 10% protective work clothing, preferably at least 15% protective work clothing, more preferably at least 20% protective work clothing.

4. Wall element according to any of the previous claims, wherein the recycled clothing substrate includes at least 5% cotton, preferably at least 10% cotton, more preferably at least 15% cotton, most preferably at least 20% cotton.

5. Wall element according to any of the previous claims, wherein the binder is a low-temperature binder,

wherein preferably the binder comprises polyethylene (PE), polyethylene terephthalate (PET), bioplastics, polylactide, resins (e.g. epoxy), polyester, bismaleimides, vinyl esters, and polyamides,
 wherein preferably the binder is made from recycling plastic waste,
 wherein more preferably the binder comprises recycled polyethylene terephthalate (PET).

6. Wall element according to any of the previous claims, wherein the textile fibers from recycled textile are mechanically intertwined, preferably needlepunched or needlefelted, before adding the binder.

7. Wall element according to any of the previous claims, wherein the wall element further comprises a layer of acoustic plaster or stucco on the substrate, wherein the acoustic plaster or stucco forms the layer of the end product that is turned to the viewer.

8. Wall element according to claim 7, wherein the acoustic plaster or stucco comprises perlite, wherein preferably the perlite has diameters between 0.001 and 10 mm, more preferably between 0.03 and 2 mm.

9. Wall element according to claim 7 or 8, wherein the acoustic plaster or stucco comprises:

- marble polish, wherein preferably the marble polish has diameters between 0.001 and 10

mm, more preferably between 0.03 and 2 mm,
and/or
- cellulose, and/or
- a reinforcement mesh that is received in the
acoustic plaster or stucco layer.

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10. Wall element according to any of the claims 7-9,
wherein the layer of acoustic plaster or stucco is
sprayed onto the substrate of recycled clothing,
wherein preferably the acoustic plaster or stucco is
polished.

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11. Wall element according to any of the claims 7-10,
wherein the wall element is finished with mineral
paint.

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12. Method of forming a wall element, comprising:

- providing textile, preferably comprising pro-
tective work clothing,
- processing the textile to obtain textile fibers,
- providing a binder that preferably includes
polyethylene (PE) or polyethylene terephtha-
late (PET),
- mixing textile fibers and binder and heating
the mixture,
- pressing and curing the heated mixture be-
tween rolls to form a substrate of recycled tex-
tile.

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13. Method of forming a wall element according to
claim 12, wherein PET bottles are processed to
form binder chips.

14. Method according to claim 12 or 13, wherein the
method further comprises forming a layer of acous-
tic plaster or stucco on the substrate of recycled
textile to obtain the wall element,
wherein the acoustic plaster or stucco preferably
includes perlite and/or marble polish and/or cellu-
lose.

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15. Method according to claim 14, wherein the method
further comprises providing a reinforced mesh and
applying the reinforced mesh in the layer of acous-
tic plaster or stucco and applying a further layer
onto the wall element with reinforced mesh.

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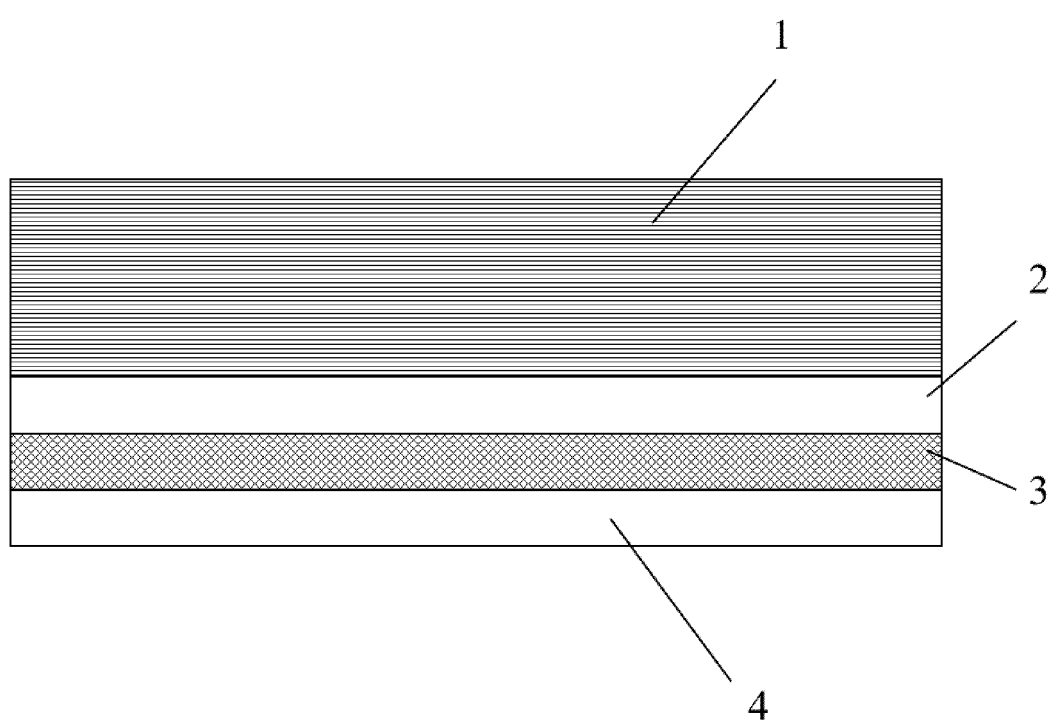


Figure 1

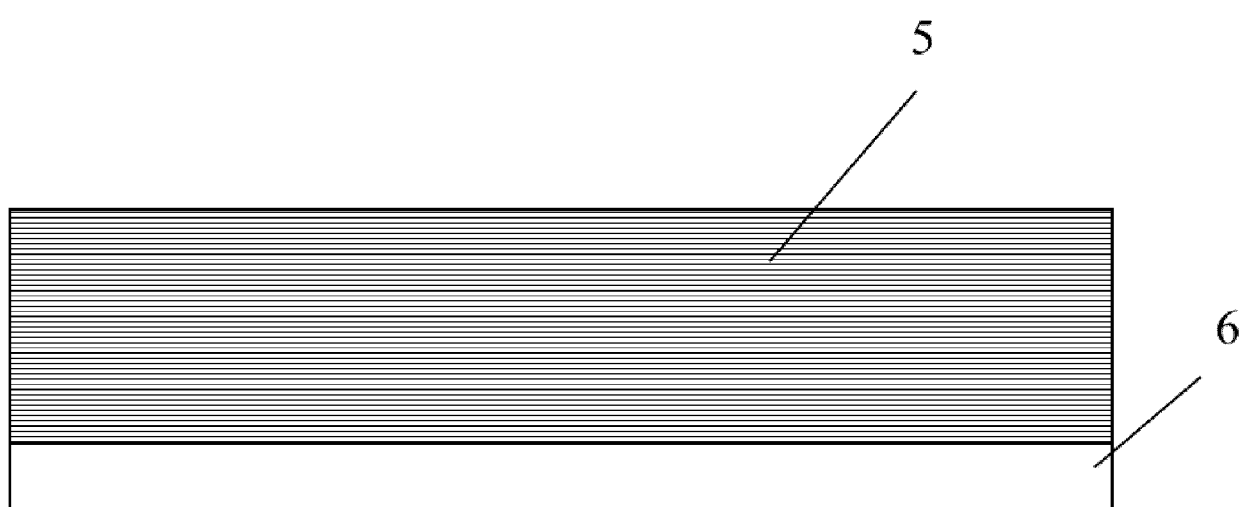


Figure 2

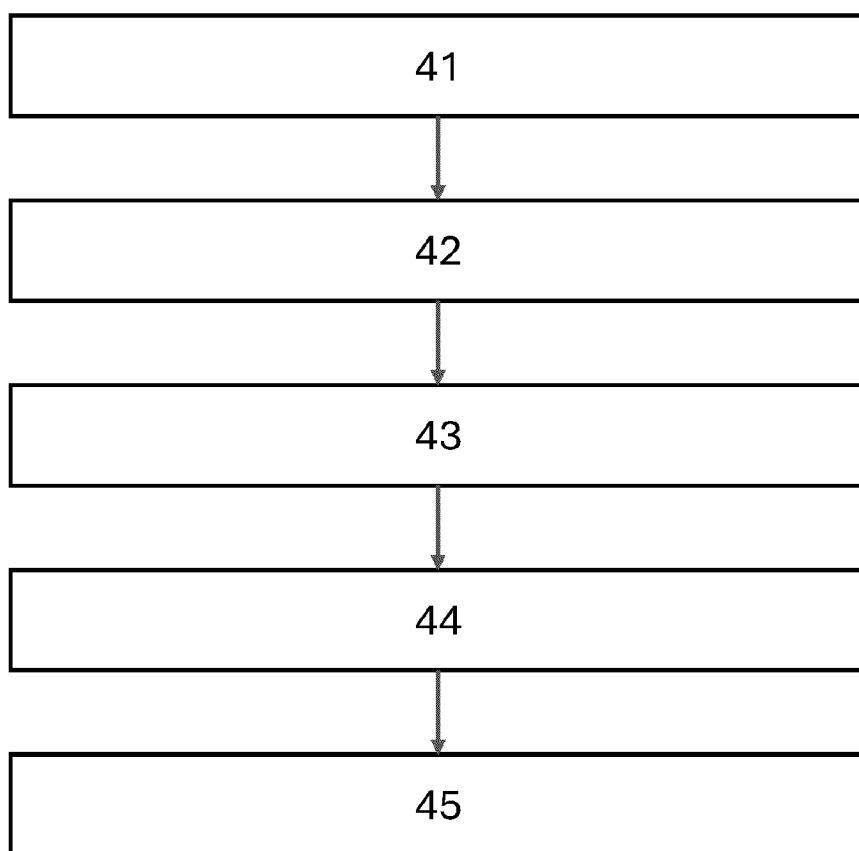


FIGURE 3



EUROPEAN SEARCH REPORT

Application Number

EP 25 17 0767

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,D	WO 2017/017537 A1 (ETERNO IVICA SRL [IT]) 2 February 2017 (2017-02-02) * claims 1-10 * * figures *	1-15	INV. E04C2/04 E04B1/76 E04B1/86 E04C2/16 E04B1/74
X	US 2016/215421 A1 (SAMSØE KLAUS [DK] ET AL) 28 July 2016 (2016-07-28) * paragraph [0012] * * paragraph [0052] * * claim 38 * * figures *	1-15	
A	BG 112 100 A (HABITAT SOSHAL BIZNES SOLYUSHANS EOOD [BG]) 31 March 2017 (2017-03-31) * the whole document * * Assembly of waste textile and binder, permeability; pages 2, 3 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04C E04B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		5 September 2025	Durrenberger, Xavier
CATEGORY OF CITED DOCUMENTS			
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EP 25 17 0767

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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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05-09-2025

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2017017537 A1	02-02-2017	NONE	

US 2016215421 A1	28-07-2016	DK 3049563 T3	22-01-2018
		EP 3049563 A1	03-08-2016
		ES 2657340 T3	02-03-2018
		NO 3049563 T3	07-04-2018
		PT 3049563 T	12-02-2018
		US 2016215421 A1	28-07-2016
		WO 2015044894 A1	02-04-2015

BG 112100 A	31-03-2017	NONE	

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- NL 2017678 B1 **[0004]**
- WO 2017017537 A1 **[0005]**