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(54) **Surface-treated nonwoven facer for gypsum wallboard**

(57) The present invention relates to a nonwoven facer for use in wallboard wherein at least one surface of the nonwoven facer is treated with a composition comprising water and at least one latex binder.

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Description

[0001] The present invention relates to nonwoven facer treated with an additive as well as to a process for manufacturing gypsum wallboard. The invention relates to a new gypsum wallboard having a nonwoven facer and uses in exterior insulating systems and sheathing, as well as in interior systems, and generally speaking in any wet or humid area.

[0002] In the industry, there is still a need for gypsum wallboards showing a strong bonding of the facer to the gypsum core.

[0003] Surprisingly, it has been demonstrated that a nonwoven facer treated with a composition comprising water and at least one latex binder is useful to manufacture gypsum wallboard, and to provide a reinforced bond between the gypsum and the facer.

[0004] One of the problem solved by the present invention is to provide a nonwoven facer for gypsum wallboard with an improved bonding to the gypsum core, especially in any wet or humid area.

SUMMARY OF THE INVENTION

[0005] The present invention relates to a nonwoven facer for use in wallboard wherein at least one surface of the nonwoven facer is treated with a composition comprising water and at least one latex binder.

[0006] The present invention also relates to a wallboard comprising a gypsum core and at least one nonwoven facer treated with a composition comprising water and at least one latex binder.

[0007] Additionally the present invention relates to a process for producing the nonwoven facer according to the invention for use in wallboard comprising the steps of:

i) obtaining a nonwoven facer; and

ii) treating at least one surface of the nonwoven facer with a composition comprising water and at least one latex binder.

[0008] Advantageously, the nonwoven facer according to the invention permits to enhance the plaster bond to the nonwoven facer.

[0009] Advantageously, the nonwoven facer according to the invention permits a good bonding of all type of compounds that could be used to coat the wallboard, like jointing compounds, skimming compounds, bonding compounds, building compounds, finishing compounds,

DEFINITIONS

[0010] By the word "gypsum" according to the invention, it should be also understood hydratable gypsum, plaster, stucco, calcium sulfate hemi hydrate or calcium sulfate semi-hydrate (or alternatively anhydrite). The source of the gypsum, before it is calcined by any method known to one skilled in the art, may be natural or synthetic production of gypsum.

[0011] By the word "gypsum core" according to the invention, it should be also understood the product resulting from the hydraulic setting and the hardening of a hydratable calcium sulfate, that is to say an anhydrous calcium sulfate (anhydrite II or III) or a semihydrated calcium sulfate ($\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$) in its α or β crystalline form. The gypsum core may also comprise other hydraulic binders in low amounts, water-resistance additives, fire-resistant additives or anti-mould additives.

[0012] By the word "gypsum wallboard" according to the invention it should be also understood any type of gypsum wallboard like for example, but not limited to, typical gypsum wallboard, water-resistant gypsum wallboard or fire-resistant gypsum wallboard.

[0013] By the word "facer" according to the invention, it should be also understood a liner or a mat.

DETAILED DESCRIPTION OF THE INVENTION

[0014] The present invention relates to a nonwoven facer for use in wallboard wherein at least one surface of the nonwoven facer is treated with a composition comprising water and at least one latex binder.

[0015] The facer according to the invention is a nonwoven facer, preferably a glass mat or a mat formed of other fibers (e.g. synthetic fibers or a mixture of cellulosic fibers and synthetic fibers). The nonwoven facer is not paper. The gypsum may penetrate partly or fully in the nonwoven facer, or the nonwoven facer may even be embedded in the gypsum core. Preferably, the facer may be of the mat type, i.e. non-woven. In one embodiment the nonwoven facer is fibrous.

[0016] The nonwoven facer has two sides, one in contact with the gypsum core : the bottom side, and the other one not in contact with the gypsum core : the top side.

[0017] The nonwoven facer according to the invention may comprise glass fibers. The glass fibers can be any type of fibers used in the facer industry. The glass fibers can be E, C, T, S or any known type glass fiber of good strength and durability in the presence of moisture and mixtures of lengths and diameters. Any commercially wet chop glass fiber product will be suitable. Diameters may vary within broad ranges; 15 μm or lower values or 23 μm or higher values are appropriate. The glass fibers used in the facer can be of any suitable length, for example from 0,25 cm up 5 cm, preferably 0,6 to 1,2 cm. Mixtures of fibers of different lengths and/or fiber diameters can be used as is known. These fibers can be coated with a silane containing size composition as is well known in the industry. Mixtures of any type of mineral or inorganic fibers can be used. The glass fibers may be replaced in part with any mineral fiber known in the art.

[0018] The nonwoven facer according to the invention may further comprise at least a binder. A binder will confer structural integrity to the nonwoven facer by linking the fibers together. The binder used can be any binder typically used in the facer industry. A wide variety of binders are used to make nonwovens facer, such as urea formaldehyde (UF), melamine formaldehyde (MF), polyester, acrylics, polyvinyl acetate, UF and MF binders modified with polyvinyl acetate and/or acrylic, styrene acrylic copolymers, etc. Preferably, said binder is a self cross-linkable binder, e.g. a styrene acrylic copolymer (with pendant cross-linking functionalities). Preferably, said binder is a hydrophobic binder; especially it is desired to have a binder that would coat the fibers and further protect them against water.

[0019] The nonwoven facer according to the invention may further comprise at least mineral filler, said filler being distributed at least partially into said bottom and/or top side. When used, the filler are of such size that it substantially penetrates into the fibrous side. For example, the mineral filler could be particles that have a d_{50} from about 0,1 to about 10 μm , preferably about 0,5 to about 5 μm . Coarser material may however be used. The mineral filler can be any filler known in the art, organic or inorganic powders, for example calcium carbonate, calcium sulfate (anhydrite, semi-hydrate or dihydrate), clay, kaolin, sand, talc, mica, glass powder, titanium dioxide, magnesium oxide, alumina, alumina trihydrate (ATH), aluminium hydroxide, antimony oxide, silica, silicate, carbon, boron, beryllium, etc... Kaolin is one preferred filler.

[0020] The nonwoven facer according to the invention may comprise cellulose fibers. The cellulose fibers are classical fibers, and can be obtained from kraft papers, i.e. be recycled or obtained from wood, as is known in the art, e.g. resinous trees. A mixture of various woods or sources is also suitable. One preferred embodiment is obtained with pure cellulose of selected trees comprising resinous trees.

[0021] The nonwoven facer according to the invention may comprise organic (polymeric) fibers. The organic (polymeric) fibers are any known polymer fibers, and can include polyamide, polyaramide, polyethylene, polypropylene, polyester, etc. Polyester is the preferred organic fiber. The dimensions of the organic fibers are in the same range than the ones for the glass fibers.

[0022] In one embodiment, the bottom and/or top sides further comprise a water-resistant agent. Said water-resistant or repellent agent can be any agent typically used, and can for example be one useful also for the gypsum core. In one embodiment, said water repellent agent is a fluorocarbon repellent or a fluorinated polymer. The amount of said fluorinated compound (on the basis of the dry content) may vary from about 0,1 to about 5 wt%, preferably about 0,3 to about 2 wt%, based on the total weight of the facer. One example of fluorinated polymer is an acrylic polymer having a pendant (per)fluorinated group having 4 to 20 carbon atoms.

[0023] In a preferred embodiment, the nonwoven facer comprises at least two plies, with an inner ply and an outer ply. Other plies can be present as well, if needed. The inner ply may comprise a mixture of cellulose fibers, glass fibers and optionally organic (polymeric) fibers. The said outer ply may comprise essentially cellulose fibers; i.e. the cellulose fibers represent at least 90 wt%, preferably 95 wt%, more preferably 98 wt% and advantageously about 100 wt% of the fibers. The inner ply preferably comprises by weight based on the total weight of the fibers used in the inner ply, from 25 to 60 wt% of cellulose fibers, from 25 to 60 wt% of mineral or inorganic fibers, and from 0 to 30 wt% of organic fibers, and more preferably from 30 to 50 wt% of cellulose fibers, from 30 to 50 wt% of glass fibers, and from 10 to 20 wt% of organic fibers. The mineral or inorganic fiber is any fiber known in the art useful for manufacturing plies of facers. Diameters may vary within broad ranges, for example from 5 to 40 μm . The mineral or inorganic fibers used in the inner ply can be of any suitable length, for example from 0,25 cm up 5 cm. Mixtures of fibers of different lengths and/or fiber diameters can be used as is known. One example of such fibers is basalt fibers. The plies are such that their surface weight may vary within broad limits. For example, the inner ply may represent from about 30 to about 150 g/m^2 , the outer ply may represents from about 10 to about 70 g/m^2 , the binder may represent from about 10 to about 100 g/m^2 or the binder and filler together may represent from about 20 to about 150 g/m^2 . The entire facer represents for example from about 100 to about 200 g/m^2 .

[0024] The process for manufacturing the nonwoven facer used to achieve the invention is in fact quite conventional as it uses typical devices.

[0025] Most nonwoven facer processes and forming machines are suitable for modification and use with the present invention, but preferred are the wet laid nonwoven facer processes and machines wherein an aqueous slurry containing fibers is directed onto a moving permeable screen or belt called a forming wire to form a continuous nonwoven wet fibrous facer.

[0026] One of the method among others for manufacturing the nonwoven facer comprises three steps. The first step

comprises dispersing fibers, such as glass fibers and cellulose fibers, in an aqueous slurry, collecting the dispersed fibers onto a moving permeable support to form a fibrous nonwoven layer, removing excess water from the fibrous nonwoven layer. One thus obtains a web that will form the inner ply. The second step comprises dispersing cellulose fibers, in an aqueous slurry, collecting the dispersed fibers onto the moving web formed in step (1) to form a fibrous nonwoven layer on top of this, removing excess water from the fibrous nonwoven layers. One thus obtained a web that will form the outer and inner plies. It is of course possible to reverse the process and first form the outer ply. The third step comprises the step of impregnating the web with a binder solution, preferably an aqueous binder solution. The binder solution may if required contain the filler and optionally the water-repellent, and any other additives (e.g. a fungicide/biocide). The third step is usually the classical sizing step known in the industry. The final step is a classical drying step, which may comprise a curing step for the binder. The fiber concentration in the slurries is classical and can vary from less than 0.1 wt% to about 1 wt%.

[0027] The thus obtained nonwoven facer may be used to achieve the invention.

[0028] The nonwoven facer for use in wallboard according to the invention comprises at least one surface treated with a composition comprising of water and at least one latex binder. The said composition comprises water and at least one latex binder, and may also comprises an amount of a mineral filler, a rheology modifier, such as a cellulose ether, a stabilizer, a preservatives and/or a biopolymer or mixtures thereof.

[0029] Preferably, the surface treated with the said composition is in contact with the gypsum core.

[0030] The composition used to treated the nonwoven facer according to the invention comprises water and at least one latex binder. The said composition may preferentially further comprise a mineral filler.

[0031] The preferred pourcentage of the latex binder in the composition is in the range of 1 to 55 wt% of the composition. The latex binder of the composition may be selected from commonly available latex polymers and may be preferably selected from the group consisting of ethylene polyvinyl acetate, polyvinyl acetate (PVOAc) latex, styrene butadiene (SBR), styrene acrylic, acrylic, vinyl acrylic or a mixture thereof. Preferably, the latex binder is ethylene polyvinyl acetate or polyvinyl acetate, (PVOAc) latex or a mixture thereof.

[0032] Suitable latex binders according to the invention are styrene acrylic, especially those from BASF sold under the name Acronal®.

[0033] Suitable latex binders according to the invention are those having a glass transition temperature in the range of - 20°C to +10 °C, preferably in the range of - 15°C to +8 °C, more preferably in the range of - 10°C to +6 °C, even more preferably in the range in the range of - 5°C to +5 °C.

[0034] In one embodiment, the composition used to treat the nonwoven facer according to the invention may comprise mineral filler. If used, the ratio of the mineral filler in the composition is generally in the range of 1 to 50 wt% of the composition. Many types of minerals and a wide selection of particle size distributions of the mineral filler are possible, although generally finer particle sizes are preferred for use in the composition. The mineral filler can include, and may be selected from, the group consisting of calcium sulfate hemi hydrate, calcium sulfate dihydrate, calcined gypsum, uncalcined gypsum, Portland cement, calcium carbonate, clays, and powdered silica. Other inorganic species may also be suitable as the mineral filler like example kaolin, sand, talc, mica, glass powder, titanium dioxide, magnesium oxide, alumina, alumina trihydrate (ATH), aluminium hydroxide, antimony oxide, silicate, carbon, boron, beryllium.

[0035] Other water-soluble species selected from the group consisting of rheology modifiers, salts, accelerators and dispersants may be used as additives in the composition to modify other properties of the treated nonwoven facer and the resultant wallboard. The preferred rheology modifier comprises a cellulose ether. The cellulose ethers suitable according to the invention may be selected from the group consisting of carboxymethylcellulose (CMC), hydroxypropylmethylcellulose (HPMC), methylcellulose (MC), hydroxypropylcellulose (HPC), hydrophobically modified hydroxypropylcellulose (HMHPC), hydroxyethylcellulose (HEC), ethyl hydroxyethylcellulose (EHEC), hydrophobically modified hydroxyethylcellulose (HMHEC), cationic hydrophobically modified hydroxyethylcellulose (cationic HMHEC), and anionic hydrophobically modified hydroxyethylcellulose (anionic HMHEC) or mixture thereof. The preferred cellulose ether comprises hydroxyethylcellulose.

[0036] The rheology modifier may also comprise biopolymers or polysaccharides. The preferred biopolymer comprises xanthan gum or guar gum.

[0037] One embodiment of the invention is that the composition, when it comprises the mineral filler as well as the rheology modifier, results in fluid mixtures having high levels of mineral filler. A high level of mineral filler is a level of mineral filler about 20% by weight or more, preferably about 30% by weight of the surface treatment adhesive. The preferred rheology modifier is HEC. Another preferred rheology modifier is xanthan gum. Still more preferred is a rheology modifier comprising a mixture of HEC and xanthan gum.

[0038] When the composition comprises mineral fillers, the said composition should be produced as follow: a quantity of water is first mixed with a small amount of a rheology modifier and stirred to dissolve. Once the rheology modifier is dissolved in the water, the high level of mineral filler is gradually added to the aqueous solution comprising the rheology modifier in stages with high speed mixing. The viscosity of the aqueous mixture comprising the mineral filler is sheer thinned after each stage in order to control the viscosity of the mixture. Finally, an amount of the latex binder is added

to the mixture. A fluid stable mixture is obtained.

[0039] An alternative method to produce the composition is to mix the quantity of water with the latex binder followed by gradual addition of the mineral filler and finally add in the rheology modifier(s).

[0040] The amount of the composition used to treat the nonwoven facer is of a level of greater than about 0,1 g/m², preferably in the range of greater than about 0,1 g/m² to 4 g/m², preferably about 0,1 to 2 g/m² more preferably about 0,5 to 1 g/m², still more preferably in the range of about 0,2 to 0,5 g/m².

[0041] Secondly, the invention relates to a process for producing a nonwoven facer according to the invention for use in wallboard comprising the steps of:

i) obtaining a nonwoven facer; and

ii) treating at least one surface, preferably the one in contact with the gypsum core, of the nonwoven facer with a composition comprising water and at least one latex binder.

[0042] In practice, the step ii) of the process according to the invention may be achieved using the composition described above diluted with water to a working concentration of from about 2-20% solids by weight then this mixture and applied to a surface of the nonwoven facer by any of the mechanical processes typically used in the art of nonwoven facer conversion, including, but not limited to, using a doctor blade, using a roll, using a puddle applicator, a curtain applicator, using a size press applicator or using of a spray applicator.

[0043] In a preferred embodiment, the step ii) of the process according to the invention is achieved by using either a roll, or a size press applicator.

[0044] The process according to the invention may further comprise a drying step of the surface of the nonwoven facer.

[0045] Thirdly, the invention relates to a wallboard comprising a gypsum core and at least one nonwoven facer according to the invention.

[0046] The nonwoven facer with a surface-treated side is converted into a wallboard by a mechanical process whereby both sides of a layer of wet plaster are brought into contact with treated surface of the nonwoven facer with a surface-treated side to create a wallboard useful in construction applications.

[0047] In the process of producing wallboard, a two-step process is envisioned where the nonwoven facer with a surface-treated side of the present invention which has been previously produced and dried is subsequently combined with a layer of wet plaster to produce a wallboard.

[0048] Alternatively, a one step process is also envisioned where the composition is applied to the nonwoven facer surface and, prior to completely drying the nonwoven facer surface, wet plaster is applied to the nonwoven facer with a surface-treated side to produce a wallboard. The wallboard that is produced through the process of the present invention has several improvements over similar prior art process such as enhanced strength due to the lesser quantity of water employed to prepare the wallboard as well as economic benefits. Thus, this process can be envisioned in a further step to potentially allow the production of significantly lower density wallboard products with acceptable strength dimensions, than is currently possible with existing art technology.

[0049] The following steps should also be present in the process of making wallboard : covering the slurry with a second facer, forming a preform (by passing under a conventional wallboard forming plate), allowing the gypsum slurry to set (supported on the conveyor belt), cutting boards from the continuous ribbon of set material, inverting the boards to expose the underside of the boards, drying the boards in a wallboard dryer.

[0050] The wallboard according to the invention can be used in a variety of applications, both indoors and outdoors. As an example of an indoor application, one may mention shaft wall assemblies, tile backing as well as partitions and ceilings in wet area rooms. A gypsum board as described herein can be used to particular advantage as a component of a partition or shaft wall assembly or similar assembly in the interior of a building. In such application, the faced board can be used with particular advantage in place of conventional paper-faced gypsum core board or shaft liner panels, the core of which may include fire-resistant additives. Assemblies of this type generally comprise metal or wood framework or studs for support of the gypsum panels which form the partitions in bathrooms and other wet or humid areas, the walls of the shafts of elevators, stairwells and the like. The facer gypsum board, as described herein, can be used, for example, as the shaft liner panel. For use in such application, the core of the board can include fire resistant additives.

One may refer to US-P-4047355, incorporated herein by reference, for details on a shaft wall assembly. The instant wallboard can also be used with advantage in aeraulic ducts, in a manner similar to WO-A-02/06605. The instant wallboard can also be used with advantage as a tile backing in bathrooms. The usual construction of bathroom walls includes a ceramic tiles adhered to an underlying base member, for example, a panel of gypsum board of the invention. Such a panel is referred to in the industry as a "tile backing board" or "tile backer". In usual fashion, sheets of tile backer are fastened by rust-resistant nails or screws to studs.

[0051] The instant wallboards will also be useful in any application for partitions and ceilings in wet area rooms. Also, the wallboards of the invention can be used in any application for which wallboards are known to be useful, including drywall .

[0052] As outdoor applications, one may mention especially, roof deck system and EIS (Exterior Insulating System) and EFS (Exterior Finishing System).

[0053] The invention is further demonstrated by the following examples. The examples are presented to illustrate the invention, parts and percentages being by weight, unless otherwise indicated.

[0054] The following examples illustrate the invention without limiting it.

EXAMPLES

1/ Boards: preparation of minibboards

[0055] Facer preparation: the wallboard facer (treated or not treated) was cut 350 mm wide and 658 mm long in the cross direction with a razor knife. The top side of the facer was creased to make a sharp fold at 11,5 mm from each cross direction end of the facer. Rubber cement glue was applied to the creased sections. The creased ends were folded perpendicularly to the field between the creases. The facer was bent along the short dimension; the two glued surfaces were aligned and affixed to make a 350 mm long tube. The tube was formed around a board and the glued joint was pressed against the forming board to make a uniform smooth closed joint. The lower end of the tube was closed with tape and the facer was placed in a support that allowed the upper end of the tube to remain open.

[0056] In the preparation of the core materials: any dry additives were weighed into the gypsum stucco. The dry materials were homogenized in a Hobart mixer with a wire whisk at slow speed and foam was optionally generated with the pre-selected foaming agent. Any liquid additives were weighed into a bowl; water was added with the optional Potash to the liquid additives and stirred with a spatula until the mixture was uniform.

[0057] In the making of mini-board: the water and liquid additives were poured into the Hobart mixer bowl with the stucco and dry additives, the mixer was started to make a uniform mixture and the mixer was stopped. The optional foam was added into the water and stucco slurry. The Hobart mixer was started to combine the foam and the mixer was stopped. The wire whisk and the bowl were dismounted from the Hobart mixer base. The contents were directly poured into the bottom of the open facer and the support was closed to make the thickness 13 mm. The excess was removed from the top of the facer to leave a flat surface.

[0058] Mini-board finishing: Gilmore set was measured in the upper surface of the mini-board core. After Gilmore initial set, the mini-board was carefully removed from the support. The wet mini-board was cut into a 316 mm by 316 mm square with a razor knife with uniform 13 mm thickness. The mini-board was allowed to achieve Gilmore final set. Drying was then performed in hot air, at less than 100°C, until the board achieved a stable weight. The mini-board was conditioned at 23°C and 50% RH for 24 hours before measuring mechanical properties.

2/ Nonwoven facer:

[0059] The following facers have been manufactured. The inner ply comprises, in wt% based on the total weight of the fibers, 45% cellulose fibers (length of about 2,5 to about 5 mm), 14% polyester fibers (length of about 3 to 12 mm and diameter of about 11 μm), and 41% glass fibers (length of about 6 to about 12 mm and diameter of about 23 μm). The dry surface weight is about 70 g/m². The outer ply comprises 100% cellulose fibers (length of about 2.5 to about 5 mm). The dry surface weight is about 20 g/m².

3/ Compositions according to the invention :

[0060] Composition 1, 2, 3 : A quantity of 20 parts by weight of Acronal® S400, S559 or S790 respectively styrene acrylic latex available from BASF, was mixed with 80 parts by weight of water. A fluid stable dispersion was obtained.

[0061] Composition 4 : A quantity of 20 parts by weight of Airflex® 526 BP ethylene vinyl acetate latex (available from Air Products and Chemicals, Inc.) was mixed with 80 parts by weight of water. A fluid stable dispersion was obtained.

[0062] Composition 5 : A quantity of 49,8 parts by weight of water was mixed with 0,2 parts by weight of Natrosol® 250H4BXR hydroxyethylcellulose (available from Hercules Incorporated) and stirred to dissolve. Once the hydroxyethylcellulose (HEC) was dissolved in the water, 30 parts by weight of calcium sulfate hemihydrate was added gradually and in stages with high speed mixing. Viscosity was relatively high when each successive portion of the gypsum was initially added to the HEC aqueous solution but this mixture was shear thinning with time and so was considered to be a controllable process. Finally, 20 parts by weight of Airflex® 526 BP ethylene vinyl acetate latex (available from Air Products and Chemicals, Inc.) was added to the mixture. A fluid stable mixture was obtained. This process demonstrated that a highly concentrated dispersion of gypsum particles can be obtained by adding calcium sulfate hemihydrate to water containing an HEC component.

[0063] Composition 6 : A quantity of 20 parts of Airflex® 526 BP ethylene vinyl acetate latex (available from Air Products and Chemicals, Inc.) was added to 49,7 parts of water then 30 parts by weight of calcium sulfate hemihydrate was added

gradually and in stages with high speed mixing. Only a slight viscosity rise was observed with each successive calcium hemihydrate addition making this method a very easily controlled process. After all of the calcium sulfate hemihydrate was added, 0.1 parts by weight of Natrosol® 250H4BXR HEC (available from Hercules Incorporated) and 0.2 parts of Keltrol® RD xanthan gum (available from CP Kelco Inc.) are added and dissolved in the mixture as stabilizers for the gypsum slurry as the last components of the batch. In this case, the viscosity of the product was measured to be 1000 cps Brookfield viscosity and there is no settling of the fluid slurry observed after 24 hours.

TABLE I

Ingredients	Compositions						
	Control b)	1	2	3	4	5	6
Water	100	80	80	80	80	49,8	49,7
Airflex® 526 BP ethylene vinyl acetate latex					20	20	20
Acronal® S400		20					
Acronal® S559			20				
Acronal® S790				20			
calcium sulfate hemihydrate						30	30
Natrosol® 250H4BXR HEC						0,2	0,1
Keltrol® RD xanthan gum							0,2
% are expressed in weight of the total weight							

[0064] The nonwoven facer described above is surface-treated with the 6 compositions according to the invention using a lab bench bar-coater. Then the wet treated nonwoven facer surface is dried in an oven. Two control conditions were also tested including a) no surface treatment of the nonwoven facer surface and b) treatment of the nonwoven facer surface with water only. The surface- treated nonwoven facer samples treated with the compositions from Table 1 were used to prepare mini-board according to the procedure described above.

4/ Treatment procedure:

[0065]

- Apply the compositions described in table 1 to nonwoven facer surface with a lab bench bar-coater, dry into a oven to produce a nonwoven facer with a surface-treated side;
- mini-board were realized according to the procedure described above using the treated non woven facer.

5/ Result of the tests:

[0066] Differents tests have been carried out using the following procedure:

Bonding test : the principle of this test is to measure the load necessary to strip off a 5 cm width piece of facer from the core of a board, perpendicularly to the surface. To achieve the measure, a piece of 10cm x 25cm is taken from a gypsum board sample. Notches 5cm apart are cutted in the facer along the longest part of the sample. At one end of the sample, piece of 3 to 5 cm of the facer is detached from the core between the two notches without damaging the facer and folded perpendicularly to the sample surface. The sample is fixed on a frame. A clamp weighting less than 5g is fixed on the detached folded part of the facer. An empty bucket weighting less than 250 g is hanged under the sample to the clamp with a hook weighting less than 25 g. Glass beads (less than 1 mm in diameter) are poured in the bucket with a flow adjusted to 10 N/min (1 kg /min) until the facer is striped off from the gypsum core due to the increasing weight of the glass beads accumulating in the bucket. At this moment, a so called failure load is reached. The bucket containing the glass beads + hook + the clamp is weighted. The failure load is expressed in grams.

Humid bonding test: Prior to testing, the samples have been conditioned for two hours into a climate room with a relative humidity adjusted to 90% and the temperature adjusted to 30°C. Immediately after the end of this period of

time, the so called humid bonding is measured using the method described above for the bonding test.

Dry bonding test: Prior to testing, the samples have been conditioned for 24 hours into a climate room with a relative humidity adjusted to 50% and the temperature adjusted to 23°C. Immediately after the end of this period of time, the so called dry bonding is measured using the method described above for the bonding test.

Table 2: Failure load of surface-treated nonwoven facer of mini-board samples

	Compositions							
	Control a)	Control b)	1	2	3	4	5	6
Coating applied in g/m ² (solid)	none	3.0	3	3	3	1.5	1.5	1.5
Dry bonding in grams	2200	2200	2800	3000	1450			
Humid bonding in grams	800	800	1450	1550	250	800	1500	1500

[0067] It was found in the control case a) in which there was no surface treatment of the nonwoven facer that no appreciable bond between the nonwoven facer and the plaster was achieved. In the second control case b) where water alone was employed to coat the surface of the nonwoven facer, no bond with the plaster was observed.

Claims

1. A nonwoven facer for use in wallboard wherein at least one surface of the nonwoven facer is treated with a composition comprising water and at least one latex binder.
2. The facer according to claim 1, wherein the composition further comprising a mineral filler.
3. The facer according to claim 2, wherein the mineral filler is selected from, the group consisting of calcium sulfate hemi hydrate, calcium sulfate dihydrate, calcined gypsum, uncalcined gypsum, Portland cement, calcium carbonate, clays, and powdered silica.
4. The facer according to claims 1 to 3, wherein the latex binder is selected from the group consisting of ethylene polyvinyl acetate, polyvinyl acetate (PVOAc) latex, styrene butadiene (SBR), styrene acrylic, acrylic, vinyl acrylic or a mixture thereof.
5. The facer according to claims 1 to 4, wherein the composition further comprises a water-soluble species selected from the group consisting of rheology modifiers, salts, accelerators and dispersants.
6. The facer according to claims 1 to 5, wherein the rheology modifier comprises a cellulose ether.
7. The facer according to claims 1 to 6, wherein the amount of composition used to treat the nonwoven facer is of a level of greater than about 0,1 g/m².
8. A wallboard comprising a gypsum core and at least one nonwoven facer according to claims 1 to 7.
9. A process for producing a nonwoven facer according to claims 1 to 7 for use in wallboard comprising the steps of:
 - i) obtaining a nonwoven facer; and
 - ii) treating at least one surface of the nonwoven facer with a composition comprising water and at least one latex binder.
10. The process according to claim 9, wherein the composition is applied to the surface of the nonwoven facer using either a roll, or a size press applicator.
11. The process according to claim 9, further comprising a drying step of the surface of the nonwoven facer.



EUROPEAN SEARCH REPORT

Application Number
EP 09 35 6027

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