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PHONIC INSULATION PRODUCT AND METHOD OF ITS MANUFACTURE

The present invention relates to the technical field of phonic insulation, and more particularly to a product intended to reinforce the phonic insulation, against airborne noise, of walls in particular vertical partitions of buildings, and a method of manufacturing said product.

5 Inside buildings, noise is transmitted across walls and screeds by their vibration. The purpose of insulation against noise is to reduce the transmission of residual noise through partitioning walls.

 New regulations currently in force for new buildings are intended to fight against noise. Tests have been determined to measure, in particular, the
10 transmission of noise from one room to another. The level of noise measured must be less than a prescribed limit before the building may be made available on the market.

 In practice, when the authorized limits are exceeded, additional acoustic insulation must be installed.

15 Also, during the renovation of old buildings, it is advisable to improve phonic insulation.

 A need therefore exists for efficient phonic insulation products that are easy to install and take up little space so that the surface area of the buildings remains virtually unchanged.

20 In this respect, it is to be pointed out that some products may absorb noise and reduce resonance in a room without, however, insulating the room since the transmission of residual noise through the partition wall is not reduced. This is particularly the case for wall carpeting or cork coverings.

 Therefore, acoustic absorption is only of benefit to the occupiers of
25 the room concerned

 Phonic insulation products are already known that are relatively thick, made for example of glass wool and plaster boards. The thickness of said



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products is at least 4 cm. They are therefore very cumbersome and reduce the habitable surface area

Phonic insulation products of narrower thickness are also known, available in rolls or tiles that are generally multilayer.

5 Particular mention may be made of a product in rigid tiles made up of a layer of cork granules, intended to be glued to the wall to be insulated, an intermediate layer made up of bitumen and mineral aggregate, and finally a top surface intended to be placed facing outwards on which a wall covering is generally applied.

10 This product has the disadvantage of being relatively heavy, the weight per m^2 being approximately 10 kg. It is time-consuming to install since it is in the form of tiles approximately 0.25 m^2 in size. Also, the presence of numerous joints means substantial preparation work before the wall covering can be applied. Finally, the tiles are still relatively thick, in the region of 8 mm.

15 The products marketed in rolls can be glued in lengths and application time is therefore reduced in comparison with products in tile form.

A known product in roll form is made up of a layer of soundproofing polyurethane foam, covered with a paper support so that a wall covering can be applied.

20 This product is, moreover, relatively light since it weighs less than 2 kg per m^2 and its thickness is in the region of 6 mm.

It forms a very good base material for wallpaper or acrylic paint. However, this foam product essentially offers acoustic absorption properties and proves to have virtually no effect on the passage of noise through a partition wall.

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Document JP-A-09029873 relates to a phonic insulation product in sheet form made up of a basic bitumen layer, a foam layer and a protective layer. These three layers can be applied in the order protective layer/base layer/foam layer. This known product is intended to be laid on a floor in such

manner that the foam layer faces outwards, that is to say towards a source of noise such as a person walking on the floor.

The protective layer of the known product of document JP-A-09029873 may be made in a woven or non-woven material. The bitumen layer may comprise between 10 and 35 % by weight of an asphalt, and between 65 and 90 % of aggregate. The foam layer is made in a closed cell foam so that it can tolerate stresses it has to stand up to, for example the weight of furniture placed on the floor.

Document JP-A-06087170 concerns the production of a polyurethane foam from a recycled polyurethane foam that is crumbled and agglomerated. To manufacture the foam, the crumbled matter and a binder are placed in a mould.

Document US-A-5 665 447 concerns a phonic insulation screen comprising a central bitumen layer covered on either side successively with an insulating layer in mineral fibres, advantageously glass fibres, such as glass wool, and a protective layer.

The characteristic of reduced sound transmission through this known phonic insulation screen may be varied by adding different quantities of fine aggregate to the mixture of the bitumen layer.

The products used up until now to obtain phonic insulation are light if they are designed so as to reduce the time of reverberation, that is to say when they are intended for acoustic correction. On the contrary, they are heavy when they are designed to reduce the transmission of sound, that is to say when they are intended for acoustic or phonic insulation. None of these products is both light, thin and designed for the effective reduction of sound transmission (phonic insulation).

The purpose of the invention is to provide a phonic insulation product for a wall, which is light and easy to install but nonetheless effectively reduces the transmission of noises through the wall, and which takes up little space.

The purpose of the invention is achieved with a phonic insulation product for a vertical building wall which successively comprises .

- a first layer in open cell foam in synthetic material, intended to be placed on the wall to be insulated and whose thickness is between 1.5 mm and 5 mm,
- a second layer in a mixture of bitumen, aggregate in limited quantity, and at least one polymer, with no reinforcement, whose thickness lies between 1 and 4 mm, and
- a third layer, bitumen-proof, in a primer material, intended to take a wall covering

The first layer is, preferably, made in polyurethane foam, melamine foam, polyester foam or polyether foam. It may also be made in a mixture of these foams, for example from waste such as chopped foams which are agglomerated, or in a multilayer assembly.

- 15 The volume mass of the foam is, preferably, between 15 and 35 kg/m³, if the foam is homogenous, and between 150 and 350 kg/m³ if the foam is not homogenous.

- By way of example, a foam of heterogeneous polyurethane may be chosen, made up in particular of relatively coarse waste (1 to 3 mm), agglomerated and bound, whose volume mass is advantageously 250 kg/m³.

In particular the foam marketed by RECTICEL under the reference RECFOAM U250/2.5 may be used, whose volume mass is 250 kg/m³ and thickness 2.5 mm, or under the reference RECFOAM U250/4.5, whose volume mass is 250 kg/m³ and whose thickness is 4.5 mm.

- 25 In another example, a polyester foam may be chosen whose volume mass is advantageously 25 kg/m³.

Under these conditions, the layer of synthetic foam is flexible, which is preferable so that the product may fulfil its function of phonic insulation.

The second layer has a volume mass of between only 900 kg/m³ and 1 300 kg/m³, these values having been obtained through the addition of aggregate in limited quantity.

The second layer advantageously comprises :

- 5 - between approximately 0% and 25 % by weight of aggregate,
- between approximately 46 % and 92 % of bitumen and,
- between approximately 8 % and 29 % by weight of at least one polymer, preferably at least two homopolymers.

10 The bitumen used is, preferably, road bitumen, whose penetration at 25°C, in accordance with standard NFT 66-004, lies between 70 and 220 tenths of a mm, advantageously between 120 and 220 tenths of a mm.

 Alternately, the bitumen may be de-asphalted bitumen, synthetic bitumen or flowed bitumen. However, the use of oxidized bitumens or natural asphalt is not advisable, since they would deprive the bitumen mixture of its flexibility. The reduction in phonic transmission, and hence phonic insulation, is achieved with the product of the invention through the conversion of acoustic energy into heat energy, making use of the visco-elastic/visco-plastic character of the product of the invention (visco-elastic / visco-plastic effort).

20 The aggregate is, for example, made up of calcium carbonate or aluminium hydroxide, in the form of powder having low granulometry.

 The mixture of polymers advantageously comprises APP (atactic polypropylene), IPP (isotactic polypropylene), optionally with copolymers, or SBS (styrene butadiene styrene).

25 Men of the art know that APP is obtained from production waste of IPP. SBS is a product which may substitute for other polymers.

 Also, IPP is used to confer rigidity to the second layer of the insulating product.

When the polymers are in the form of a mixture of IPP, APP and possibly copolymers, the proportions of each constituent of the polymer mixture are, preferably, the following :

- between approximately 8 and 24 % by weight of APP
- 5 - between approximately 2.5 and 5 % by weight of IPP
- and between approximately 0 and 7 % by weight of copolymers

The presence of copolymers improves the visco-elastic qualities of the second layer of the product, which also improves resistance to cracking, as will be explained below

- 10 In the particular case when the mixture does not contain copolymers, the percentage by weight of aggregate preferably lies between 10 and 15 %, while the percentage by weight of APP, respectively of IPP lies between 13 and 24 % and 2.5 and 5 % respectively.

- 15 When the polymer present in the second layer is made up of SBS alone, the percentage of SBS is between 8 and 15 %.

Preferably, this second layer of the insulation product does not contain added oils

The third layer is a primer layer to which a wall covering can be applied, such as paint or wall paper.

- 20 The thickness of this third layer is, preferably, less than 0.5 mm.

It may in particular be made in a non-woven material such as glass or polyester cloth, or even in paper, cardboard or metal foil.

This third layer is preferably made in glass cloth with a surface mass of 60 g/m².

- 25 This glass cloth is advantageously submitted to a coating treatment. The coating layer obtained has a surface mass preferably in the region of 40 g/m². The coating plugs any porosities in the glass cloth and therefore prevents

the bitumen from rising up through the glass cloth, and also prevents the finishing layer such as paint from penetrating into the glass cloth.

This coating treatment may also be used for other primer layers, such as those in polyester cloth, cardboard or paper. In the latter case, greaseproof paper in particular may be used.

One example of a phonic insulation product in accordance with the invention comprises :

- a first layer in foam of RECFOAM U250/2.5 type, having a volume mass of 250 kg/m^3 and a thickness of 2.5 mm ;
- 10 - a second layer 1.5 mm thick, comprising 65 % by weight of road bitumen whose penetration at 25°C is 150 tenths of a mm, 18 % by weight of APP, 4.5 % by weight of IPP and 12.5 % by weight of aggregate ;
- 15 - a third layer 0.4 mm thick, made in a glass cloth whose surface mass is 60 g/m^2 , coated with a coating layer having a surface mass of 40 g/m^2 .

The phonic insulation product of the invention is placed on a wall by means of a suitable glue with a serrated spatula. This glue must not contain any organic solvent.

20 The glue marketed by HENKEL under the trademark THOMSIT K188 is compatible with this product.

The product of the invention underwent tests to measure the acoustic reduction index R, the product of the invention being applied to two different partition walls : a prefabricated partition of PLACOPAN type and a
25 partition in plaster squares.

It is recalled at this point that a prefabricated partition is made up of two thin walls of plaster, between which is placed a cardboard structure.

These tests showed that the product of the invention provides an improvement in phonic insulation ranging from 2 dB to 9 dB depending upon its composition and the support material.

The results of these tests are shown graphically in the sole Figure 1
5 appended.

Sole Figure 1 therefore shows two curves representing the acoustic reduction index R referenced (a) and (b) Curve (a) represents acoustic reduction in relation to the frequency of the sound transmitted, measured for a dry partition 72 mm thick, made up of two facings in BA13 cardboard-backed
10 plaster board 12.5 mm thick glued to a cardboard core having an alveolar network. Curve (b) corresponds to acoustic reduction in relation to the frequency of sound transmitted through a dry partition as specified above provided on one of its surfaces with an insulation product of the invention applied by gluing.

15 These tests also showed that, when a thick insulating product, whose thickness is at least 4 cm, is covered with an insulation product of the invention, the latter can improve the phonic insulation of the thick insulating product, especially at low frequencies.

To explain the improved phonic insulation obtained with the product
20 of the invention, without such explanation being final or restrictive, it can be postulated that the second layer in bitumen/modified bitumen enables the sound energy to be spread over a wider surface of the first layer in synthetic foam, whose sound energy absorption function is put to even better use.

This leads to an improvement in phonic insulation with an insulating
25 product which remains relatively thin.

It was also noted that the phonic insulation product of the invention improves resistance to cracking of wall coverings, for example paper or paint, for which the insulating product serves as a base material.

The wall on which the insulating product is glued may be unstable. Stabilities may cause breaks and/or cracks in the insulating product and therefore in the wall covering.

5 It would appear that each of the three layers which makes up the insulating product of the invention can absorb, at least in part, the stresses due to wall instability.

On this account, with the insulating product of the invention it is possible to improve the resistance to cracking and breaking of the wall coverings fixed to the product.

10 It was therefore noted that cracks extending as far as 3 mm wide do not lead to any deterioration in the wall coverings if the phonic insulation product of the invention comprises a layer of synthetic foam approximately 2.5 mm thick and a layer of modified bitumen approximately 1.5 mm thick.

15 A layer in glass cloth makes fixation of the wall coverings easier through its « adhering » qualities.

In respect of fire resistance, a special coating may be applied to the product of the invention during its manufacture or after it has been applied to the wall.

20 It is to be noted that the presence of a glass cloth gives the phonic insulation product better fire resistance compared with other primer layers.

Also, a plaster board may be placed over the phonic insulation product of the invention without its phonic insulation properties being deteriorated.

25 The purpose of the invention is also achieved with a method of manufacturing a phonic insulation product as described above in its principle and according to its different embodiments.

More particularly, the invention concerns a method of manufacturing a phonic insulation product for a vertical building wall, the insulation product successively comprising :

- a first layer in open cell foam, in synthetic material, intended to be placed on the wall to be insulated, having a thickness of between 1.5 mm and 5 mm,
- a second layer in a mixture of bitumen, aggregate in limited quantity, and at least one polymer, with no reinforcement, whose thickness is between 1 and 4 mm, and
- a third layer, bitumen-proof, in a primer material, intended to take a wall covering.

According to one advantageous embodiment of the method of the invention, the insulating product of the invention is fabricated as follows :

The first layer in synthetic foam is, preferably, purchased in roll form directly from a supplier.

The third layer in primer material, in particular glass cloth, is also purchased in roll form directly from a supplier.

The second layer of intermediate layer in modified bitumen is produced firstly by preparing an appropriate mixture, then pouring this mixture in liquid state onto the layer of synthetic foam or onto the layer in primer material. Pouring temperature is between 150°C and 190°C and is advantageously in the region of 170°C.

According to a first variant, before the layer of modified bitumen obtained has completely cooled, the other layer, i.e. the layer in synthetic foam or the primer layer, is applied to its free side.

The second layer maintains sticking properties until it has completely cooled.

With this first variant it is therefore possible to glue the first and third layers to the intermediate layer, without any glue or additional operation being necessary. It is therefore a variant that is simple and economical

According to a second variant, the second layer is left to cool until it solidifies

The other layer (layer in synthetic foam or primer layer) can then be glued to the other side of the second layer using a suitable glue.

The second layer may also be superficially heated on its free side so that the bitumen becomes liquid on the surface.

- 5 To this free side of the second layer is then applied the other layer of the insulating product of the invention (layer of synthetic foam or primer layer) in order to obtain the phonic insulation product

CLAIMS

1. Acoustic insulation product for a vertical structural wall, comprising, in succession:

- a first layer made of an open-cell foam, of synthetic material, intended to be placed on the wall to be insulated and the thickness of which is between 1.5 mm and 5 mm,
- a second layer without a reinforcement made of a mixture of bitumen, of at least one polymer and of up to 25% by weight of fillers, the thickness of which is between 1 and 4 mm, and
- a third layer, made of a primer material impervious to bitumen or subjected to a coating treatment to render it impervious to bitumen and intended to receive a wall covering.

2. Acoustic insulation product according to Claim 1, characterized in that the density of the foam is between 15 and 35 kg/m³ for a homogeneous foam and between 150 and 350 kg/m³ for a heterogeneous foam.

3. Acoustic insulation product according to either of Claims 1 and 2, characterized in that the first layer is made of a polyurethane foam, a melamine foam or a polyester foam.

4. Acoustic insulation product according to one of Claims 1 to 3, characterized in that the first layer is produced from polyurethane foam scrap chopped up and then agglomerated.

5. Acoustic insulation product according to one of Claims 1 to 4, characterized in that the second layer has a density of between 900 kg/m³ and 1 300 kg/m³.

6. Acoustic insulation product according to one of Claims 1 to 5, characterized in that the second layer comprises:

- between 0 and 25% by weight of fillers,
- between 46% and 92% by weight of bitumen
- and between 8% and 29% by weight of at least one polymer.

7. Acoustic insulation product according to one of Claims 1 to 6, characterized in that the bitumen used in the second layer is a road bitumen the 25°C penetration of which, according to the NFT 66-604 standard, is between 70 and 220 tenths of a mm.

8. Acoustic insulation product according to one of Claims 1 to 7, characterized in that the second layer comprises a mixture of APP, of IPP and of copolymers in the following proportions:

- between 8% and 24% of APP,
- between 2.5% and 5% of IPP,
- and 0% and 7% of copolymers.

9. Acoustic insulation product according to Claim 8, characterized in that, when the mixture does not include copolymers, the percentage by weight of fillers is between 10 and 15%, the percentage by weight of APP being between 13 and 24%.

10. Acoustic insulation product according to one of Claims 1 to 7, characterized in that the second layer comprises a single polymer which is SBS in a percentage of between 8 and 15%.

11. Acoustic insulation product according to one of Claims 1 to 10, characterized in that the third layer is made of glass or polyester fabric, of paper, of board or else of metal sheets.

12. Process for manufacturing an acoustic insulation product for a vertical structural wall, the acoustic insulation product comprising, in succession:

- a first layer made of an open-cell foam, of synthetic material, intended to be placed on the wall to be insulated and the thickness of which is between 1.5 mm and 5 mm,
- a second layer without a reinforcement, made of a mixture of bitumen, of at least one polymer and of up to 25% by weight of fillers, the thickness of which is between 1 and 4 mm, and
- a third layer, made of a primer material impervious to bitumen, or subjected to a coating treatment to render it impervious to bitumen and intended to receive a wall covering,

characterized in that the process consists:

- in pouring a mixture of bitumen of fillers and of at least one polymer onto the first or the third layer of the insulation product, so as to obtain a second layer whose thickness is between 1 and 4 mm, and
- in adhesively bonding, to the free side of the said second layer, the other layer of the insulation product.