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(54) **Wall covering material**

(57) A wall covering material having heat insulating, sound absorbing and flame-retardant properties comprises on the face which in use faces towards the wall to be covered an elastic, open-cell foam layer containing hollow, closed cell spherical grains of inorganic material, the said layer being permeable to gas and contains flame-retardant additives and on the other face, which in use of the said material is visible, a fibrous outer layer.

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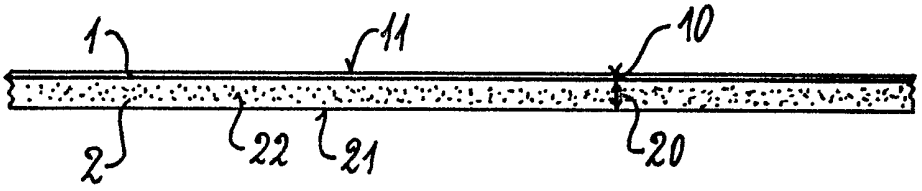
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SPECIFICATION

Wall covering material

The invention relates to a wall covering material having heat insulating, sound absorbing and flame-retardant properties, which can be applied to a wall in the same way as wallpaper.

Insulating materials which are suitable as a wall covering, for example styrene foams, may possess a modest decorative effect, for example as a result of a moulded surface, but do not have any flame-retardant properties. In general, they require further finishing, for example, by painting or wall-papering; as a rule, this is not able to eliminate the pressure sensitivity of the said insulating materials and for this reason protective measures have to be taken, in addition to the work already mentioned, and this is time-consuming.

Other insulating materials which do have flame-retardant properties, such as rock wool, are not, however, generally regarded as having any decorative effect.

Decorative materials, for example carpets, which possess insulating properties to a certain degree, are not sufficiently flame-retardant and they are so expensive that they can only be considered for use in exceptional cases.

Swiss Patent Specification No. 587,119 describes a wall covering material possessing heat insulating, sound absorbing, flame-retardant and decorative characteristics which has on the back (i.e. the face which in use faces towards the wall) a foam layer which contains flame-retardant additives and, on the front (i.e. the face which in use is visible) an outer layer which contains textile fibres and is of decorative design. The foam layer is said to have a high resilience, similar to that of cellular rubber, in order to reduce pressure sensitivity. To enable the wall to breathe, the entire wall covering material is permeable to gas to permit gases such a water vapour to pass therethrough.

However, a wall covering material of this type has the disadvantage that, because of its elastic foam layer, it can result in irregular joints if the formulation is relatively soft. A certain rigidity of the foam layer would therefore be desirable, but, if the material is nevertheless still to remain pressure-insensitive, this can be achieved only by increasing the proportion of filler. This increase in the amount of filler has, however, the disadvantage of reducing the amount of air in the foam, and this considerably impairs the insulating properties.

The present invention provides a wall covering material which, like the lastmentioned known material, has insulating properties, is sound-absorbent, flame-retardant and decorative and can be manufactured at low cost and can be marketed at a price which makes it attractive for general use but which, in additon, is simple to hang with clean joints, without any loss of the insulating effect.

The wall covering material of the invention comprises, on the face which in use faces towards the wall to be covered an elastic, open-cell foam layer containing hollow, closed cell spherical grains of inorganic material, the said layer being permeable to gas and containing flame-retardant additives and on the other face, which in use of the said material is visible, a fibrous outer layer.

The grains with closed cells preferably consist of a glass and $CaSiO_4$. The grain diameter is usually in the range of 10 to 300 μ and preferably 20 to 75 μ. These grains make up a proportion of up to 75%, or even more, of the dry weight of the foam layer. Although these closed cell grains "stiffen" the foam layer, they do not reduce the insulating properties. The permeability to gas is also retained by the use of an open-cell foam. The "rigid" foam layer makes it possible to obtain clean joints when hanging, but has sufficient resilience.

The desired characteristics of the foam layer can be obtained, in particular, with a vulcanised styrene/butadiene latex, which can contain hydrated aluminium oxide as a flame-retardant additive.

A suitable form layer should have a thickness of at least several millimetres in order to meet the requirements with regard to insulating properties and sound absorbency; however, in some cases it can have a lower thickness.

The top layer preferably consists of a nonwoven fabric and the decorative effect can be achieved by surface moulding and/or the provision of a coloured design, for example by printing. Polyester fibre nonwoven fabrics, especially spun bonded nonwoven fabrics of continuous polyester fibres, which have been entangled, slightly needle-punched and impregnated are especially preferred. A nonwoven fabric of this type should have a sufficiently high weight per square metre, for example above 100 grams, and should be so loose in structure that as far as possible it is not similar to paper. A nonwoven fabric of this type can, for example, have a thickness of about 1 millimetre, and it appropriately has a stiffness similar to that of flexible cardboard. In combination with the foam described, a nonwoven fabric of this type gives very good wall coverings, and the nonwoven fabric itself can be provided with a flame-resistant finish or can be made flame-resistant by means of suitable additives or by suitable choice of the fibres. Frequently, however, the flame resistance of the foam is sufficient to confer on the adjacent polyester nonwoven fabric adequate flame resistance.

In the nonwoven polyester fabrics, fibres with a diameter of 10 to 20 μ are advantageous, because the nonwoven can then exhibit not only a particular textile appearance but also, in particular, a felt-like textile handle after an appropriate finishing process, for example after printing. In this context, handle is not to be understood as meaning the condition which is tested by slightly crushing a textile structure in the fist but merely as the handle which can be tested by stroking the fingertips over the smooth product.

Of course, it is also possible to use woven fabrics or knitted fabrics as the top layer and, in particular, glass

fibre fabrics are advantageously used when the requirements for flame-repellency are stringent; with such glass fibre fabrics, the decorative effect can easily be obtained by moulding the fabric and an optimal subsequent decorative coating. So-called pigment printing can also be employed.

The invention is illustrated in more detail by the following Example:

Example

A polyester nonwoven fabric of the type already described, which has a weight per square meter of about 160 g and a thickness of about 1 mm, is printed on one side, in known manner in such a way that a surface is obtained which has a light-fast finish, is fast to rubbing and is washable in the same way as wallpaper and which has a textile-like appearance.

The back of this nonwoven fabric is provided with a foam backing in a device of the conventional type. The receipe for this foam is as follows:

	Parts by weight
SBR latex (67% in water)	600
Polystyrene dispersion (50% in water)	80
Potassium oleate (18% solution in water)	90
Water	20
Vulcanising paste*	60
Small hollow spheres of aluminium silicate (10-75 μ)	200

*The vulcanising paste used had the following composition by weight:

Sulphur	13.5%
Zinc oxide (Red Seel)	6.0%
Zinc diethyldithiocarbamate (Vulkazit LDA of Bayer)	2.9%
Zinc mercaptobenzthiazole (Vulkazit ZM of Bayer)	5.8%
Diphenylguanidine (Vulkazit D of Bayer)	5.85%
Sulphonated naphthalene condensate (Vultamol of BASF)	2.25%
2,2'-Methylene-bis(4-methyl-6-tert.butyl-phenol) (Vulkanox BkF of Bayer)	6.7%
Silicon dioxide (Kieselguhr)	10.9%
Water	46.1%

Trade names are shown in brackets.

The small hollow spheres used can be of the "Fillite" brand from Messrs. Fillite (Runcorn) Ltd., Runcorn, Great Britain or of the "Armospheres" brand from Messrs. Georg M. Langer & Co. Ritterhude/Bremen, Germany. They are advantageously filled with CO_2 and nitrogen, which increases the flame resistance and the heat insulating properties of the end product.

These constituents are foamed in conventional manner in a mixer and the foam is then applied through a static mixer to the back of the nonwoven fabric, ammonium acetate or sodium silicofluoride being added, as gelling agents, before the foam passes into the static mixer. In order to accelerate the gelling process, the foam, which has been adjusted to the suitable thickness using a doctor, together with the nonwoven fabric beneath it, is allowed to pass under an infrared radiation device; after which the product is vulcanised in a continuous furnace. The foam can also be produced by the non-gel process, in which case, in the above recipe, the potassium oleate is replaced by a synthetic soap, for example the sodium salt of a sulphosuccinamate. The product is then vulcanised in the conventional manner in a continuous furnace. The foam thus obtained, which has a thickness of, for example, 5 mm, is firmly bonded to the nonwoven fabric, has high resilience, has a softness similar to that of cellular rubber and provides an ideal base for sticking the wall covering material thus obtained to a wall.

The hollow spheres of aluminium silicate serve as a reinforcing filler which maintains or even improves the insulating effect. The hollow spheres can be filled with CO_2 and N_2 and this increases the flame resistance and the insulating properties.

The hydrated aluminium oxide mentioned in the above recipe serves both as a filler and as a flame-retarding agent.

Of course, certain variations in this recipe are possible and, in particular, it may be pointed out that the foam can be coloured if desired, although as a rule with a nonwoven of the type mentioned a white foam

would not be expected to show through and would not be troublesome even if it did show through.

A similar foam formulation can also be applied to a woven fabric or knitted fabric which has been provided with a decorative design, by moulding and/or by colouring, in particular by printing the surface. A particularly good flame-retardant effect or flame resistance is obtained when a product which consists at least in the main of glass fibres is used as the top layer, and here again nonwovens or, advantageously, textured woven textile structures can be used. The surface of such a glass fibre product can be provided with a further decorative pattern, in particular by a so-called pigment printing process. However, it is also possible to apply a flame-retardant dispersion.

The present invention makes it possible to manufacture by simple means inexpensive wall coverings with a decorative effect which have insulating and sound-absorbing properties and are flame-resistant or flame-retardant and can be hung easily with clean joints.

The single figure of the accompanying drawings shows a side view of a fragment of a wall covering according to the invention. The top layer 1, which preferably consists of a non-woven fabric of the type mentioned, has a thickness 10 of about 1.1 mm and is intimately bonded to the foam layer 2, which has been foamed onto the back of the top layer 1 and then gelled and vulcanised. The foam layer 2, in turn, has a thickness of about 4 mm and a consistency similar to that of cellular rubber. The relatively smooth surface 11 of the top layer 1 is provided with a printed pattern, which, of course, is not visible in the drawing. The surface may additonally be textured, for example by embossing or in another way, or it may merely exhibit such texturing without a print. The back 21 of the foam layer 2 is, in turn, relatively smooth, so that even the fine pores can be discerned only on close examination. This is necessary for sticking the wall covering to a wall if only for the reason that, with such a surface, the glue which may be applied to the back 21 does indeed enter into a good bond with the porous foam layer 2, but is not able to penetrate so deeply into the foam that it would impair its ability to function. The hollow grains in the foam layer 2 are indicated by scattered points 22, but the number of such points is much fewer than the number of grains that would in practice be present.

CLAIMS

1. Wall covering material possessing heat insulating, sound absorbing and flame-retardant properties, comprising on the face which in use faces towards the wall to be covered an elastic, open-cell foam layer containing hollow, closed cell spherical grains of inorganic material, the said layer being permeable to gas and contains flame-retardant additives and on the other face, which in use of the said material is visible, a fibrous outer layer.

2. Wall covering material according to Claim 1, in which at least a majority of the said spherical grains are filled with an inert gas.

3. Wall covering material according to Claim 2, in which the said inert gas is nitrogen and/or carbon dioxide.

4. Wall covering material according to any one of Claims 1 to 3, in which the said spherical grains have a particle size distribution in the range of 10 to 300 μ.

5. Wall covering material according to Claim 4, in which the particle size distribution of the said spherical grains is 20 to 75μ.

6. Wall covering material according to any one of Claims 1 to 5, in which the said foam has high resilience after deformation.

7. Wall covering material according to Claim 6, in which the foam contains a vulcanised styrene/butadiene latex.

8. Wall covering material according to any one of Claims 1 to 7, in which the said foam layer contains hydrated aluminium oxide as a flame-retardant additive.

9. Wall covering material according to any one of Claims 1 to 8, in which the fibrous outer layer is nonwoven.

10. Wall covering material according to Claim 9 in which the fibrous outer layer is a non-woven polyester fibre layer.

11. Wall covering material according to any one of Claims 1 to 8, in which at least half of the fibrous outer layer consists of glass fibres.

12. Wall covering material according to Claim 11, in which the fibrous outer layer is a glass fibre fabric layer.

13. Wall covering material according to one of Claims 1 to 12, in which the fibrous outer layer has a surface with a decorative appearance.

14. Wall covering material according to Claim 1, substantially as hereinbefore described with reference to the accompanying drawing.

15. Wall covering material according to Claim 1, substantially as described in the foregoing Example.

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