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(54) **DAMP-PROOFING WITH WIND-PROOFING FOR BUILDINGS**

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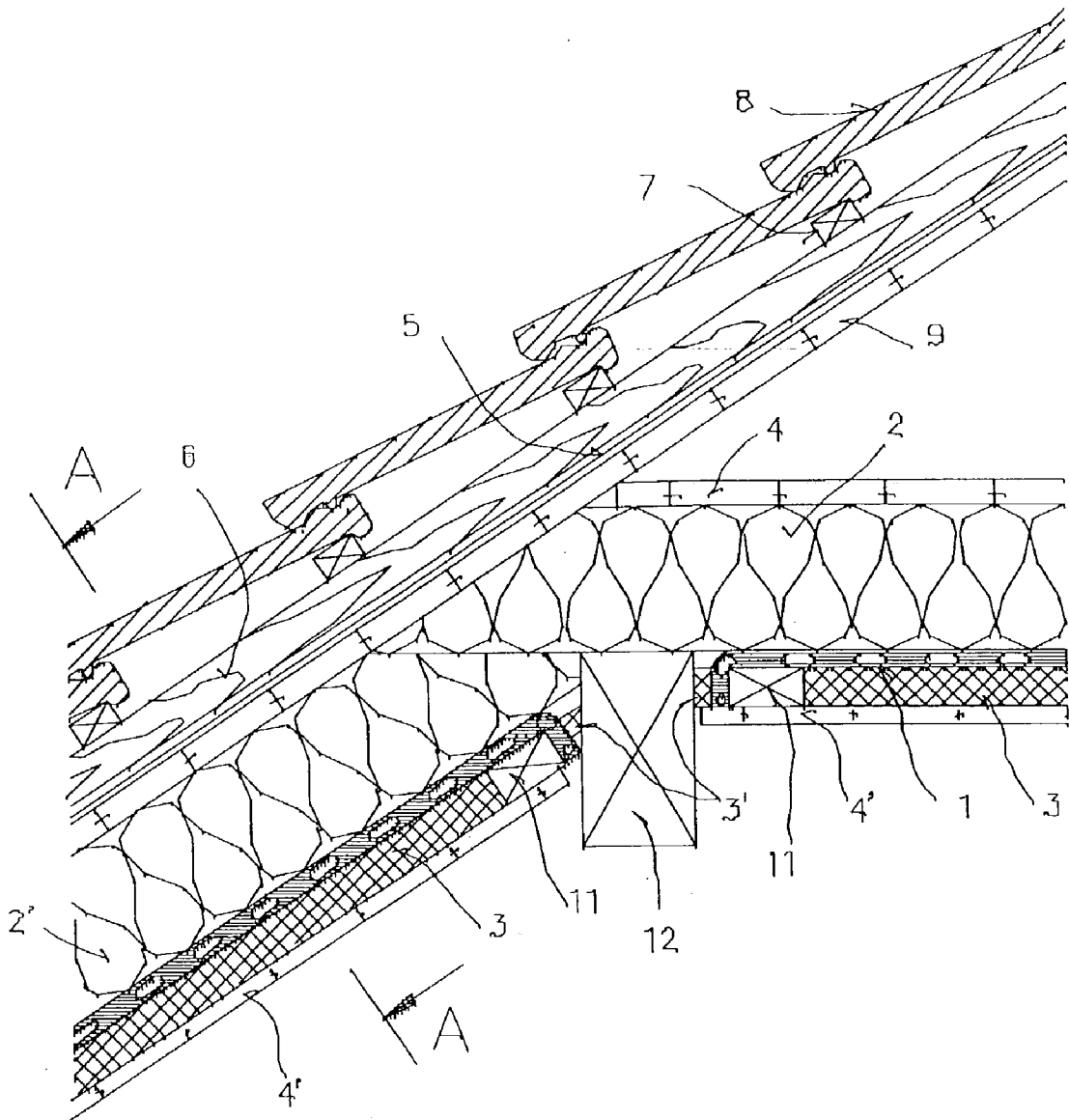
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(57) **ABSTRACT**

A moisture-adaptive vapour-barrier film consisting of polyethylene and acrylic ester is proposed for the full insulation of buildings, which adapts its diffusion resistance to environmental conditions in such a way that it blocks its pores in the winter and opens its pores in the summer and the vapour-diffusion resistance of which can be changed and adjusted as a function of the proportion of the acrylic ester so as to correspond to a diffusion equivalence from 0.5 m to 100 m air-layer thickness.



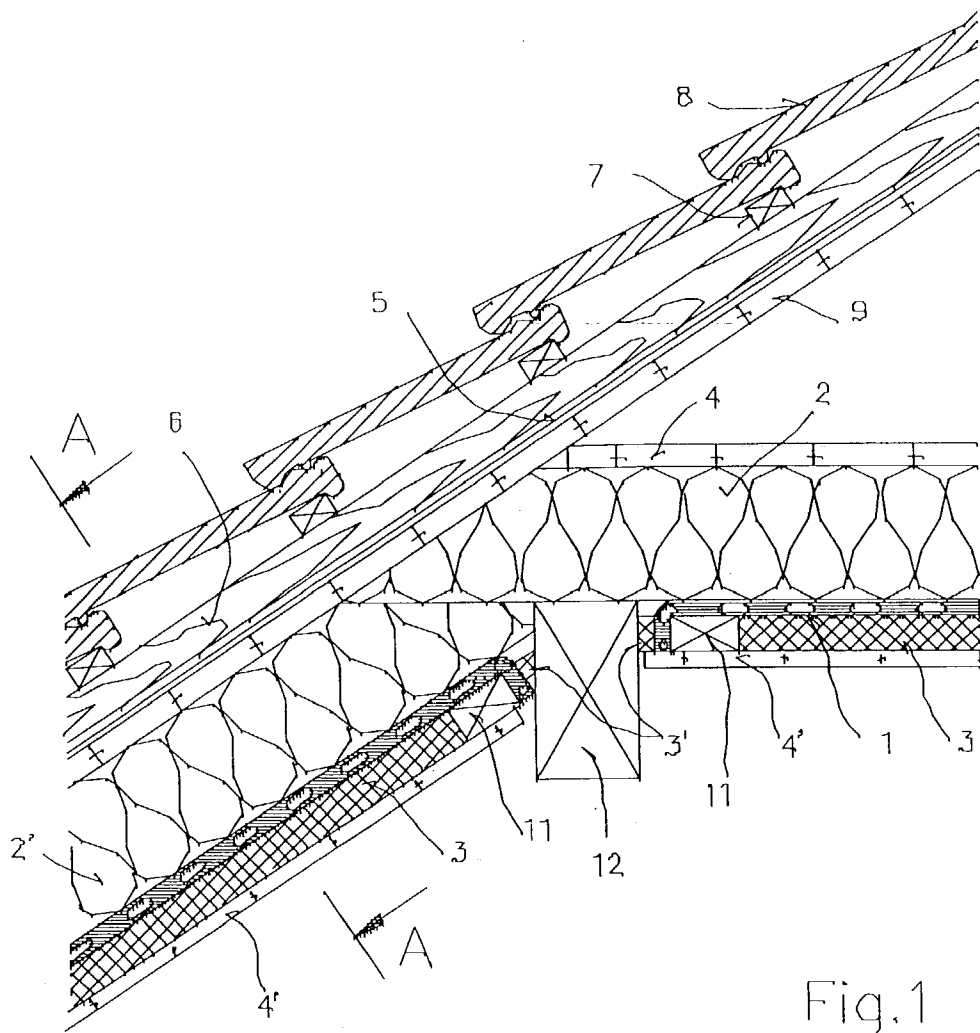
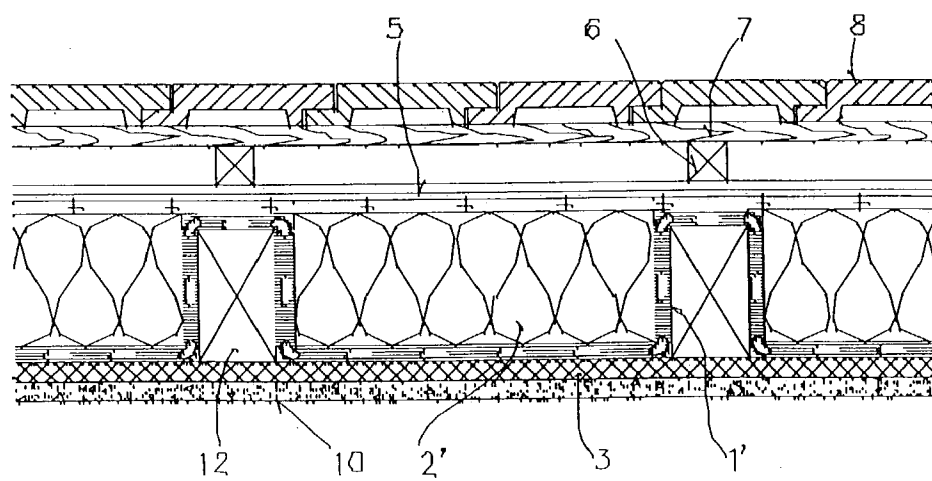


Fig. 1



Schnitt A-A

Fig. 2

DAMP-PROOFING WITH WIND-PROOFING FOR BUILDINGS

FIELD OF THE INVENTION

[0001] The invention relates to the damp-proofing and wind-proofing of buildings with the aid of a plastic film which, particularly with a view to lasting protection of the wooden construction of the roofs and of the prefabricated construction consisting of porous building materials, serves to enhance the heat insulation and consequently to improve the thermal energy balance of buildings.

BACKGROUND OF THE INVENTION

[0002] Buildings are erected for the purpose of protecting the interior from wind and weather. For a long time the cubic volume delimited by the walls and the ceiling was regarded as the utility space of a building. The attic, by which is meant the space between the ceiling and the roof, was considered by the owner of a building as a necessary evil of protection against the weather, for—except for drying the laundry—abiding occupancy was prohibited on account of misgivings on the part of the fire-regulation authorities. Since around the time of the oil crisis of the seventies, a harmonisation of the economic and ecological interests of the individual with the community has come about in the building and construction industry thanks to technical feasibility. Evidence of this radical change are enclosed new buildings defying the wind and the weather and an increasing proportion of the old structural fabric which has been renovated in accordance with these features, in which utilisation of the reconstructed space is permitted in unrestricted manner.

[0003] From document DE 195 14 420 a “moisture-adaptive vapour barrier” is known which in the form of film preferably consists of polyamide 6 or 3, 4 and which together with the water-vapour diffusion resistance, which is dependent on the ambient humidity, also exhibits sufficient tensile strength and tearing strength. Because the film alters its physical properties in such a way, depending on moisture loading, that it acts as a vapour barrier against the penetration of moisture and, on the other hand, thanks to its adaptability in a cold climate, allows the constructional elements to dry out, it is also called a “climate membrane”.

[0004] As a matter of fact, the film changes its molecular structure in such a way that the constructional elements protected by it through the heating-period of the winter and also in the humidity of the summer can attain and retain the optimal dry condition. Hence the film prevents the penetration of moisture in the winter with the increase in its diffusion resistance, and in the summer it becomes vapour-permeable as a consequence of the increased humidity, so that the parts of a new building that are damp with trapped moisture and covered by the film are able to dry out ideally.

[0005] The disadvantage of the state of the art is that the use of the known film, particularly in connection with the full insulation of rafters in roofs, is criticised and, where possible, boycotted by manual workers. The reasons for this are:

[0006] 1. loud noises in the course of laying,

[0007] 2. low tearing strength, so that cracks arise in the course of laying which have to be repaired by bonding,

[0008] 3. deficient suppleness, which in the case of penetration by a pipe and with local complexity of trajectory is manifested by wrinkling and warping,

[0009] 4. only 2 m sheet width and roll width (cf. <http://www.isover.ch/de/prod-vario.html>), which, in connection with the speedy covering of relatively large areas, is restrictively narrow,

[0010] and, last but not least,

[0011] 5. according to the manufacturer's instructions it must not be stretched, not even in plane-parallel manner, but must be laid exclusively with sagging, e.g. in the case of an average rafter span with about 60 cm clearance, with sagging of about 3 cm (cf. <http://www.isover.ch/de/prod-vario.html>), since it otherwise tears.

[0012] For prefabricated construction the consequence of the disadvantage specified in point 5 is dramatic, for, on account of the sagging, the use of the vapour-barrier film pertaining to the state of the art on prefabricated panels is abandoned. This is because, for the handling and logistics of panels, the risk of an injury from sagging films is too extreme

[0013] It is here that the invention intends to provide a remedy. The invention as characterised in the Claims solves the task without the above disadvantages (1-5), in that a polymer of ethylene which is compounded with carboxyl-containing monomers is proposed and used.

[0014] The film having the protected trade name AIRPASS, which is manufactured by the applicant, stems from the group constituted by the thermoplastic copolymers of ethylene with carboxyl-containing monomers, in particular the ethylene/acrylic copolymers with acrylic acid. In the course of copolymerisation the linear structure of the methylene chain is interrupted, and hence the crystallinity is reduced in such a way that the melting-temperature is lowered. The crucial point is that, in comparison with the PA6 films pertaining to the state of the art, the AIRPASS film has a higher tensile strength, by which is meant the maximum tension that a film is able to tolerate before ultimate tearing, and has a clearly higher extension at rupture, i.e. the value by which the film is stretched until it tears, so that the AIRPASS film can be stretched substantially more until tearing than the PA6 film pertaining to the state of the art. By reason of the higher stretchability and the excellent stress-cracking resistance of the polyethylene copolymer, the AIRPASS film can be blow-extruded and in this connection can be stretched excellently when hot. In comparison with the PA6 films these properties are significant, for they signify a more rational production process, more generous product design (i.e. substantially larger sheet widths) and, not least, a proverbially higher flexibility for the consumer in the course of working. This is because the films pertaining to the state of the art (PA6) can only be produced with slit dies and, for this reason, only “statically” and only in limited width (2 m) which, in comparison with the sheet width of the “dynamic” blowing process of up to 4 m, is rather modest. The proposed AIRPASS film can be produced with higher productivity, and, because on account of its elastically supple behaviour it does not rustle or tear, it can also be laid out better. Laying is additionally favoured by the broader sheet width, because this substantially reduces the installa-

tion effort. Finally and lastly, the outstanding properties of permeability and the low transmission-rate of the gas permeability of the AIRPASS film should be mentioned. In this connection the permeability in respect of water vapour indicates how many grams of water a film lets through per day, relative to its area, and the transmission-rate indicates the gas permeability: what volume of gas the film of defined thickness, area and also ambient pressure lets through per day at zero per cent relative atmospheric humidity and temperatures. The AIRPASS film can be manufactured in thicknesses from 20 μm to 200 μm and, depending on the mixing-ratio of the components polyethylene and acrylic ester, its water-vapour diffusion resistance (s_d value) may vary from 0.5 m to 100 m of diffusion-equivalent air-layer thickness. The AIRPASS film can be applied on the most diverse base materials, such as tiles, reinforced and unreinforced papers, fabrics consisting of metals and also domestic and industrial textile fibres, and can be coated over its full area or partially with coupling agents and adhesives. With the AIRPASS film it is possible for prefabricated panels consisting of porous building materials to be coated or covered without sag.

[0015] The AIRPASS film fulfils the valve function for buildings in ideal manner, inasmuch as it restricts the penetration of moisture from outside but permits the escape of moisture from inside.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The use of the invention is shown below on the basis of embodiment variants by way of example as follows:

[0017] **FIG. 1** the use of AIRPASS in the case of a gable roof with full insulation of intermediate rafters,

[0018] **FIG. 2** section A-A through the roof of **FIG. 1**

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0019] **FIGS. 1 and 2** show the typical structure of a gable roof in traditional timber construction, with collar-beam floor and with the supporting elements of the beams **12**, rafters **6** (which are also called counterlaths), roof battens **5** and with the roof tiles **8** with pantiles resting on the roof battens **5**.

[0020] Corresponding to section A-A (**FIG. 2**) and the state of the art, however, there is situated between the beams **12** and the rafters **6** a surface-covering layer **5** supported by the boarding **4** and consisting of water-repellent, diffusion-open material and the moisture-adaptive vapour-barrier film AIRPASS **1'**, which at the same time envelops the surfaces of the roof beams **12**, with the exception of their surfaces facing towards the inside, and in this way forms closed quadrangular spaces for acceptance of the insulating boards **2'** with the aid of the installation fillets **1'** (of **FIG. 1**). The great advantage of the AIRPASS film **1, 1'**—that it may be installed without sagging, i.e. “tightly”—already becomes

evident from **FIG. 1**, where its fastening and mounting with insulating strips **3'** on the beams **12** and on the installation laths **11** take place. For, in contrast with the state of the art, the AIRPASS film **1, 1'** may be laid tightly, i.e. without any sagging with the installation laths **11**, so that it can fit snugly against the insulating mats **3** which are held by the boarding **4'** or by the layer of plaster. Corresponding to the arrangement shown, no interspaces are present for any sagging of the AIRPASS film, thus simplifying installation work.

[0021] Corresponding to the panels of prefabricated construction, the AIRPASS film with the layers of the insulating material **2** and the insulating mats **3** could be structured in the manner of a sandwich and, depending on requirements, could be laminated with further finishes, for example metallic lathing, to counter electrosmog.

What is claimed:

1) A moisture-adaptive vapour-barrier film for full insulation of buildings, which adapts its diffusion resistance to environmental conditions in such a way that it blocks its pores in the winter and opens its pores in the summer, characterised in that it consists of a mixture of polyethylene and acrylic ester.

2) Moisture-adaptive vapour-barrier film according to claim 1, characterised in that the vapour-diffusion resistance of the film can be changed and adjusted as a function of the proportion of the acrylic ester in the polyethylene, corresponding to a diffusion equivalence from 0.5 m to 100 m air-layer thickness and a relative atmospheric humidity from 60% to 80%.

3) Moisture-adaptive vapour-barrier film according to claims 1 and 2, characterised in that the film has a thickness from 20 μm to 200 μm .

4) Moisture-adaptive vapour-barrier film according to claims 1 to 3, characterised in that the film is preferably used for the full insulation of the rafters of a roof.

5) Moisture-adaptive vapour-barrier film according to claims 1 to 3, characterised in that the film is used for the coating of building boards such as panels which consist of open-pore building materials.

6) Moisture-adaptive vapour-barrier film according to claims 1 to 3, characterised in that the film serves for the coating of insulating mats.

7) Moisture-adaptive vapour-barrier film according to claims 1 to 6, characterised in that the film forms a laminate with a base material consisting of paper.

8) Moisture-adaptive vapour-barrier film according to claims 1 to 5, characterised in that the film forms a laminate with a base material consisting of tiles.

9) Moisture-adaptive vapour-barrier film according to claims 1 to 8, characterised in that the film is manufactured from recycled material.

10) Moisture-adaptive vapour-barrier film according to claims 1 to 9, characterised in that the film is preferably manufactured by the extrusion blowing process.

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