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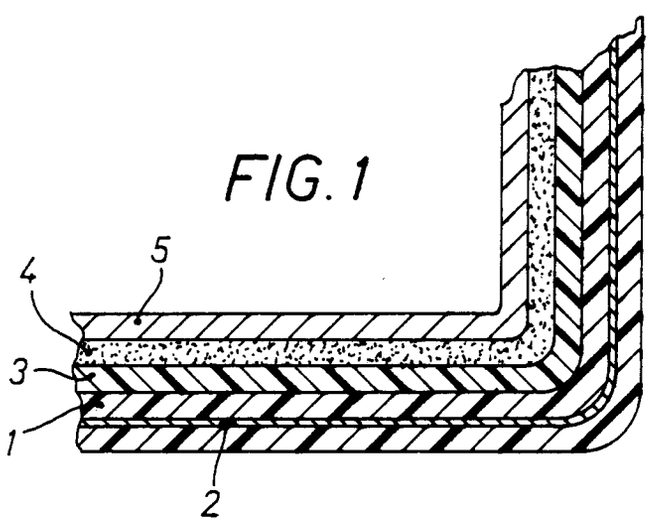
(54) **A preformed multilayer article for sealing coverings and roofings and process for manufacturing the same.**

(57) A preformed multilayer structure for sealing coverings and roofings, formed by a layer (1) of a bitumen-based blend embedding a framework (2), and by a layer (5) of a preforming auxiliary material which forms the external surface thereof. An additional resin layer (3) of elastomeric copolymers in water emulsion, and a further additional layer (4) comprising a binder can be provided.

The structure is incorporated in accessories of the building construction field of various shapes and types (10, 15, 20, 25, 30, 38).

FIG. 1



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The present invention concerns the external sealing of buildings and other kinds of constructions, and more particularly multilayer and preformed accessories to be used at the junctions between separate sealing coatings based on bitumen, such as for example at corners, openings, etc. in buildings, roofs and the like.

For sealing or rendering rainproof buildings, e.g. at terraces, roofs, etc. there are used the so called bitumen-polymer membranes, formed by a framework which is impregnated and coated by a bituminous mixture with added polymers. The framework can comprise a continuos yarn or a nonwoven polyester staple fabric and/or a so called nonwoven glass, or glass fibers.

Plastomers can be added to the bituminous mixture, such as atactic polypropylene, i.e. having a random strucure, (so called APP-Bitumen membranes), or elastomers such as block copolymers (so called membranes of styrol-butadiene SBS bitumen). Due to the physical characteristics of the polymer employed, the former are also called bitumen-polymer plastomeric membranes, while the latter are defined as bitumen-polymer elastomeric membranes.

In the sealing and rainproofing operations most of the continuous waterproof roofing or covering is built with these bitumen membranes comprising a framework which is impregnated by a hot bituminous mixture.

The edge of the waterproof roofing accomplished by means of bituminous sheaths, where the horizontal and the vertical surfaces are to be joined together, is the most critic area of the roofing and requires a proper protection.

For such purpose there are presently available junctions or accessories made of synthetic materials such as PVC, EPDM, ECBM. These known sealers are practically impervious to vapor, but their chemical composition is not compatible with the bituminous sheaths forming the main portion of a sealing system.

Further, such incompatibility can lead to a degraded sealing performance because of the different degrees of resistance to ageing and to reactions involving ultraviolet light.

Finally, such known sealers cannot be applied by using the flame of a gas burner, usually the one used for laying the main roofing, since the flame would melt and permanently deform such accessories of synthetic materials.

It is an object of the present invention to overcome the limitations and the shortcomings of the above mentioned prior art, and more particularly to provide a preformed multilayer article of the above type that is inexpensive and easy and advantageous to be used.

The invention consists of a multilayer preformed structure for use in the building construction accessory field for sealing coverings and roofings, characterized in that it comprises a bitumen-based blend layer embedding a framework, and a layer of a preforming auxiliary material which forms the external layer thereof.

The invention further consists of building construction accessories incorporating a structure of the above mentioned type.

Finally, the invention consists of a process for manufacturing a layered structure of the above mentioned type, characterized by the steps of:

a. positioning a bituminous sheath with an embedded framework on a loading plane;

b. applying one or more additional layers;

c. heating the so formed layered article in a radiating furnace to soften the bitumen at a level such as to allow the stretching of the layered article in a mold or die.

The invention will be now described with reference to preferred but not-limiting embodiments, illustrated in the accompanying drawings in which:

Figure 1 is a fragmentary cross section view showing the structure of an accessory according to the present invention;

Figure 2 is a perspective view showing an outside corner or edge-cover member realized according to the invention;

Figure 3 shows a plain corner member;

Figure 4 shows a pipe union member;

Figure 5 shows a pipe ventilator member;

Figure 6 shows a cone member;

Figure 7 shows an inside corner or corner-cover member;

Figure 8 shows an expansible joint covering member; and

Figure 9 illustrates the process for manufacturing the accessories according to the invention.

Figures 1 and 2, there illustrate a cross-section structure of an accessory according to the invention and an angle member using such previously formed structure, respectively.

Referring more particularly to Figure 1, that shows a cross-sectional portion of the angle member that is fully shown in Figure 2, a building construction accessory according to the present invention, comprises a

layer 1 of an elastomeric and/or plastomeric blend, also called a bitumen-polymer membrane or bitumen sheath, that incorporates a framework 2. The accessory can further comprise an additional resin layer 3 of elastomeric copolymers in a water emulsion, and/or an additional layer 4 comprising a binder. The function of the additional layer 4 is substantially that of dimensionally stabilizing the accessory and improving the bonding between the layers.

When both layers 3 and 4 are present, they can be layered in the order shown in Figure 1, that is with layer 4 outside in respect of layer 3. In some applications it is however preferable having the additional layer 4 directly contacting the blend 1, with the resin layer 1 being outside.

Finally the facing layer is formed by a preformed coupling layer 5 of an auxiliary material. The outer surface (i.e. the one on the side of blend 1) is covered by chalk powder for easy manufacturing and handling. Moreover, a polyethylene or like material sheet (not shown) is preferably applied over the outer surface to prevent undesired adhering, this sheet being usually incorporated in the impermeabilization when the accessory is installed.

The elastomeric and/or plastomeric blend layer 1 is based on fractioned (distilled) bitumen, atactic polypropylene, isotactic polypropylene, and polyolefine elastomers, in case charged with calcium or chalk carbonate. Alternatively, the elastomeric blend can be formed by fractioned bitumen and thermoplastic rubber comprising a styrol-butadiene radial block copolymer.

Hereinbelow numerical data are listed relating to the compositions of preferred embodiments of the structure according to the invention.

Chemical composition of the covering sheath:

- Fractioned bitumen from oil residuum:
  180/200 decimillimetres of APP and/or
  80/100 decimillimetres of SBS
- isotactic or atactic polypropylene (PP) as a modifier
- inert fillers (mineral charges): calcium carbonate
  marmorino
  rubber dust.
- PES as framework insert.

SHEATH PREPARATION

First bitumen and polypropylene are mixed together for producing the blend, then mineral charges are added. The percentages by weight are within the following ranges:

	Preferred	Maximum
Bitumen	55% - 75%	50% - 80%
polypropylene	7% - 23%	5% - 35%
$CaCO_3$	0% - 36%	0% - 40%

According to an embodiment, the blend layer 1 can either have a composition including both the above mentioned blends (APP + SBS), or generally be formed by a blend obtained by modifying and integrating the base bottom bitumen mass available from oil distillation.

The framework 2 embedded or incorporated in the blend layer can be realized by means of a continuous yarn, or nonwoven polyester staple, or glass fabric, or polyester fabric, or netting (lace net) fabric plus nonwoven, or glass fiber yarns/glass web plus nonwoven. More generally the material of the framework must be capable of being cold formed or hot formed.

The sheath thickness, including the framework, usually falls within a range from 1 mm to 7 mm, with the weight thereof ranging from 1 to 7 kg/m^2.

The resin layer 3 that can be included in the accessory for improving the dimensional stability thereof, comprises elastomeric copolymers in a water emulsion, in particular a water emulsion of a styrol butadiene metiol acrylamide elastomeric copolymer.

The material of the additional layer 4 is selected depending on the additional function being desired, and generally it is adapted to improve the characteristics of the final article, or the type of the blend which is being used.

The material of the coupling layer 5 consists of a continuous yarn or nonwoven polyester staple, polypropylene, polyamide or other polymers, or paper, or fabrics, for example. More generally such layer comprises a cold or hot formed material capable of being used as a preforming auxiliary adapted to

enhance the dimensional stability of the final product.

Figures 2 and 3 show two accessories or junctions according to the invention, particularly an outside corner or edge-cover 10 and a plain corner member 15. The corner 10 comprises an L-shaped flat portion 11 and a portion 12 that is formed as a right angle dihedral and is orthogonal to the preceding one, both being realized according to one of the constructions illustrated with reference to Figure 1.

The corner member 15 in Figure 3 is a plain corner formed by two flat portions 16 and 17 joined at an angle, typically a right angle. It can constitute for example an angle member adapted for sealing an impermeabilization and for improving the adhesion between the different layers of bituminous sheath forming the system. From the manufacturing point of view, both accessories are obtained by stretching and forming one layered sheet.

These accessories are used for making easier and quicker the laying of sealing covers and roofings, in particular bitumen sheaths, at corners or edges. Thanks to the structure of the invention, it is possible to obtain a covering or roofing as a one-piece with uniform features, and therefore with an improved reliability in respect of the sealing, a pleasant appearance, and time-saving when being installed.

Figures 4 to 6 show other accessories manufactured in accordance with the structure of the invention and having a cylindrical symmetry.

Figure 4 shows a pipe union member or mouth 20 comprising a flange 21 with a central hole 23 and a cylindrical or frusto-conical portion 22 for channelling and draining water.

Figure 5 shows a pipe ventilator member 25 for allowing the aeration through the sealed bitumen covering or roofing, thus preventing any bulking thereof and preserving the heat insulation features. The member 15 comprises a flange 26 and a projecting portion 27 of frusto-conical shape provided with two or more slots 28.

Figure 6 shows a conical junction or cone member 30 formed by a flange 31 and a cylindrical or frusto-conical portion 32 with an end opening 33. Such cone member can be used, for example, for covering the engaging portion of an antenna or for allowing the passage of electrical cables or of other type.

Figure 7 shows an inside corner o corner cover formed by three flat portions 34, 35 e 36 connected at an angle, typically right angles.

Figure 8 shows an expansible joint covering member 38 with two half-channels 37 and 39 crossing each other.

The preformed multilayer structure according to the invention provides the following advantages.

It is fully compatible with the covering or roofing since it has a composition substantantially similar to the raw material of the bituminous sheath, and therefore it exhibits the same behaviour in respect of the temperature, ultraviolet radiation and atmospheric agents;

it allows for obtaining a surface uniformity forming a one-piece or integral covering, thus increasing the sealing reliability;

finally, it can be applied by means of a gas-burner flame without being warped, which is not possible with the known synthetic accessories, such as for example those of PVC. When using the accessory according to the invention warping can be easily prevented through the controlled melting of the bitumen.

Referring to Figure 9, there is illustrated the manufacturing and preforming process of an accessory according to the invention.

The bituminous sheath 1, already including the framework, either supplied from a roll 40 or in sheets 41 cut at the proper size, is placed onto a loading plane 45, in case provided with guides 46, to which there are fed and applied the other layers. The layers are then heated in a radiating furnace 50, to soften the bitumen at level such as to allow the stretching of the sheath 1 and of any additionally applied layer(s) during the preforming operation in a mold or die. In other words, the heating must ensure that the rigid framework 2 is softened to a thermoelastc or thermoplastic condition, thus allowing a gradual stretching without breaking when the accessory is preformed.

Preferably the furnace provides for open vessels below the product being softened, which contain cooling water to prevent an excessive heating of the lower face.

The bituminous sheath 1 can be coupled either on-line or off-line, on one or both faces, with a layer 5 of an auxiliary preforming material. In the off-line situation, this layer 5 is applied on an unloading or resining plane 55, for allowing the subsequent preforming operation without damaging the bitumen. Namely this latter, when heated, becames nearly fluid, and could not be properly worked due to its adhesion to the surfaces of the preforming mold or die and to an uneven distribution, with consequent unpredictable variations of the initial density of the bituminous sheath 1, that would yield a rejected article.

During the preforming operation, the preforming auxiliary material 5 adheres to the bitumen and further to prevent dirtying the mold or die surface, it becomes integral with the bituminous sheath 1 thus ensuring the dimensional stability thereof after the preforming operation.

When the final article has to exhibit an improved dimensional stability, it can be treated either on-line or off-line with resins of elastomeric copolymers in a water emulsion (layer 4).

The preforming is accomplished by a press 60, which can be a mechanical, pneumatic or idraulic press, and capable of applying a suitabe thrust for preforming the bituminous sheath 1 in the mold or die with which the press is equipped.

The preforming mold or die is formed from a metal plate or a fiber-glass reinforced resin, or aluminum or any other suitable material, and is provided with clamps (not shown) to hold the material to be formed, and with a cooling chamber to ensure a constant and gradual cooling of the formed article, which in turn leads to dimensional stability in time. A plurality of molds or dies can be foreseen, with the molds or dies alternating in a preforming station to increase the plant productivity.

The finished article is then peripherally trimmed, either on-line or off-line, manually or automatically by means of a cold cutting machine.

The accessory according the invention is applied using a propane-gas burner flame, preferably the same which is already used to fix the bituminous sheath. The disclosed structure can be used as an agle or corner member in the following ways:

1. as a first waterproof layer for the connection to the subsequent bituminous membrane realising the covering or roofing;
2. as finishing for corners or edges;
3. as intermediate layer between two different layers of bituminous membranes.

Claims

1. A multilayer preformed structure for use in the building construction accessory field for sealing coverings and roofings, characterized in that it comprises a bitumen-based blend layer (1) embedding a framework (2), and a layer (5) of a preforming auxiliary material which forms the external layer thereof.

2. A structure as claimed in claim 1, characterized in that said layer (5) consists of a material selected from the group of continuos yarn, nonwoven polyester staple, polypropylene, polyamide, paper, fabric.

3. A structure as claimed in claims 1 or 2, characterized in that it further comprises an additional resin layer (3) of elatomeric copolymers in a water emulsion between the blend layer (1) and the preforming layer (5).

4. A structure as claimed in claim 3, characterized by providing a further additional layer (4) comprising a binder, located between the additional resin layer (3) and the preforming layer (5).

5. A structure as claimed in claims 1 to 4, characterized in that said blend layer (1) comprises an elastomeric and/or plastomeric blend based on distilled bitumen, atactic polipropylene, isotatic polipropylene and polyolefine elastomers, said elastomeric and/or plastomeric blend (1) being charged with calcium or chalk carbonate.

6. A structure as claimed in claims 1 to 4, characterized in that said blend layer (1) comprises a blend of distilled bitumen and thermoplastic rubber formed by a radial styrol butadiene block copolymer.

7. A structure as claimed in claims 3 to 6, characterized in that said resin layer (3) is formed by elatomeric copolymers in a water emulsion.

8. A structure as claimed in claim 7, characterized in that said water emulsion comprises a styrol butadiene metiol acrylamide elastomeric copolymer.

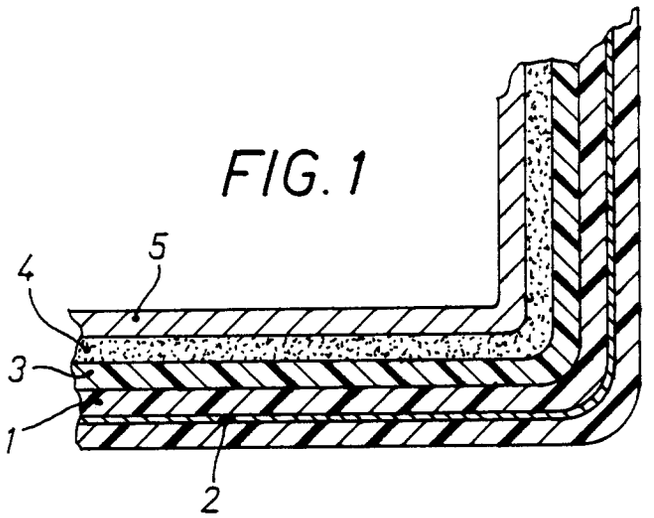
9. A building construction accessory incorporating a structure as claimed in any of claims 1 to 8, and formed as one selected from the group formed by an outside corner, a plain corner, a pipe union member, a pipe ventilator member, a cone, an inside corner, a joint covering member.

10. A process for manufacturing a multilayer structure according claims 1 to 8, characterized by the steps of:

a. positioning a bituminous sheath (1) with an embedded framework (2) on a loading plane (45);
b. applying one or more additional layers;

c. heating the so formed layered article in a radiating furnace (50) to soften the bitumen at a level such as to allow the stretching of the layered article in a mold or die.

FIG. 1



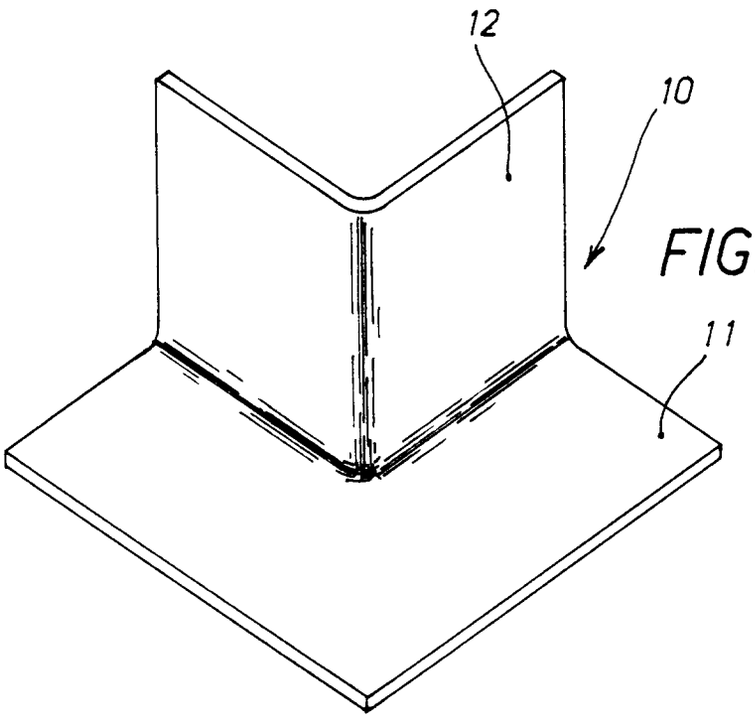


FIG. 2

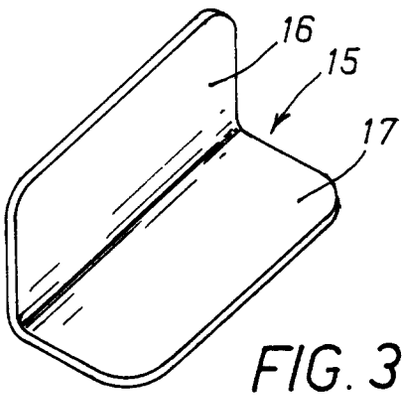


FIG. 3

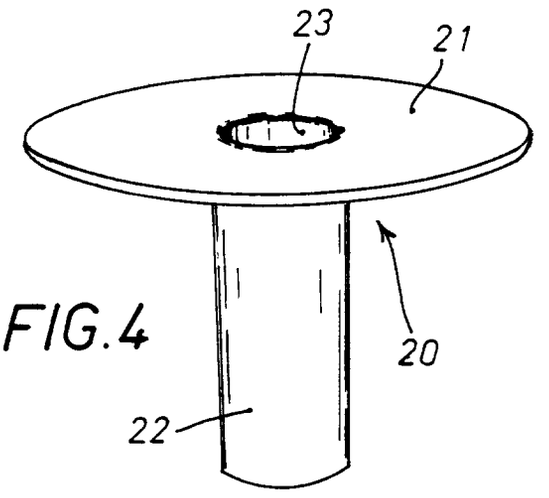


FIG. 4

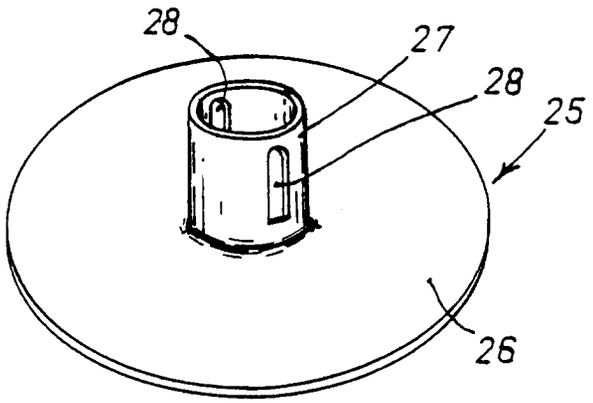


FIG. 5

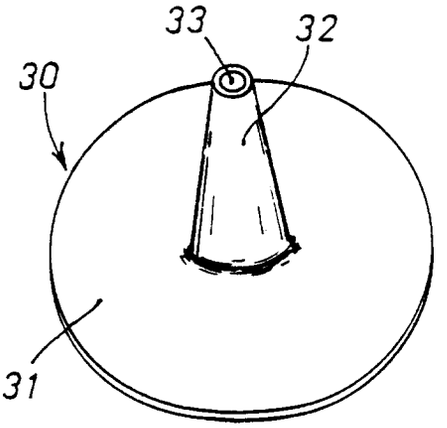


FIG. 6

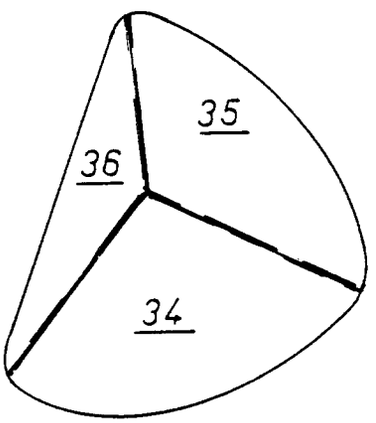


FIG. 7

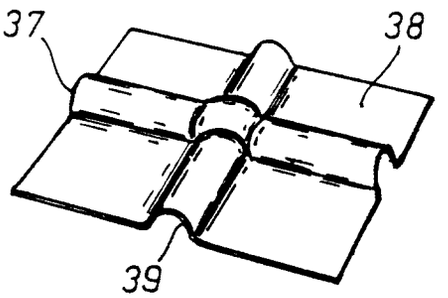


FIG. 8

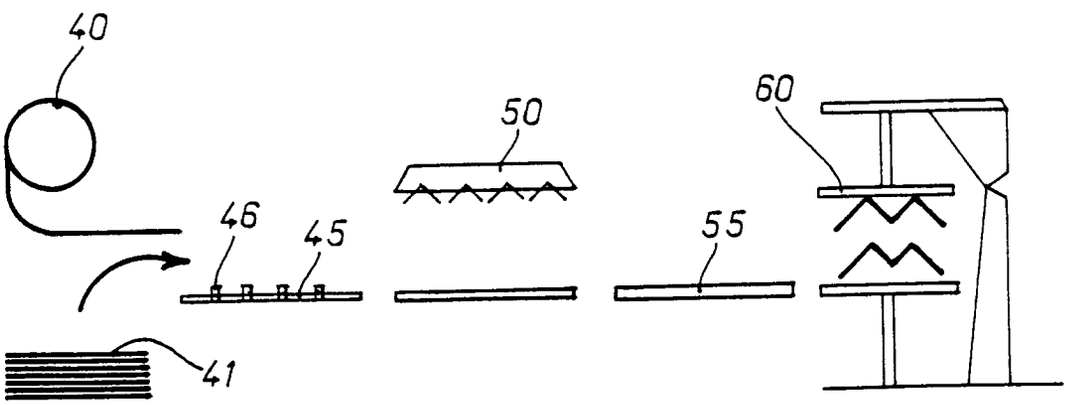


FIG. 9