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Scholander

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[54] **BUILDING ELEMENT**

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Related U.S. Application Data

[63] Continuation of Ser. No. 702,674, Feb. 2, 1968, abandoned.

[52] **U.S. Cl.**..... **161/36,** 52/625, 156/71, 156/157, 161/48, 161/118, 161/135, 161/149, 161/151

[51] **Int. Cl.**..... **B32b 3/02,** B32b 3/16, B32b 3/28, B32b 15/14, B32b 17/02

[58] **Field of Search**.....161/36–38, 41, 133, 161/135, 151, 145, 169, 157, 159, 160, 161/48, 118, 44, 149; 52/518, 519, 539, 52/556, 625, 520, 537, 540; 156/62.2, 71, 156/157, 159, 304

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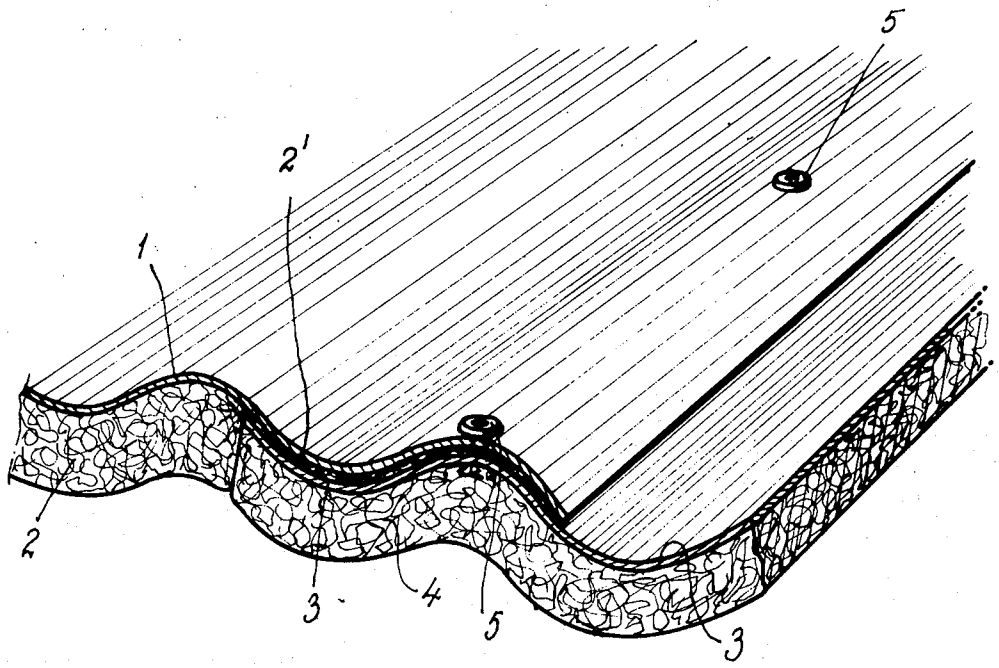
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[57] **ABSTRACT**

A building element for roofing and walls wherein a rigid sheet material is covered on one side with a moisture retaining porous glass fiber layer having a uniform thickness of 0.4 to 1.0 mm. The building element may be either even or corrugated. The invention is especially directed to a roofing element wherein a corrugated sheet metal element is covered by a porous glass fiber layer having a thickness of 0.5 to 1.0 mm.

5 Claims, 2 Drawing Figures



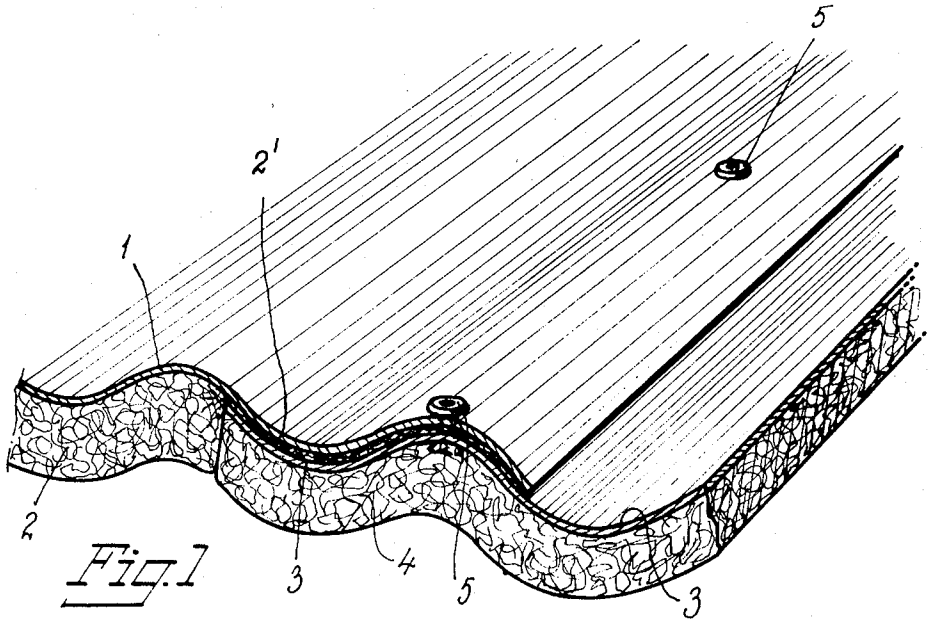


Fig. 1

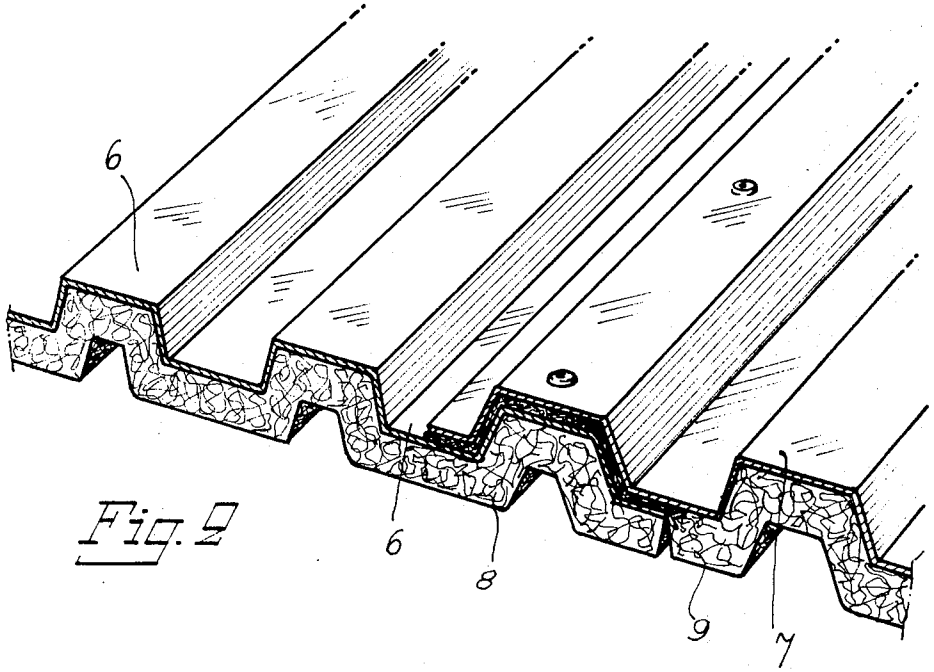


Fig. 2

BUILDING ELEMENT

CROSS RELATED APPLICATION

This application is a continuation of my earlier Application Ser. No. 702,674 filed Feb. 2, 1968 and now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to buidling elements, and more especially to building elements intended for roofs and walls in single layer.

In the building of uninsulated, so called "cold" warehouses, stores and covered sport courts etc., is used mostly corrugated material and especially corrugated sheet metal. For economic reasons a single layer of sheet metal is preferred but under certain weather conditions, especially at temperatures of around 0° C during spring and autumn, a troublesome water condensation appears with the subsequent inconvenience that the water drips from the roof or runs down the sides of the walls. This dripping is often of such inconvenience that the goods stored in the warehouse or store must be covered with tarpaulins.

SUMMARY OF INVENTION

The present invention eliminates the above problems by the provision of a building element especially intended for roofing and walls comprising a rigid water impervious base sheet having an outer surface adapted for exposure to the environment externally of the guilding, the opposite building, of said sheet which is inside the building being lined with a moisture retaining porous glass fiber layer having a uniform thickness of 0.4 to 1.0 mm.

According to the invention it has surprisingly been found that the dripping of condensation water can be effectively prevented by the use of a porous glass fiber layer having a thickness of 1.0 mm as a maximum and which can be reduced to 0.5 mm or even 0.4 mm as a minimum. A glass fiber layer especially suitable for this purpose is composed of glass staple fibers having an average diameter of 10 to 12 microns.

Said glass fiber material is easy to glue to sheet metal, even if the sheet metal is corrugated. Due to the great porosity, any condensation water is well retained. On account of the porosity, the material also dries quickly because of air circulation. The glass fibers as such are not hygroscopic, i.e., they lack the ability to absorb moisture themselves; therefore a glass-wool layer which has become saturated by moisture condensed from the air, on drying resumes its original properties.

It is therefore an object of this invention to provide a building element for roofing and walls in a single layer and of such construction that, as water condenses from the moist air, the water is retained and is prevented from dripping from the roof or running down the walls. A further object of the invention is to provide a corrugated roofing element capable of retaining condensing water and thus preventing dripping of water from the underside of the element.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which :

FIG. 1 is a perspective view of two building elements according to the invention, of sinusoidal shape, and

FIG. 2 is a perspective view of two building elements according to the invention, of trapezoidal shape.

In FIG. 1 there is shown a roofing element consisting of a corrugated roofing sheet 1 and, bonded to its underneath side, a glass fiber layer 2 (shown on enlarged scale). The roofing sheet 1 is in overlapping relation at a joint 2' with a similar roofing sheet 3 having a glass-fiber layer 4 bonded to its underside. The glass fiber layer has such a small thickness that it does not need to be removed from the underside of the overlapping sheet 1. The roofing sheets are attached in a suitable way, e.g., with rivets 5.

FIG. 2 shows another embodiment where the roofing sheets 6, 7 are trapezium-shaped in cross-section. The glass fiber layers are designated by numerals 8 and 9 respectively and shown on enlarged scale.

Test specimens according to the invention were examined with respect to the formation of condensing water and dripping thereof under varying weather conditions with and without a glass fiber layer having a thickness of 0.5 and 1.0 mm, respectively, glued to the underside of the roof. The properties of such roofs were compared with roofs of corrugated asbestos cement, this because a roof of corrugated asbestos cement overcomes the dripping problems, which is not the case with roofs made of bare sheet metal.

The investigations were performed as comparative laboratory tests on various roof structures under extreme climatic conditions. Thus, for instance, the air temperature under the roof was varied from +12° C to +25° C whereas the temperature of the air above the roof or at the top surface of the roof C varied from 0° to −5° C. The condensation problem was studied for two relative humidities indoors, namely 60–70 percent and 100 percent (extreme case), and without ventilation.

The tests were performed in a specially constructed climate chamber for simultaneous testing of six roof profiles each having a roof surface of approximately 370 × 800 mm, and with slopes varying between 0° and 15°.

In the course of the experiments, temperature variations were registered continuously by means of thermocouples at the top and undersides of the sheet and in the space at a distance below the test roof. An examination revealed that, when incipient dripping of water was observed, the metal sheet coated with a glass fiber layer is capable of retaining essentially more water than the bare metal sheet and, accordingly, the fibrous layer increases substantially the moisture retaining capacity of the sheet. Moreover, it was found that the moisture absorption of the sheet depends on the thickness of the fibrous layer, the absorption capacity being larger for a thickness of 1.0 mm than for 0.5 mm.

Initially the condensation of moisture at the underside of the roof proceeds relatively rapidly and decreases thereafter. If the sheet is uncoated, dripping occurs after 2–5 hours depending on the slope of the roof, i.e., at a slope of 0° after 5 hours and at a slope of 10° after 3 hours. In the case of sheet metal coated with a glass-fiber web the condensation of moisture occurs relatively rapidly to saturation of the fibrous coating with condensed water. Thereafter, a state of equilibrium is established with a very small condensation rate, and without formation of droplets.

Not even under extremely unfavorable conditions (100 percent relative humidity and no ventilation) could any dripping from the glass-fiber coated sheet be

observed whereas, in the case of the bare sheets, a vigorous dripping and running water could be observed.

Moreover, the laboratory testing of uninsulated, glass-fiber coated sheet metal roofs evidenced their superiority with respect to their ability of retaining condensed moisture. The tests were performed under extreme conditions with a substantial temperature difference between the top and underside of the roof and, moreover, the space below the roof was not ventilated.

The building element according to the invention is preferably intended as a roofing element, although it is of course also possible and conceivable to use it as a wall element. The glass fiber layer used as the inner lining of the building element is non-imflammable, a quality which in this case is necessary since the building elements are intended for use in warehouses, stores etc., where fire risk exists. Most suitable as corrugated roofing material is galvanized sheet with a thickness of 0.6 mm or aluminum sheet with a thickness of, for example, 0.7 mm. Other corrugated materials can also be used, e.g., corrugated sheets of synthetic resins. The corrugations may be sinusoidal, trapezium shaped or shaped as in a so-called through-type sheet.

While the invention has been described in connection with the drawings as, respectively, corrugated and trapezium wave shaped building elements, especially roofing elements, the invention is not restricted solely to this, but also extends to building elements consisting of even sheet materials, e.g., an even metal sheet having a glass fiber layer glued thereto.

Finally, as an important advantage of the building element according to the invention it should be observed that it can be pre-fabricated in a factory, which entails an important saving of time and labor on the building site, i.e., a not unimportant reduction of the total costs.

Although the foregoing embodiment has been described in detail, there are obviously other embodiments which can be made by a person skilled in the art without departing from the spirit, scope or principle of this invention. Therefore, this invention is not to be limited except in accordance with the scope of the appended claims.

What is claimed is:

1. A building structure comprising a rigid base sheet having an outer surface exposed to the ambient atmosphere outside the building, and a moisture-retaining porous glass fiber layer having a uniform thickness of 0.4 to 1.0 mm connected to the opposite surface exposed to the interior of the building.

2. A building structure as claimed in claim **1** wherein said base sheet is corrugated.

3. A building element as claimed in claim **1** wherein said base sheet is metal.

4. A structure as claimed in claim **1** wherein two of said sheets with their respective glass fiber layers are overlapped in edge-to-edge relation to form a joint, the fiber layer of one sheet being interposed and compressed between both base sheets.

5. A structure as claimed in claim **1** wherein the glass fibers of said layers have an average diameter of 10–12 microns, said glass fiber layers being compressible to a fraction of their thickness when compressed between two base sheets at a joint between the sheets.

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