

SPECIFICATION

Sag Proof Fibrous Materials Useful for Roofing or Siding, and Method for the Production Thereof

The present invention relates to the production of sag proof bituminous fibrous materials, which may be shaped, as well as the resulting novel materials.

5 It is now conventional to choose for roofing or siding works, among the range of available materials, bituminous and possibly shaped fibrous materials, and especially bituminous, shaped cellulosic materials. 5

Said bituminous materials, which are preferably also coloured, can be produced either by continuous or intermittent dipping of previously dried shaped materials into a hot bitumen bath, or by a novel method (disclosed in more details in French Patent application filed on June 21, 1979 in the name of the applicant under No. 79/15,992) which essentially comprises a step of impregnation under vacuum, advantageously effected on shaped elements of material to be impregnated which are gathered into a compact bundle and, if so desired, cooling the impregnated elements by immersion into hot water, said cooling step being followed, also if so desired, by further exposition to vacuum of the impregnated shaped elements obtained after said immersion step. 10 15

However, irrespective of the manner in which they are produced, bituminous fibrous materials have at present a strength which may in some cases be insufficient when subjected to a moist atmosphere or to condensation. Roofing or siding elements of this type, when stored or installed and subjected to high moisture or condensation, will undergo substantial softening and pronounced, quite objectionable sagging. 15 20

Therefore, the need was acutely felt for the obtention of roofings and/or sidings that would be substantially distortion free in normal conditions of use, even in a moist atmosphere, to provide bituminous fibrous materials which would not be liable to sagging induced by hygrometric variations or by pronounced condensation on one of their surfaces.

25 To this end, tests were performed in fact on numerous substances incorporated as additives in the body of, or on the surface of shaped bituminous fibrous materials. Said substances were, for example, resins of the thermoplastic type, acrylic compounds and vinylic compounds (acetates and chlorides), among others. 25

However, these proved to be ineffectual, either because they were in fact detrimental to the mechanical properties, or because they caused unsatisfactory sweating of the material after the latter was impregnated with hot bitumen, or else because their industrial use was difficult or their cost too high. 30

There was then found unexpectedly that sag proof roofing or siding materials can be produced by incorporating into bituminous fibrous, especially cellulosic material, which may be shaped and/or coloured, either on the surface of, or in the body of the fibrous material at least one thermosetting or thermally cross-linking resin in an amount ranging up to 10%, and preferably only up to 4—5% of the weight of the dry fibrous material before impregnation thereof with bitumen. 35

Thus, the prime object of the invention is to provide a method comprising, in a conventional process for manufacturing fibrous materials, especially cellulosic materials, which may also be shaped and/or coloured, and are intended to be subsequently impregnated with hot bitumen, the step of incorporating on the surface or in the body of such a fibrous material at least one thermosetting or thermally cross-linking resin in an amount ranging up to 10%, and preferably only up to 4—5% of the weight of the dry fibrous material before impregnation thereof with bitumen. It will be understood that where the fibrous material is impregnated with the resin prior to being bituminized, the surface here referred to will not necessarily form the outer surface of the fibrous material after being bituminized. 40 45

The lower the amount of introduced resin, the smaller the effect produced. On the other hand, above about 10% by weight, unsatisfactory bitumen sweating will occur if resin-impregnated elements are then impregnated in a hot bitumen bath.

In practice, any thermosetting or thermally cross-linking resin may be used. In particular, use may be made with fully successful results of melamine thermosetting or thermally cross-linking resins, and especially of those known under the names of Lamelite (commercialized by Montedison) or of Ucar (commercialized by Union Carbide). 50

The thermosetting or thermally cross-linking resins thus used, either alone or together with suitable conventional curing catalysts, may be either in the liquid state (as it is the case for Ucar melamine resins), or in the solid state (as it is the case for resins of the Lamelite series, which are powders to be dissolved before use in water in an amount of about 30—60% on a weight basis). The advantage of solid resins (particularly under the form of a powder to be dissolved in water just before use) is that they are easy to store and unaffected by freezing temperatures, and that they do not undergo parasitic cross-linking due to aging. 55

60 It is indeed already known to use melamine resins in the paper industry, but for the purpose of, and in amounts adapted for treating the paper so as to make it more resistant to water by inter-binding the cellulose fibers, but without improving its sag proof properties, which besides are by no way sought, the purpose being quite the contrary. 60

On the contrary, according to the invention, it is in fact a dimensional property which can be improved by the resin addition.

The invention is more specifically illustrated with reference to figures 1 and 2 of the accompanying drawings of which detailed description will be given hereunder.

Basically, the addition of the aforesaid resin amount may be effected at any stage of manufacture of the material, and principally before impregnating the latter with hot bitumen.

However, it was found unexpectedly that, while the addition can be made at various stages, it seems that the best results, by far, are obtained when the addition is effected either before or after the device for pressing the still unbituminized, wet, fibrous material plate being manufactured, with a more marked preference for an addition effected immediately after said pressing device.

The addition of the suitable amount of resin at this step can be made by any suitable known means whereby such a resin can be introduced on the surface of, or in the body of a wet fibrous, especially cellulosic, material, and particularly by spraying or coating of said material.

It was ascertained that addition at a stage prior to the manufacture of said material, i.e. prior to the stage where an initial quantity of moisture is sucked off to form a wet plate already endowed with some strength, will lead to most unsatisfactory results, since the resin will then encounter a very wet lump and will precipitate and clog the pores at the surface of the material.

Similarly, such an addition made on the device effecting the aforesaid suction will lead to poor results.

Finally, an addition at a stage subsequent to the fibrous material drying step, the latter step being itself subsequent to the pressing step and to a possible shaping step for forming the desired sections, if required, will bring forth very bad results, since the unbituminized, hot fibrous material will then cure the resin at the surface and prevent impregnation.

Another object of the invention is to provide bituminous possibly shaped, fibrous materials which thus contain, either in the body of, or on the surface of said fibrous material, at least one thermosetting or thermally cross-linking resin in an amount ranging up to 10%, and preferably only up to 4—5% of the weight of the dry fibrous material before impregnation thereof with bitumen.

The process for producing a bituminous, possibly shaped and/or coloured, fibrous material, which is attended by said resin addition according to the invention, may be any suitable process known in the art, and especially of the type disclosed, or including the embodiments disclosed, in French patents and patent applications Nos. 1,487,419; 70,03,741; 76,16,263 and first certificate of addition thereto No. 78,14,039; and 79,15,992, all filed in the name of the applicant.

At all events, the method according to the invention affords, during the drying step conventionally provided at the end of a process for manufacturing a substantially dry fibrous material, intended to be subsequently impregnated with hot bitumen, an initial cross-linking of the resin, which may be induced by the catalyst if the same is used:

The invention is more specifically described in the following examples, given by mere way of illustration.

Example 1

By following the procedure described in French Patent No. 1,487,419, and combining therewith the method according to the invention, there was prepared corrugated plates of bituminous cellulosic board of 2 m x 0.90 m (this corresponding to a developed width of 1.10 m) having a weight of 3.1—3.2 kg. Each of said plates included on the surface of the cellulosic material a respective quantity of 150 or 200 g (according to the plates) in dry weight of a melamine resin of the Lamelite type (commercialized under this trade name by Montedison) dissolved with water to a concentration of about 35%.

The application of resin per se was effected by spraying onto one face of each plate, immediately after subjecting the latter to the pressing step according to the method of French Patent No. 1,487,419.

Said plates, which were thereafter impregnated with bitumen according to the method of French Patent Application No. 79,15,992, were then subjected to tests on a condensation tank, with due consideration to the normal direction in which such plates are conventionally installed as roofing material, that is by arranging the face underlaid with resin on the lower side, exposed to moisture.

The results obtained were plotted as the various curves of appended Fig. 1. To measure the degree of sagging of the respective plates—the serial numbers of said measurements being plotted as abscissae, while the sagging in millimetres is plotted as ordinates—the procedure was as follows:

—measurements were effected from Monday to Friday included, at the rate of two measurements per day, viz. one at 8 a.m. and the other at 4 p.m.;

—the plates were held during 5 weeks, Saturdays and Sundays included, above a condensation tank with a span of 90 cm.

The plates designated by the reference numbers of the curves were respectively as follows:

	No.	Type of Plate	
	16	reference plate	
	17	similarly manufactured plate, but including about 150 g per plate of Lamelite C. Industrie resin.	
5	15	similarly manufactured plate, but including about 200 g per plate of Lamelite C. Industrie resin.	5
	20	reference plate	
	21	similarly manufactured plate, but including about 150 g per plate of Lamelite C. Industrie resin.	
10	19	similarly manufactured plate, but including about 200 g per plate of Lamelite C. Industrie resin.	10

Example 2

The various plates of example 1 were re-used and subjected to aging tests, which are therefore prolongations of the tests relating to the behaviour above a condensation tank, the results of which are shown on Figure 1. 15

These aging tests consisted in subjecting the plates bearing the same respective reference numbers as set forth in Example 1, to condensation during the five working days of a week above the condensation tank, then removing said plates and putting them to dry at the laboratory room temperature during the two week-end days following the five working days, and repeating these sequential steps for several consecutive weeks. 20

The results obtained are shown on appended Fig. 2 (wherein the abscissae and ordinates have the same meanings as in Fig. 1), which further shows that by the treatment according to the invention, sagging is substantially avoided.

Claims

- 25 1. A method for producing bituminous fibrous materials, which may be shaped and/or coloured, that are not liable to sagging induced by hygrometric variations or by condensation, comprising the steps of incorporating on the surface of, or in the body of such a fibrous material at least one thermosetting or thermally cross-linking resin, in an amount ranging up to 10% of the weight of dry fibrous material before impregnation thereof with bitumen. 25
- 30 2. A method according to claim 1 wherein said resin is present in an amount up to 4—5% of the weight of dry fibrous material before impregnation thereof with bitumen. 30
3. A method according to claim 2 or claim 3 wherein said fibrous materials are cellulosic materials.
- 35 4. A method according to any of claims 1 to 3 wherein the resins used are melamine resins. 35
5. A method according to any of claims 1 to 4 wherein the resin addition is effected immediately after pressing the still unbituminized, wet fibrous material being manufactured.
6. A method according to any of claims 1 to 5 wherein the resin addition is effected by spraying or coating.
- 40 7. Bituminous fibrous material, which may be shaped and/or coloured, including, either in the body of, or on the surface of said fibrous material, at least one thermosetting or thermally cross-linking resin in an amount ranging up to 10%, of the weight of dry fibrous material before impregnation thereof with bitumen. 40
8. Bituminous fibrous material according to claim 7 wherein said resin is present in an amount up to 4—5% of the weight of dry fibrous material prior to impregnation thereof with bitumen.
- 45 9. Bituminous fibrous material according to claim 7 or claim 8 characterized in that the fibrous material is cellulosic. 45
10. Bituminous fibrous material according to any of claims 7 to 9, characterised in that said resin is a melamine resin.
- 50 11. A method for producing bituminous fibrous material substantially as hereinbefore described. 50
12. Bituminous fibrous material substantially as hereinbefore described.

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	16	reference plate	
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- 30 2. A method according to claim 1 wherein said resin is present in an amount up to 4—5% of the weight of dry fibrous material before impregnation thereof with bitumen. 30
3. A method according to claim 2 or claim 3 wherein said fibrous materials are cellulosic materials.
4. A method according to any of claims 1 to 3 wherein the resins used are melamine resins. 35
- 35 5. A method according to any of claims 1 to 4 wherein the resin addition is effected immediately after pressing the still unbituminized, wet fibrous material being manufactured. 35
6. A method according to any of claims 1 to 5 wherein the resin addition is effected by spraying or coating.
7. Bituminous fibrous material, which may be shaped and/or coloured, including, either in the body of, or on the surface of said fibrous material, at least one thermosetting or thermally cross-linking resin in an amount ranging up to 10%, of the weight of dry fibrous material before impregnation thereof with bitumen. 40
8. Bituminous fibrous material according to claim 7 wherein said resin is present in an amount up to 4—5% of the weight of dry fibrous material prior to impregnation thereof with bitumen.
- 45 9. Bituminous fibrous material according to claim 7 or claim 8 characterized in that the fibrous material is cellulosic. 45
10. Bituminous fibrous material according to any of claims 7 to 9, characterised in that said resin is a melamine resin.
11. A method for producing bituminous fibrous material substantially as hereinbefore described.
- 50 12. Bituminous fibrous material substantially as hereinbefore described. 50

