

UNITED STATES PATENT OFFICE

MAX H. KLIEFOTH, OF MADISON, WISCONSIN, ASSIGNOR TO C. F. BURGESS LABORATORIES, INC., OF MADISON, WISCONSIN, A CORPORATION OF DELAWARE

FIBROUS PRODUCT AND METHOD OF MAKING THE SAME

No Drawing.

Application filed June 21, 1930. Serial No. 462,924.

This invention relates to a method of making a composite product composed of a fibrous material and a binding material. The fibrous product may be in the form of loose pads or it may be in the form of hard, dense, water-repellent compositions or of intermediate densities. Board or other shapes may be produced. My process is especially suitable for the making of fibrous mats or boards used for embossing.

At the present time there are several methods used to make fibrous products containing a binding substance such as pitch, asphalt, and the like. One method consists in fabricating the fibrous product and then saturating it by immersing it in a hot molten bath of the binding substance. This method is unsatisfactory for many purposes as the saturating material does not penetrate the fibrous product thoroughly. In recent years asphalt and pitch emulsions have been used to produce a product of this type. The emulsion is mixed with the paper pulp or other fibrous product in the beater and the mixture of pulp and emulsion may either be run over a suitable paper machine in the usual manner or the pulp may be molded. Such emulsions, however, are expensive. In the Weiss Patent No. 1,461,337 a method is described and claimed wherein a mixture of fibrous material and a hard, solid pitch or other binder is shredded in a suitable shredder and the intimate mixture of shredded pulp and binder, after screening, is laid down on a screen in the form of a blanket and then subjected to heat and pressure to form a wall-board and to simultaneously melt the binder to saturate the fibers. In the method disclosed and claimed in the Weiss Patent 1,737,282, the powdered binder, such as pitch and asphalt, is sprinkled onto a wet pulp web coming from the wet end of a paper machine. The combined wet pulp web and powdered binder is then fabricated into the desired product. On heating and pressing the binder melts and saturates the final product. All of these methods have advantages for certain purposes.

I have discovered a novel method for introducing the binder into the fibrous product

which has certain advantages which will become apparent as the description progresses. It has the decided advantage of lowering the cost over the competing methods which are now in commercial use.

In carrying out my invention the fibrous material and binding agent are preferably mixed in a shredder which pulverizes the binder and shreds the fibrous material into a mass of fibers intimately mixed with small particles of binder. The fibers leaving the shredder have the fine particles of the binder attached to them so that they are not easily separated therefrom. This intimate mixing may also be accomplished though not as efficiently by first shredding the fibrous material and powdering the binding material to a fine powder. These two substances are then thoroughly mixed in order to secure the intimacy of contact needed. Although I may use wood waste in the form of shavings, sawdust, chips, cork or the like as the fibrous material, I prefer to use paper pulp, cotton, or similar high-grade fibrous material. For embossing boards and especially where deep embossing is required, I prefer a long fibered stock such as kraft pulp. It is also possible to use fibrous material not of a cellulosic nature such as hair and asbestos. As the binding agent I may use pitch-like materials such as solid coal-tar pitch, asphalt, rosin, certain waxes and combinations thereof, or similar water-repellent materials, or any other suitable binding material which melts at a temperature not destructive to the fibrous material. The fibrous material is substantially dry, preferably containing 10% or less of moisture. The fibrous material and binder are each placed in the shredder or other suitable mixing machine in a substantially dry and solid condition and the shredding or mixing operation produces an intimate mechanical admixture of the two materials. At the same time, it shreds the woody or other fibrous materials to more or less separate the individual fibers, and pulverizes the binding agent. For reasons which will become apparent hereinafter, it is desirable to add the binder to the shredder in granular form so that it will be practi-

cally entirely powdered during the shredding operation. If the shredder warms up sufficiently to cause the binder to ball up, it may be kept cool by means of an air stream passing through it with the material being shredded.

After the shredding or mixing operation, the mixture of fibrous material and binding agent is preferably screened to separate the particles of binding agent which are still too coarse to adhere to the fibers. During the shredding operation the finely divided binding agent becomes attached sufficiently to the fibers to prevent a separation during the subsequent operations. The screen is sufficiently fine to retain practically all of the fibers but allows the non-adhering particles of binding agent and a few fibers to pass through. If the pieces of binder are too large when they are fed to the shredder then some of the particles coming from the shredder will be too coarse to pass through the screen and will be retained with the fibers. Although continued shredding breaks down the large particles it also cuts up the fibers which is undesirable. The material passing through the screen may be returned to the shredder.

The fibrous material passing through the shredder and which has been suitably pulverized and shredded and in accordance with this invention may be conveyed directly to a tank in which it may be suspended in water. I prefer, however, to pass the mixture of fibers and adhering binding material through an oven heated to such a temperature that the binding material becomes slightly softened and adheres more firmly to the fibers. The product should not be heated to such a temperature that the entire mass sticks together or to such a temperature that the fibers become brittle. The heating of the mixture of fibers and binding substance to effect better adherence between the two prevents losses of binding substance in the subsequent operation.

Although it is possible to use the intimate mixture of shredded fibers and binder directly to form boards, etc., I find that the binding substance tends to stick to the mold or faces of the press. This sticking tendency is overcome by using a wet mixture of fibers and binder. By my process I can form water suspensions of mixed fibers and binder at a low cost, and thus avoid the use of the expensive pitch or asphalt emulsions of prior processes.

In carrying out this process, the screened, intimate mixture of fibrous material and binding agent is suspended in water. A paddle mixer may be used in forming the suspension. To put the fibrous mixture in better condition for running over the wet end of a paper machine it is desirable to give

the mixture a light beating, sometimes called "combing".

This combing prevents the segregation of bunches of the mixed fibrous material and results in a uniform suspension which is necessary to obtain the best results. If the particles of binder do not adhere sufficiently to the fibers during the beating operation, these particles become detached, settle to the bottom, and are lost in the waste water. As previously described, this loss is decreased by heating the intimate mixture of fibers and binding agent to effect better adherence. After thus combing the product it may be utilized in several ways.

The suspension or slurry of the mixture of fibers and binding agent may be run onto a suction screen as in pulp molding operation. The molded article after drying may be heated to melt the binding substance and to thoroughly saturate the fibers to secure the maximum of water resistance. Pressure also may be used with or without heat to densify the final product. The suspension of fibers and binding substance may be used to form wall and insulating boards, insulating pads and the like.

I prefer, however, to utilize the suspension of fiber and adhering binding substance in a paper machine and form fibrous products therewith. After drying, these fibrous products may be heated to still higher temperatures if necessary to melt the binding substance and saturate the fibers to form a water-repellent product. A dense product is formed by applying pressure during or after the saturating operation. The suspension as described is especially suitable for use with the machine described in the Weiss Patent 1,737,283 to form the various fibrous products and especially some of the products claimed and described in Weiss Patent 1,737,282. The resulting product may be left in the form of a porous absorbent pad which may subsequently be pressed as previously described to form a dense, hard, water-repellent board. After heating and compressing the board, it is allowed to cool and it may then be cut to any desired dimensions.

It is desirable for some purposes and especially for embossing boards to have clay or other similar filler in the stock. I have found that the filler may be added to the mixture of fibrous material and binding material prior to or during the shredding operation to be thereby intimately mixed therewith. The filler also may be added in the beater or paddle mixer. The filler, binder and very short fibers form the plastic material which must be present in embossing stock. The filler is preferably added during the shredding operation since this produces a more intimate mixture with the fibers and binding agent and furthermore helps prevent the binder from adhering to the shredder and screen.

Where the final product must be harder and the surface must be smooth, these properties may be obtained by introducing sodium silicate into the stock. The sodium silicate as
 5 such may be used or it may be precipitated by means of alum as is well known to those skilled in the paper making art. The sodium silicate preferably is added to or precipitated in the pulp slurry.

10 I claim:

1. The method of manufacturing a fibrous product which comprises heating an intimate mixture of fibers containing not more than 10 per cent moisture and finely-powdered,
 15 adhering, solid fusible binder sufficiently to cause said binder to adhere more firmly to said fibers, suspending said mixture of fibers and binder in water, and forming a fibrous product from the wet pulp thus produced.

2. The method of manufacturing a water-resistant fibrous product which comprises heating an intimate mixture of cellulosic fibers containing not more than 10 per cent
 25 moisture and finely-powdered, adhering, fusible, pitch-like, solid water-repellent binder sufficiently to cause said binder to adhere more firmly to said fibers, beating said mixture of fibers and binder while suspended in water, forming a moist web from the pulp suspension thus produced, forming a
 30 product from said web, heating said product to remove moisture, and compressing said product while hot to densify it and to saturate the fibers with said binder.

3. The method of manufacturing a fibrous product which comprises shredding fibrous material containing not more than 10 per cent moisture with a solid fusible binder to
 40 produce an intimate mixture, heating said mixture sufficiently to cause said binder to adhere more firmly to said fibers, suspending said mixture in water, forming a fibrous product from the wet pulp thus produced, and drying said product.

4. A method of manufacturing a fibrous product which comprises shredding fibrous material containing not more than 10 per cent moisture with a solid fusible binder to
 50 produce an intimate mixture, removing the coarse particles of said binder therefrom, heating said mixture sufficiently to cause said binder to adhere more firmly to said fibers, suspending said mixture in water, and forming a fibrous product from the wet pulp thus produced.

5. The method of manufacturing a fibrous product which comprises shredding fibrous material containing not more than 10 per cent moisture with a solid fusible binder to
 60 produce an intimate mixture, suspending said mixture in water, and forming a fibrous product from the wet pulp thus produced.

6. The method of manufacturing a fibrous product which comprises shredding a mix-

ture of cellulosic fibrous material containing not more than 10 per cent moisture, filler, and a solid fusible binder to produce an intimate mixture, suspending said mixture in water, and forming a fibrous product from
 70 the wet pulp thus produced.

7. The method of manufacturing a fibrous product which comprises shredding fibrous material containing not more than 10 per cent moisture with a solid fusible binder to
 75 produce an intimate mixture, beating a suspension of said mixture in water, forming a moist web from the pulp suspension produced, and forming a product from said web.

8. The method of manufacturing a fibrous product which comprises shredding fibrous material containing not more than 10 per cent moisture with a solid fusible binder to
 80 produce an intimate mixture, heating said mixture sufficiently to cause said binder to soften and to adhere more firmly to said fibers, suspending said mixture of shredded fibers and binder in water, forming a moist web from the pulp thus produced, forming a product from said web, heating said prod-
 85 uct to remove the moisture and to saturate the fibers with said binder.

9. The method of manufacturing a fibrous product which comprises shredding fibrous cellulosic material containing not more than
 95 10 per cent moisture with a solid fusible pitch-like binder to produce an intimate mixture, removing the non-adhering particles of said binder therefrom, suspending said mixture in water, and forming a fibrous product from
 100 the wet pulp thus produced.

10. The method of manufacturing a dense fibrous product which comprises shredding paper pulp containing not more than 10 per cent moisture with a solid fusible, pitch-like,
 105 water-repellent binder to produce an intimate mixture, heating said mixture sufficiently to cause said pitch-like binder to soften and adhere more firmly to said fibers, beating a suspension of said mixture in water, forming a
 110 moist web from the pulp suspension thus produced, forming a product from said web, heating said product to remove moisture and compressing said product while hot to densify it and to saturate the fibers with said binder.

11. The method of manufacturing a dense, fibrous product which comprises shredding kraft paper pulp containing not more than 10 per cent moisture with a solid fusible, pitch-like, water-repellent binder to produce an intimate mixture, screening said mixture to re-
 120 move the non-adhering particles of said binder therefrom, beating a suspension of said mixture in water, forming a moist web from the pulp suspension produced, forming a product from said web, heating said product to remove moisture, and compressing said product while hot to form a dense product and to saturate the fibers with said binder.

12. In the herein-described process for

manufacturing a fibrous product from fibrous material and a fusible binder, the combination of steps which comprises heating an intimate mixture of shredded fibrous material
 5 containing not more than 10 per cent moisture and adhering powdered, solid fusible binder to cause said binder to soften sufficiently to adhere more firmly to said fibers, and beating a suspension of said mixture of fibers and ad-
 10 hering binder in water.

13. In the herein-described process for manufacturing a fibrous product, the combination of steps which comprises shredding fibrous material containing not more than 10
 13 per cent moisture with a solid fusible binder to produce an intimate mixture, and suspending said mixture in water.

14. In the herein-described process for manufacturing a fibrous article, the step
 20 which comprises shredding a mixture of fibrous material containing not more than 10 per cent of moisture, a solid fusible binder, and filler to produce an intimate mixture.

15. An article of manufacture comprising
 25 an irregular, intertangled mass of fibers and irregularly dispersed discrete particles of a fusible binder, said particles of binder adhering to said fibers and being adapted for subsequent fusion to bind the fibrous mass to-
 30 gether in the fixed form ultimately desired.

In testimony whereof I affix my signature.

M. H. KLIEFOTH.

DISCLAIMER

1,875,018.—*Max H. Kliefoth*, Madison, Wis. FIBROUS PRODUCT AND METHOD OF MAKING THE SAME. Patent dated August 30, 1932. Disclaimer filed July 7, 1934, by the assignee, *The Patent and Licensing Corporation*.

Hereby enters this disclaimer to that part of the specification of the aforesaid Letters Patent which consists of claims 5, 6, 7, 13, 14, and 15 which are in the following words, to wit:

"5. The method of manufacturing a fibrous product which comprises shredding fibrous material containing not more than 10 per cent moisture, with a solid fusible binder to produce an intimate mixture, suspending said mixture in water, and forming a fibrous product from the wet pulp thus produced.

"6. The method of manufacturing a fibrous product which comprises shredding a mixture of cellulosic fibrous material containing not more than 10 per cent moisture, filler, and a solid fusible binder to produce an intimate mixture, suspending said mixture in water, and forming a fibrous product from the wet pulp thus produced.

"7. The method of manufacturing a fibrous product which comprises shredding fibrous material containing not more than 10 per cent moisture with a solid fusible binder to produce an intimate mixture, beating a suspension of said mixture in water, forming a moist web from the pulp suspension produced, and forming a product from said web."

"13. In the herein-described process for manufacturing a fibrous product, the combination of steps which comprises shredding fibrous material containing not more than 10 per cent moisture with a solid fusible binder to produce an intimate mixture, and suspending said mixture in water.

"14. In the herein-described process for manufacturing a fibrous article, the step which comprises shredding a mixture of fibrous material containing not more than 10 per cent of moisture, a solid fusible binder, and filler to produce an intimate mixture.

"15. An article of manufacture comprising an irregular, intertangled mass of fibers and irregularly dispersed discrete particles of a fusible binder, said particles of binder adhering to said fibers and being adapted for subsequent fusion to bind the fibrous mass together in the fixed form ultimately desired."

[*Official Gazette August 7, 1934.*]

manufacturing a fibrous product from fibrous material and a fusible binder, the combination of steps which comprises heating an intimate mixture of shredded fibrous material
 5 containing not more than 10 per cent moisture and adhering powdered, solid fusible binder to cause said binder to soften sufficiently to adhere more firmly to said fibers, and beating a suspension of said mixture of fibers and ad-
 10 hering binder in water.

13. In the herein-described process for manufacturing a fibrous product, the combination of steps which comprises shredding fibrous material containing not more than 10
 13 per cent moisture with a solid fusible binder to produce an intimate mixture, and suspending said mixture in water.

14. In the herein-described process for manufacturing a fibrous article, the step
 20 which comprises shredding a mixture of fibrous material containing not more than 10 per cent of moisture, a solid fusible binder, and filler to produce an intimate mixture.

15. An article of manufacture comprising
 25 an irregular, intertangled mass of fibers and irregularly dispersed discrete particles of a fusible binder, said particles of binder adhering to said fibers and being adapted for subsequent fusion to bind the fibrous mass to-
 30 gether in the fixed form ultimately desired.

In testimony whereof I affix my signature.

M. H. KLIEFOTH.

DISCLAIMER

1,875,018.—*Max H. Kliefoth*, Madison, Wis. FIBROUS PRODUCT AND METHOD OF MAKING THE SAME. Patent dated August 30, 1932. Disclaimer filed July 7, 1934, by the assignee, *The Patent and Licensing Corporation*.

Hereby enters this disclaimer to that part of the specification of the aforesaid Letters Patent which consists of claims 5, 6, 7, 13, 14, and 15 which are in the following words, to wit:

"5. The method of manufacturing a fibrous product which comprises shredding fibrous material containing not more than 10 per cent moisture, with a solid fusible binder to produce an intimate mixture, suspending said mixture in water, and forming a fibrous product from the wet pulp thus produced.

"6. The method of manufacturing a fibrous product which comprises shredding a mixture of cellulosic fibrous material containing not more than 10 per cent moisture, filler, and a solid fusible binder to produce an intimate mixture, suspending said mixture in water, and forming a fibrous product from the wet pulp thus produced.

"7. The method of manufacturing a fibrous product which comprises shredding fibrous material containing not more than 10 per cent moisture with a solid fusible binder to produce an intimate mixture, beating a suspension of said mixture in water, forming a moist web from the pulp suspension produced, and forming a product from said web."

"13. In the herein-described process for manufacturing a fibrous product, the combination of steps which comprises shredding fibrous material containing not more than 10 per cent moisture with a solid fusible binder to produce an intimate mixture, and suspending said mixture in water.

"14. In the herein-described process for manufacturing a fibrous article, the step which comprises shredding a mixture of fibrous material containing not more than 10 per cent of moisture, a solid fusible binder, and filler to produce an intimate mixture.

"15. An article of manufacture comprising an irregular, intertangled mass of fibers and irregularly dispersed discrete particles of a fusible binder, said particles of binder adhering to said fibers and being adapted for subsequent fusion to bind the fibrous mass together in the fixed form ultimately desired."

[*Official Gazette August 7, 1934.*]