

UNITED STATES PATENT OFFICE

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WATERPROOF FELTED SHEET

No Drawing. Original application filed May 13, 1929, Serial No. 362,877. Divided and this application filed May 6, 1930. Serial No. 450,322.

This application is a division of my co-pending application, Serial No. 362,877, filed May 13, 1929.

This invention relates to waterproof felted fibrous sheets wherein the fibrous constituents are combined with the waterproofing ingredients prior to the felting operation. More particularly the invention is concerned with waterproof felted sheets wherein normally non-fluid and adhesive bitumens are employed as the waterproofing ingredients, these materials, when properly associated with the fibers, providing very effective barriers against the entrance or permeation of water into the sheet.

In order to combine normally adhesive waterproofing material, such as asphalt or the like, with fibers prior to a felting operation for forming the several constituents into felted sheets, the waterproofing material must first be rendered relatively non-adhesive in order to prevent gumming up of the blankets and other parts of the paper machine. Methods of thus converting the relatively adhesive waterproofing material, as for example, asphalt, to a relatively non-adhesive condition, and sheeting a mixture thereof with fibers on a paper making machine, are described in Patent No. 1,536,399, issued to me May 5, 1925. In accordance with said patent, the asphalt or other bituminous or pitchy binder, is brought to a relatively non-adhesive state, as for example, by emulsifying the same in an aqueous medium comprising an emulsifying agent and water, whereupon the emulsified bituminous binder is mixed with fibrous pulp and amalgamated uniformly therewith, as for instance, in the beater or in the stuff chest, and is then run off in the usual manner on the paper making machine. The non-adhesive character of the emulsified bitumen enables the paper forming operation to be carried on without gumming the blankets or other parts of the machine, due to the fact that this characteristic prevails as long as the emulsion is stable and highly resistant to pressure during the sheet forming operation, which condition, as soon as substantially complete elimination of water from the sheet occurs (e. g., on the driers), permits

the dispersed bitumen particles to coalesce and resume their adhesive character, resulting in the union thereof with and about the fibers so as to produce a highly water-resistant sheet.

The present invention has for its chief object the provision of a waterproof felted sheet quite similar to the product produced by the process above referred to and more particularly set forth in the said patent. According to the present invention, the transformation of the waterproofing material to a condition as above described whereby to render possible the admixture thereof with fibers and the fabrication of such mixture on a paper machine is achieved in the beaters usually employed to reduce the fibrous material to pulpy condition suitable for passage over the paper forming mechanism so that the beating or equivalent agitating mechanism transforms the binder to a condition in which it is uniformly distributed therethrough. I have further found that most fibers that are employed commercially in paper manufacture possess colloidal properties when beaten out for a substantial length of time, and that this colloidal nature of the pulp can be utilized as a means for assisting in the dissemination of bituminous material such as asphalt throughout the pulp stock and for assisting in converting the same to condition permitting the same to be manipulated successfully over the paper machine. The efficiency of the fibrous pulp in this regard may be further assisted by means of the addition of suitable protective colloids, and in practical operation of the process herein described, suitable proportions of protective colloid are employed to insure against any tendency of the bitumen to adhere to the paper making instrumentalities.

In carrying out the invention, the desired fibrous material is introduced into a beater with sufficient quantities of water to permit circulation therein, and while the mass of fibers is being beaten therein, or after it has been beaten out to a sufficient extent, the bituminous binder, as for example, asphalt of 100 to 200° F. melting point in heat liquefied state, is fed gradually to the beater while

the stock is approximately at or somewhat above the melting point of the asphalt and the operation of the beater is continued for a sufficient time to effect uniform distribution of the bitumen throughout the pulp. I have found that the pulpy fibrous mass is capable, under the continued action of the beater roll, of acting upon the heat liquefied bitumen to produce a state of intimate association of the bitumen with the fibers, in the aqueous content of the mass.

In some instances it may be found necessary or desirable to assist in the distribution of the bitumen through the pulpy mass by incorporating therein, either before the introduction of the bitumen or simultaneously therewith, suitable quantities of colloidal material, as for example, colloidal clay, finely powdered mineral oxides, gelatine, tannic acid and starch. The amount of colloidal material thus incorporated will be regulated in accordance with the hardness of bitumen used in the process, (the latter depending largely upon the hardness desired in the final product), the amount of bitumen to be combined with the pulp, the character of the fibrous pulp, particularly its own ability to effect subdivision of the bitumen and cause the latter to assume a relatively non-adhesive condition. Thus, where the proportions of ingredients in the beater are such that the bitumen comprises 20 to 70% thereof on the dry weight basis, and with Mexican asphalt of a melting point of 150 to 170° F., the transformation of the asphalt to a non-adhesive condition may be assisted, if necessary, by the addition of 1 to 5% of colloidal clay, on the basis of weight of asphalt. The protective colloid serves also to ensure against sticking of the asphalt to the blankets or other parts of the machine.

In actual practice, even where the bitumen may be distributed in the pulp as above described, small amounts of protective colloid should be incorporated in the mass in order to increase the stability of the dispersed material against the pressure and mechanical action to which it is subjected in passing over the paper machine and to insure against any tendency of the dispersed material to adhere to the various parts of the machine. For this purpose, the protective colloid in suitable quantities may be added to the beaten mass of pulp and bitumen after the latter has been fairly completely distributed through the pulp by the beating action in the presence of the pulp, or, if desired, the colloid may be introduced before or simultaneously with the introduction of the bitumen. In any event, however, the quantities of protective colloid will be governed by the factors above noted and by the inherent relative stability of the dispersion effected by means of the fibrous pulp itself. Generally, however, with materials and proportions as

above stated, 2 to 8% of clay, bentonite or similar colloid will suffice to make the operation practical from all points of view.

After the bitumen combined with the pulp in the beater has been converted to the requisite nonadhesive condition and stabilized, if necessary, in the manner described, the mixture is in readiness for the sheeting operation. In order to cause the dispersed bitumen particles to clot or deposit upon the fibers and provide a freely felting furnish, alum, preferably in the presence of sodium, or other alkali silicate, may be added at any convenient stage prior to the passage of the mixture over the forming screen. The alum should be employed in sufficient quantities to flocculate or precipitate any unattached bitumen onto the fiber, so that the water will run clear from the stock during formation. The action of the alum upon the soluble silicate or other reacting substances present produces a voluminous bulky precipitate, which acts as a further protective film interposing itself between the bitumen and any contacting parts of the apparatus. In practice, 3% silicate and 5% alum will be sufficient to produce the result and bring the stock to an acidic condition. The wet web of felted fibrous material with its contained bituminous binder is capable of passing over the various parts of the paper machine, by virtue of the fact that the relatively nonadhesive condition of the stock is preserved until the water is substantially completely removed. As the last portions of water are removed in the passage of the sheet over the driers, the bitumen regains its normally adhesive character and fuses to coalesce and form more or less continuous films about the fibers.

While I have described the operation as applied to a single web, it is obvious that the features of the invention may be utilized in connection with one or more cylinders of a multi-cylinder machine. Thus, the adhesive binder may be combined with fibrous stock of certain of the plies (for example, the inner ply or plies), while the fibrous stock of the other (outer) plies may be left free of the bituminous binder. The invention is also adaptable for wet-board machine operation, in which case the bituminous binder rendered nonadhesive as above described, is contained in the fibrous stock of the cylinder mould, so that as the successive layers are transferred from the blankets to the make-up roll, the composite structure will be permeated throughout with the binder in relatively non-adhesive condition.

The composition may be employed for other purposes besides producing a fibrous sheet on the paper machine. In the form of a fibrated emulsion it may be used alone as a plastic waterproof covering, or it may be mixed with mineral aggregate to produce a fibrated floor mastic. For the latter pur-

poses, softer asphalt is preferred which is coalescable at normal atmospheric temperatures. Such a fibrated dispersion may comprise 10% of wood pulp, 40% of asphalt and 50% of water. When used for flooring it will be mixed with mineral aggregate and in proportions that 10-15% of bitumen will be present in the final mixture.

Having thus described my invention, what I claim is:

1. A fibrous paper making stock comprising a heat fusible waterproof binder and fibrous pulp in an aqueous vehicle, the binder being substantially uniformly distributed through the pulp and held in dispersed condition by constituents of the pulp functioning as dispersive media, the binder constituting the dispersed phase and being rendered sufficiently non-adhesive to prevent sticking thereof to the paper making instrumentalities.

2. A fibrous paper making stock comprising a heat fusible waterproof binder and fibrous pulp in an aqueous vehicle, the binder being substantially uniformly distributed through the pulp and held in dispersed condition by constituents of the pulp functioning as dispersive media, the binder constituting the dispersed phase and being rendered sufficiently non-adhesive to prevent sticking thereof to paper making instrumentalities, said fibrous composition also containing a protective colloid of such character and quantity as to stabilize the binder.

3. A fibrous paper making stock comprising a heat fusible waterproof binder and fibrous pulp in an aqueous vehicle, the binder being substantially uniformly distributed through the pulp and held in dispersed condition by constituents of the pulp functioning as dispersive media, the binder constituting the dispersed phase and being rendered sufficiently non-adhesive to prevent sticking thereof to paper making instrumentalities, said aqueous composition also containing a mineral powdered protective colloid of such character and quantity as to stabilize the binder.

4. A fibrous paper making stock comprising a heat fusible waterproof binder and fibrous pulp in an aqueous vehicle, the binder being substantially uniformly distributed through the pulp and held in dispersed condition by constituents of the pulp functioning as dispersive media, the binder constituting the dispersed phase and being rendered sufficiently non-adhesive to prevent sticking thereof to paper making instrumentalities, said aqueous composition also containing a clay-like protective colloid in sufficient quantity to stabilize the binder.

5. An aqueous composition comprising a heat fusible waterproof binder and fibrous pulp in an aqueous vehicle, the binder being substantially uniformly distributed through

the pulp and held in dispersed condition by constituents of the pulp functioning as dispersive media, the binder constituting the dispersed phase and being rendered sufficiently non-adhesive to prevent sticking thereof to paper making instrumentalities, said binder being clotted or deposited on the fibers in such a manner as to provide a freely feltable furnish.

6. A stock capable of being felted comprising fibrous pulp and a heat fusible waterproof binder in an aqueous vehicle, the binder being substantially uniformly distributed through the pulp and rendered non-adhesive to prevent sticking thereof to paper making instrumentalities by constituents of the pulp functioning as dispersive media.

7. A stock capable of being felted comprising fibrous pulp and a fusible waterproof binder in an aqueous vehicle, the binder being substantially uniformly distributed through the pulp and rendered sufficiently non-adhesive to prevent sticking thereof to paper making instrumentalities by constituents of the pulp functioning as dispersive media, and a protective colloid of such character and in such quantity as to stabilize the binder.

8. A stock capable of being felted comprising fibrous pulp and a heat fusible waterproof binder in an aqueous vehicle, the binder being substantially uniformly distributed through the pulp and rendered sufficiently non-adhesive to prevent sticking thereof to paper making instrumentalities by constituents of the pump functioning as dispersive media, said binder being deposited or clotted on the fibers in such a manner as to provide a freely feltable furnish.

9. A fibrous paper making stock comprising an aqueous dispersion of a fusible waterproof binder and fibrous pulp in aqueous medium, the binder being substantially uniformly distributed through the pulp in the form of discrete particles and held in said condition by the pulpy constituents functioning as dispersive media.

10. A fibrous product comprising wet pulp intimately associated with a waterproofing binder, the binder being distributed in the form of discrete particles throughout the stock and the constituents of the stock serving to substantially prevent the aggregation of the binder particles in the wet pulp and the binder having been converted in the form of discrete particles throughout the stock and in the presence thereof.

11. A fibrous product consisting of wet pulp intimately associated with a waterproofing binder, the binder being distributed in the presence of the pulp and in the form of discrete particles and prevented from substantial aggregation in the wet pulp and the binder having been converted in the form of discrete particles throughout the stock and in the presence thereof.

12. A fibrous product consisting of wet pulp intimately associated with a waterproofing binder, the binder being distributed in the presence of the pulp and in the form of discrete particles and prevented from substantial aggregation in the wet pulp by the cellulosic constituents thereof acting conjointly with an additional protective colloid and the binder having been converted in the form of discrete particles throughout the stock and in the presence thereof.

13. An aqueous stock comprising wet fibers intimately associated with a heat plastic binder, the binder being distributed in the form of discrete particles with the cellulosic constituents of the stock tending to prevent substantial aggregation of the discrete particles whereby said stock with its associated binder is capable of being felted on a paper making machine without gumming the instrumentalities and the binder having been converted in the form of discrete particles throughout the stock and in the presence thereof.

14. A fibrous product consisting of wet pulp intimately associated with a heat plastic binder having a melting point of between 100° and 200° F., the binder being distributed in the form of discrete particles throughout the stock and the constituents of the stock serving to substantially prevent the aggregation of the binder particles in the wet pulp and the binder having been converted in the form of discrete particles throughout the stock and in the presence thereof.

15. A fibrous product consisting of wet pulp intimately associated with a water proof binder, the binder having been converted into discrete particles in the presence of the pulp and being prevented from substantial aggregation by the wet pulp.

16. A fibrous product consisting of wet pulp intimately associated with a heat fusible water proof binder, the binder having been converted into discrete particles in the presence of the pulp and held in dispersed condition and prevented from substantial aggregation by the wet pulp.

In testimony whereof I affix my signature.

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