

UNITED STATES PATENT OFFICE

1,949,249

FIBROUS COMPOSITION AND PROCESS OF
MANUFACTUREHarry C. Fisher, Norwood, Ohio, assignor to The
Richardson Company, Lockland, Ohio, a corpo-
ration of OhioNo Drawing. Application October 23, 1928
Serial No. 314,551

16 Claims. (Cl. 92-21)

My invention relates to the manufacture of fibrous bodies in which a desired percentage of a binder is contained and a process of forming an aqueous pulp containing a binding substance 5 irrespective of the manner in which it is subsequently processed. Among binders which I may use are bituminous substances, rosins, waxes, and gums. It is a continuation in part of applicant's former application Ser. No. 222,691, filed Sept. 10 28, 1927.

It has been the practice in the past to introduce emulsified bitumens and other heat plastic binders into paper mill beater stock, and then felt and dry the combined materials with the 15 result of breaking down the emulsion.

It has been suggested to grind up a bituminous substance into granular condition or form it into filamentary bodies and mix them with a pre-formed watery pulp before or during introduction 20 into the vats of a paper making machine.

My process avoids the troublesome features of these old processes and results in products which are distinctly more advantageous in the arts than those produced by either.

25 By my process I preferably proceed first to thoroughly distribute fibrous material in an adhesive binder substance such as a bituminous substance and coat them with the binder substance following the practice of James C. Woodley as 30 described in his Letters Patent No. 1,156,122 dated Oct. 12, 1915. By this means, as will be noted, I obtain an individualized condition of fibers, interlaced within the bituminous substance but separated from each other by the 35 bitumen.

It had been proposed by Woodley to sheet such a substance which he described as a fibrous, gummy mass, or to mold or briquette it for forming useful articles.

40 I have discovered that by first following the Woodley practice and then sufficiently alleviating the coated condition of the fibres, and incorporating water into the materials and beating the materials or otherwise working them up by 45 one or more stages into a pulp, that the pulp, in which the binder is retained in very small particles, can be formed by using regular paper or felt mill or pulp-moulding equipment into a wide variety of useful products, or can be dried 50 and molded into various articles.

Woodley masses in certain cases and at certain temperatures will pulp without any added agents and without balling up and fouling the beating or pulping equipment, but ordinarily some added 55 agents are necessary to facilitate or make possible

the partial relieving of the fibers from the surface coating of binder, which is characteristic of my process and renders the pulping possible.

I would define the Woodley process as one in which an adhesive and stretchable binder is 60 kneaded up together with aggregates of fibrous material, where the adhesive and stretchable nature of the binder is such as to pull out the individual fibers from the aggregates and work them up into a condition thoroughly interlaced 65 and loosely felted throughout the binder. The fiber condition in the resultant material is distinctly more individual than can be obtained in any other manner and the relation between the binder and the fibers dispersed therein seems to result in a characteristic condition of the binder 70 as well as of the fibers, which I consider preferable as the first step of my process. The fibers are, however, quite fully coated with the binder and until this condition is broken down, the formation of an aqueous pulp cannot be accom- 75 plished, so far as I know.

As a substance for relieving this condition I may employ a sodium sulphonate or sodium sulphonic acid salt or sulpho derivative of an oily 80 substance such as is sold on the market under the name Kontakt. This substance acts as a detergent in my process and not as an emulsifier and ceases to function when it has exercised its detergent effects.

85 I will first describe my process as applied to the use of a bitumen, such as an asphaltic product having at 120 degrees Fahrenheit a fairly soft, semi-solid condition. By referring to asphalt and bitumen, in my description, I do not wish to ex- 90 clude other binders which function similarly.

I employ preferably in this process a Werner-Pfleiderer mixer, known to the trade as a W. P. mixer.

95 Other mechanical means besides a W. P. mixer will accomplish my objects, as will be obvious to those skilled in the arts involved.

Using such a mixing machine, which will be jacketed with a steam jacket, or otherwise kept at desired temperature, I may insert in the mixer 100 a desired quantity of the bitumen. The asphalt will act properly at fairly low temperature, and I have used, as an example, seven parts by weight of this asphalt to about three parts by weight of fibrous matter, such as waste paper clippings, 105 sulphite pulp, cotton linters, or any fibrous substance used in making of plastics, or making of paper. To give exact proportions of one mixture, I have used seven parts by weight of an asphalt of penetration of 100 at 77 degrees 110

Fahrenheit, 100 gms., 5 seconds; ball and ring softening point of 164 degrees Fahrenheit, air-blown from a paraffin base crude oil, with 2½ parts newsprint scrap and ½ part sulphite pulp.

8 The fibrous matter and bitumen are placed into the mixer, and the blades revolved, accomplishing the type of fiber distribution noted, (i. e. with the bitumen below liquid range). The mixing is kept up until the mixture appears completely black, so that all fibers are coated, and at this period the individualization of fibers will have taken place.

10 I then take the contents of the mixer and place it in an ordinary paper mill beater, or other pulping machine, and there work up a pulp with water in the usual manner. I will keep the beater water at a temperature of around 180 degrees Fahrenheit, in the example given, although it can go somewhat lower, and yet form a good fibrous asphalt pulp.

20 In another practice I use the W. P. mixer for a first pulping step and the beater afterwards. Thus I may add, say 50% by weight of water, to the contents of the mixer after the mixture is complete and operate the blades to form a preliminary thick pulp, and then place this thick pulp into the regular paper mill beater or other pulping machine.

30 It is to be noted that the asphalt employed in this example is one which under the process outlined, will upon extended beating, come away from the fibers partially, leaving the fibrous surfaces partially exposed.

35 The action in the beater accomplishes this alleviation of the coating on the fibres as a first step, and as a next step or concomitant step as the beating continues, the fibres and bitumen are formed into the watery pulp characteristic of my invention. Where the material is broken up with water in the mixer, part at least of the alleviation of coating may occur there.

40 The desired characteristic pulp condition is attained in the beating step and will vary with the degree and conditions of beating. This pulp may be described as one in which the fibers themselves are highly individualized, the binder substance is in minute film and particle form distributed with the fibers partly as a coating and partly in fine dispersion with the particles of binder in partial adhesive contact with the fibers and yet with the fibers sufficiently exposed to the water, so as to be wetted thereby. Where the binder substance is one which will not come away from the fibers unaided by use of heat, water and agitation only, my practice is substantially the same except that I use an additional ingredient.

45 Thus using the same asphalt as in my first example, but keeping the beater water at low temperatures or the subsequently added water in the mixer at low temperature, it is my practice to use sodium sulphonic acid salt (Kontakt) as an agent to facilitate the coming away of the bitumen as a water excluding coating from the fibers except for adhesion of a portion thereof to the fibers in minute particles or films of varying shapes and sizes, as seen under the magnifying glass.

65 Another example is given to describe the use of harder asphalts.

70 Thus I have used about eight parts of 10 penetration Stanolite asphalt to about two parts of sulphite pulp. The fibrillation was first accomplished and then 5% by weight of sodium sulfonic acid salt together with some water added to the mixer. After thorough working, the mixer contents were beaten in a paper mill beater kept

at 170 degrees Fahrenheit and formed a satisfactory pulp of wetted fibers with tiny asphaltic particles thereon, together with a noticeable amount of coated fibers.

80 Sheets formed on a wire screen of this particular composition, and properly calendered to .147 inches thick, had a tensile strength of 125 pounds in the one inch strip.

85 I ascribe the best results that I obtain in forming a pulp which is in large proportion bituminous in its nature, to the fairly radical nature of the fibrous distribution in the bitumen. Thus there is no product with which I am familiar made on a paper or felt machine in which bitumen or other binding agent is in the majority.

90 I may, however, depart in a number of ways from the Woodley type of mixing. I can use more fiber than can be distributed by the binder in Woodley fashion. Particularly under such circumstances I may use the binder in liquid condition during mixing. Indeed, various tests have shown that my process is essentially one in which a fibrous mass, together with a binding or sizing substance, can be made under circumstances where the binder or size actually coats or waterproofs the fibers and this substance can then be made into a pulp upon alleviation of the coated or waterproofed condition. My product varies with various types of mixes, but most of the fibres are always related adhesively or contactively to a portion of the binder and the binder is in fine enough form to bear a contact relationship in particles or films with a substantial proportion of the single or individual fibers.

110 Instead of asphalt alone as a binder, I may use the various pitches. Blown oils will be valuable to use, as well as other binders such as rosin and the gums, which can be caused to accomplish their own fiber distribution, in the manner I have noted. Also, mixtures of various pitches, tars, waxes, gums and hardened rosins and fatty acid pitches can be employed.

115 If pulp which is of normal character is added in the beating engine together with my novel material, the final product, considering it as a paper stock, will be a mixture of the two, and the web formed on the paper machine will have to be brought to the temperature of flow of the binder or bitumen, before the web will be homogeneous in its composition. It will normally be necessary in order to set up a continuous phase of the binder on the fibrous body to maintain a temperature for sufficient time to permit the binder to flow.

130 I can incorporate as much as say forty per cent of paper or sulphite pulp with the bitumen in the mixing machine, while the binder is gummy, but seem to obtain a better action beyond that limit by having the binder liquid or dividing the pulp adding stage as hereinbefore set forth. Also there should be more than around five percent of usual paper making fiber in the composition.

140 If the bitumen is a liquid in the mixing machine and the fibers in small proportion, the fibers are not liberated and distributed in the manner that is required for my best type of pulp, or at least it will be a very long and tedious operation for me to use a fibrous substance prepared in such a manner.

145 Where the pulp is used for a molding operation, it is kept moist until the time for molding, when the use of pressure alone, or pressure with heat forms it into the desired shape and

causes coalescence of the plastic material, e. g. asphalt. In many cases it may be desirable to dry the pulp at a moderate temperature before molding it.

5 The web of fibrous bituminous material which I obtain on the paper machine will be as hard as the bituminous or other binder is made. If I wish to make the web very hard, I may add some mineral filler in the form of a finely divided powder after the pulp is formed, but this will be of value chiefly where the pulp is used subsequently for molding.

10 By my process, the raw material for the fibrous ingredient is not necessarily processed before adding, since one of the functions of the mixer where the Woodley action is used is to break up the aggregate, such as pieces of cotton web, pieces of paper, sheets of wood fiber, mechanical or chemical. Some of the material formed by my process can be put back into the mixer and used over again, which makes for economy.

15 Instead of forming up sheets of my composition on a cylinder mold board machine, or a Fourdrinier paper machine, I may form articles thereof directly with such vacuum pulp molding machinery as is used for the manufacture of small containers, float balls and the like. The quantity of fiber and the quantity of the binder and the nature of the fiber and the binder will be varied within the limits of my processing possibilities, to make whatever kind of a pulp is desired.

20 I have used the terms mixing and beating in the claims that follow without any attempt to distinguish two different kinds of treatment, but because it is convenient to use the word "mixing" as applied to preliminary association of materials and beating to the incorporation of fibrous matter into water.

25 Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. The process of forming a watery pulp which consists in forming a mixture of fibers and an adhesive binder substance by extending the said substance so that by its adhesiveness and working it individualizes, distributes and coats the fibers, and incorporating into the mass so produced a substance which will aid in partially washing away the adhesive coating of the fibers, and beating the mixture together with water.

2. The process of forming a watery pulp which consists in forming a mixture of fibers and an adhesive binder substance in which the fibers are individualized largely, and distributed throughout the binder and coated thereby, adding a substance to break down the coated condition of the fibers at least in part and beating the resulting substance together with water.

3. The process of forming a sheet of fibers and binder material which consists in forming a mixture of fibers and an adhesive binder substance by extending the said substance so that by its adhesiveness and working it individualizes, distributes and coats the fibers, and incorporating into the mass so produced a substance which will aid in washing away partially the adhesive coating of the fibers, and beating the mixture together with water and finally forming the resulting pulp into a sheet on a paper machine.

4. The process of forming a sheet of fibers and binder material which consists in forming a mixture of fibers and an adhesive binder substance in which the fibers are individualized largely, and distributed throughout the binder

and coated thereby, adding a substance to break down the coated condition of the fibers at least in part and beating the resulting substance together with water and finally forming the resulting pulp into a sheet on a paper machine.

5. A process for forming a pulp, which consists in intimately mixing fibrous matter with a waterproofing agent in non-solid condition to the extent of substantial dispersion of the fibers in said agent, and then mixing the whole with a liquid including a detergent agent in which the waterproofing agent is immiscible to the extent of forming a pulp.

6. A process for forming a pulp, which consists in intimately mixing fibrous matter with a waterproofing agent to the extent of substantial dispersion of the fibers in said agent, and then mixing the whole with a liquid in which the waterproofing agent is immiscible to the extent of alleviating at least in part the coated condition of the fibers.

7. The method of preparing a fibrous pulp containing a waterproofing agent which consists in first coating fibers with said waterproofing agent and thereafter wetting the material thus formed with water, while concurrently removing the waterproofing agent in part from its adherent or coating association therewith.

8. As a new article of manufacture a fibrous pulp containing wetted fibers and a non-liquid heat plastic substance in a finely divided condition, part of which is directly adherent to the fibers.

9. As a new article of manufacture a fibrous pulp containing an adhesive organic heat plastic dispersed therein in uncoated particles and in partial adherence directly to fibrous materials therein.

10. As a new article of manufacture a fibrous pulp suitable for felting upon the screen of a paper machine or the like, said pulp comprising feltable fibers in water suspension with which is associated in particle form, a heat plastic substance non-adhesive at felting temperatures, said heat plastic substance being in substantial part in direct adhesive contact relation with suspended fibers whereby said pulp is rendered stable.

11. As a new article of manufacture, a fibrous pulp suitable for formation upon the screen of a paper machine or the like, which comprises feltable fibers in suspension in a circulating medium and in stable and in part at least in direct contact association with fibrous material therein a thermoplastic substance in minute uncoated particles.

12. As a new article of manufacture a fibrous pulp suitable for formation upon the screen of a paper machine or the like, which comprises feltable fibers in suspension in a circulating medium and bitumen in minute uncoated particles in direct stable association therewith.

13. As a new article of manufacture a fibrous pulp suitable for formation upon the screen of a paper machine or the like, said pulp comprising feltable fibers in water suspension, with which is stably associated a bituminous substance non-adhesive at the temperature of formation, said bituminous substance existing in the form of minute uncoated particles, a substantial proportion of which at least, are in direct adhering contact relationship with said fibers, whereby said stability of association is produced.

14. A sheet comprising the felted product of the pulp of claim 11, in air-dry condition, the

80

85

90

95

100

105

110

115

120

125

130

135

140

145

150

thermo-plastic substance therein being interfused.

15. A sheet comprising the felted product of claim 13, in air-dry condition, the bitumen therein being interfused.

16. A method of preparing a fibrous pulp containing a waterproofing agent which comprises first associating fibers with said waterproofing agent by a mixing operation to the extent of

waterproofing said fibers in large measure, afterward forming a pulp thereof by dispersing said fibers in a circulating medium and fitting them for felting as in the usual paper making processes, and alleviating in part at least the waterproofed condition of said fibers prior to the completion of said pulping step.

HARRY C. FISHER.

10

85

15

90

20

95

25

100

30

105

35

110

40

115

45

120

50

125

55

130

60

135

65

140

70

145

75

150