

Feb. 14, 1933.

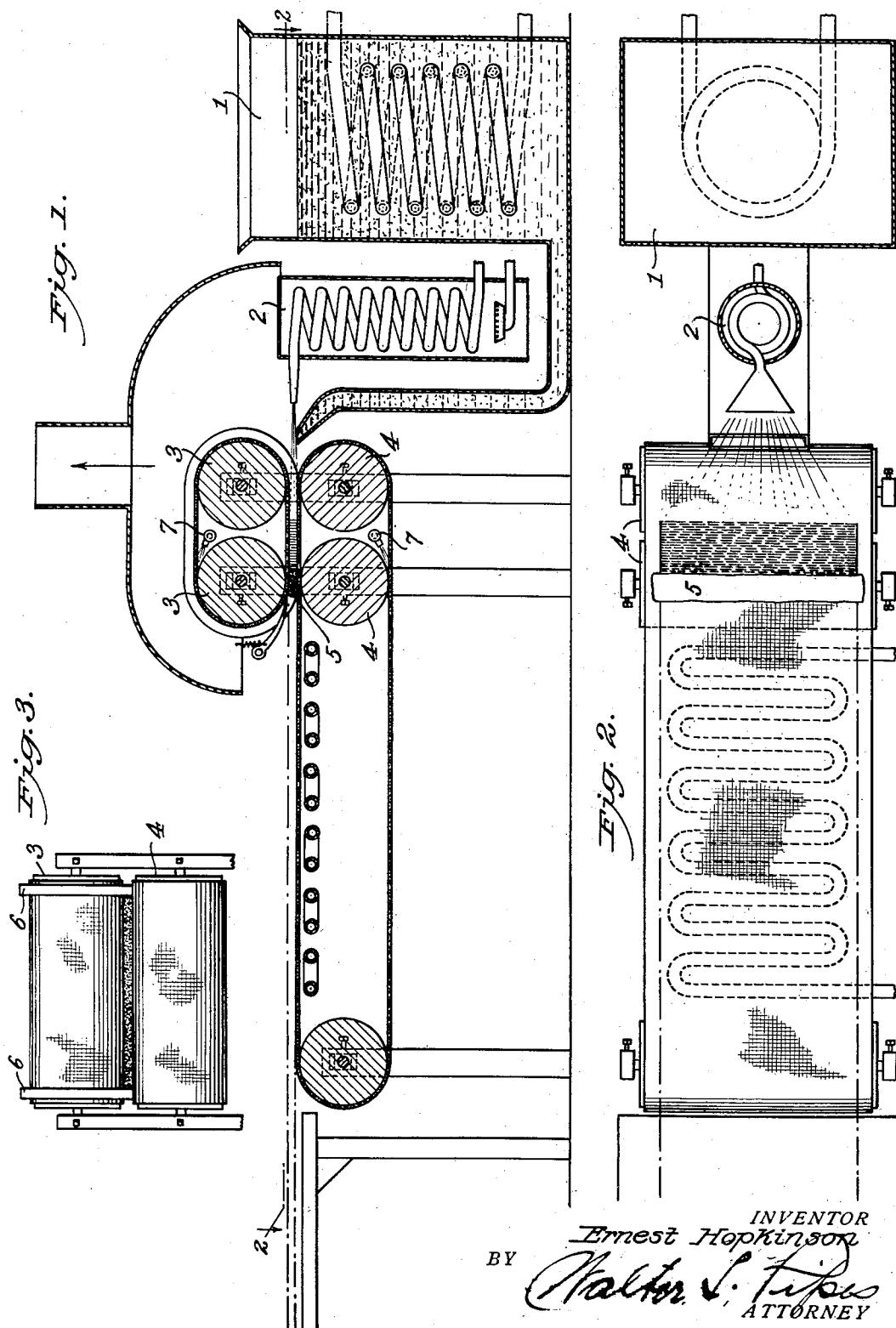
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MANUFACTURE OF FIBROUS SHEET MATERIAL

Filed Oct. 5, 1928

2 Sheets-Sheet 1



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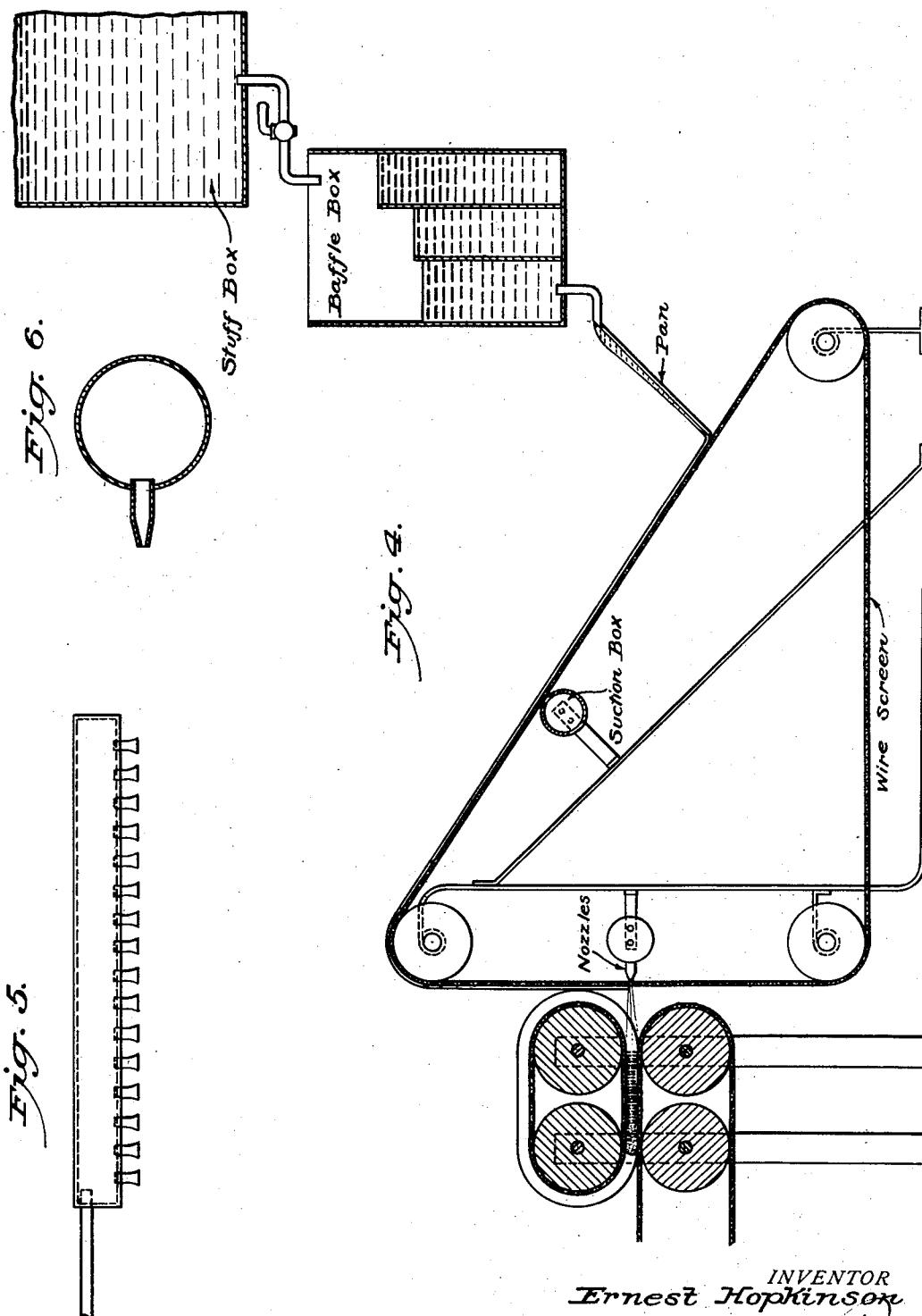
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2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

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## MANUFACTURE OF FIBROUS SHEET MATERIAL

Application filed October 5, 1928. Serial No. 310,533.

This invention relates to the manufacture of sheet material and to sheet material which can be used as a substitute for leather soles, belting, etc. More particularly it relates to a process and product wherein fibrous material of any kind, whether of vegetable, mineral or animal origin, with or without other ingredients, is formed into a sheet, with the fibres of the sheet interlocked and matted together with little or no stratification.

Sheet material made by ordinary paper making machines has not the proper strength, endurance or abrasion resisting characteristics for sustained wear due to the layer formation of the fibres.

An object of my invention is to provide a process for making a sheet material which when used as a substitute for leather as in soling and belting, etc., will have good qualities for sustained wear. Another object is to provide a process wherein the layer formation obtained in the ordinary paper making machines is avoided, and one in which the fibres are intermingled and matted together in all directions. A further object is to provide a sheeting made of latex (artificial or natural) and fibrous material. A still further object is to provide a sheet material made of latex and fibrous material which in the process of making are intermingled and matted under compacting fluid pressure, a large portion of the liquid content being evaporated.

I attain these objects by the apparatus shown generally in the drawings.

Fig. 1 is a longitudinal elevation in cross section of the apparatus.

Fig. 2 is a plan view of the apparatus, part being shown in cross section.

Fig. 3 is an end elevation of the rollers, showing the chamber spacing between the rolls.

Fig. 4 illustrates a modified form of procedure from that shown in Figs. 1-3.

Figs. 5 and 6 show respectively sectional and plan views of the nozzle arrangements used in the modified form.

The invention is comprised broadly as follows: A tank 1 is filled with pulp of the desired consistency. This pulp has been through the desired cooking and beating op-

erations, and a latex or rubber dispersion or other binding material has been added in the beater. Of course other suitable ingredients may be added to the pulp or omitted as may be desired. This pulp material is preferably kept below the boiling point. A current of air or steam under pressure to atomize the pulp is passed through a coil located in chamber 2, and blows the pulp between the bight of rolls 3 and 4. Where air is used it is preferably heated so as to not only spray the pulp material, but to evaporate a large portion of the water content. 3 represents an upper pair of rolls and 4, the lower pair. A wire mesh belt passes around both these pairs of rollers. At the commencement of the operation a closure 5 of soft material of the nature of felt is placed at the proper distance between the upper and lower mesh belts. A pair of belts 6 of flexible material, such as leather or felt, are located on each side of the upper pair of rolls to form side flanges to close the sides of the space between the upper and lower pairs of rolls. This arrangement provides practically a chamber between the upper and lower pairs of rolls, into which the pulp is sprayed. Air jets 7 are for the purpose of cleaning the screen belts.

The process is further illustrated in Figs. 4-6. Here a device embodying the principle of a Fourdrinier is used to prepare a pulp concentrate by spreading and depositing the pulp material on a wire screen which travels over a plurality of rolls, removing excess water and allowing the concentrate to cling to the screen until it is blown off the screen by a blast directed through the screen from a plurality of slits at a point opposite the channels formed by rolls 3 and 4.

The operation is as follows: The pulp is projected or sprayed under high pressure so as to hit the target or plug 5, and as the pulp accumulates between the rolls, the pulp itself forms the target, while the wire mesh belts are moved at a rate of movement coinciding with the rate at which the sheet material is built up. Of course the plug 5 is only used at the commencement of operations.

When the fibres first contact with the plug they are intermingled and matted together

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in all directions due to the impact. This action is carried through in a similar manner as the pulp itself progressively forms the target. The result is a sheet in which the fibres are interlocked and matted together in all directions. Of course it is apparent any other inert gas can be used in place of the air as the motive means. For instance  $\text{CO}_2$ ,  $\text{N}_2$ , etc. can be heated or steam at the proper temperature may be used as the impellent means to get the same result. The formed layer is carried along by the moving belt, and subjected to a drier while in transit. Such drying means can be a single unit or a plurality of units. Also a drier can be used after the sheet has been removed from the moving belt to properly condition the sheet as to moisture content. The moisture evaporated by the action of the heated blast of air or other fluid is carried off through a hood disposed over the sheet forming mechanism. Where a foraminous belt is used it is properly cleaned on the return side by blowing therethrough a stream of air or other well known drying gas, which may be heated as occasion demands.

The suction at the outlet of the nozzle caused by the blast of gas is sufficient to maintain a movement of the pulp. This action however can be regulated and facilitated by maintaining the initial volume of pulp mixture of such volume that gives the best results, in the tank 1 either by continuous feed or intermittent feed, where the form shown in Fig. 1-3 is used.

Many changes can be made in the form of the apparatus used and in the procedure without departing from the principle underlying the invention and reference should therefore be made to the accompanying claims for an understanding of its scope.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

45 1. A process which comprises spraying an admixture containing fibrous pulp material, and compacting said admixture in sheet form substantially in the plane of travel of the spray in such manner that substantially all the fibres thereof are intermingled and matted together in all directions.

50 2. A process which comprises spraying an admixture containing pulp material, blocking the passage of the spray, and compacting the blocked spray of material in the form of a sheet substantially in the plane of travel of the spray.

60 3. A process which comprises subjecting an admixture containing fibrous pulp material to a gaseous blast to form a spray of said admixture, and compacting the spray into a sheet in such manner that the fibres thereof are substantially free of layer formation.

65 4. A process which comprises subjecting an admixture containing fibrous pulp material

to a gaseous blast to form a spray of said admixture, blocking the passage of the spray, and compacting the blocked spray into a sheet in such manner that the fibres thereof are substantially free of layer formation.

5. A process which comprises spraying an admixture containing fibrous pulp material, blocking the passage of the spray, compacting the blocked spray into a sheet in such manner that the fibres thereof are substantially free of layer formation, and drying the preformed sheet.

6. A process which comprises spraying an admixture containing fibrous pulp material, blocking the passage of the spray while removing water therefrom, compacting the blocked spray into a sheet in such manner that the fibres thereof are substantially free of layer formation, and drying the preformed sheet.

7. A process which comprises, mixing a rubber dispersion with a fibrous pulp material, projecting in finely divided form the admixture between spaced moving surfaces and against opposed pressure resisting means.

8. A process which comprises concentrating a liquid admixture containing fibrous pulp material to remove excess liquid, subjecting said concentrated admixture to a gaseous blast to form a spray of said admixture, blocking the passage of said spray, and compacting the blocked spray into a sheet in such manner that the fibres thereof are substantially free of layer formation.

9. A process which comprises concentrating an aqueous admixture containing fibrous pulp material to remove excess water, subjecting said concentrated admixture to a gaseous blast to form a spray of said admixture, blocking the passage of said spray, compacting the blocked spray into a sheet in such manner that the fibres thereof are substantially free of layer formation, and drying the preformed sheet.

10. A process which comprises projecting in finely divided form an admixture containing fibrous pulp material to a position between spaced moving surfaces and continuously compacting said admixture with the aid of a further quantity of the projected admixture to form a sheet.

11. A process which comprises continuously spraying an admixture containing fibrous pulp material, blocking the movement of said spray between narrow spaced moving surfaces, continuously compacting said blocked material by the further action of said spray in such manner as to form a sheet having its fibres in substantially unstratified form, and continuously removing and drying said preformed sheet.

12. A process which comprises projecting in finely divided form an admixture containing dispersed rubber and fibrous pulp

material to a position between spaced moving surfaces, and continuously compacting said admixture with the aid of a further quantity of the projected admixture to form 5 a sheet.

13. A process which comprises mixing a rubber dispersion with a fibrous pulp material and projecting in finely divided form the admixture between spaced moving surfaces and against opposed pressure resisting means, forming into a sheet, and drying 10 the sheet.

Signed at New York, county and State of New York, this 2nd day of October, 1928.

15 ERNEST HOPKINSON.