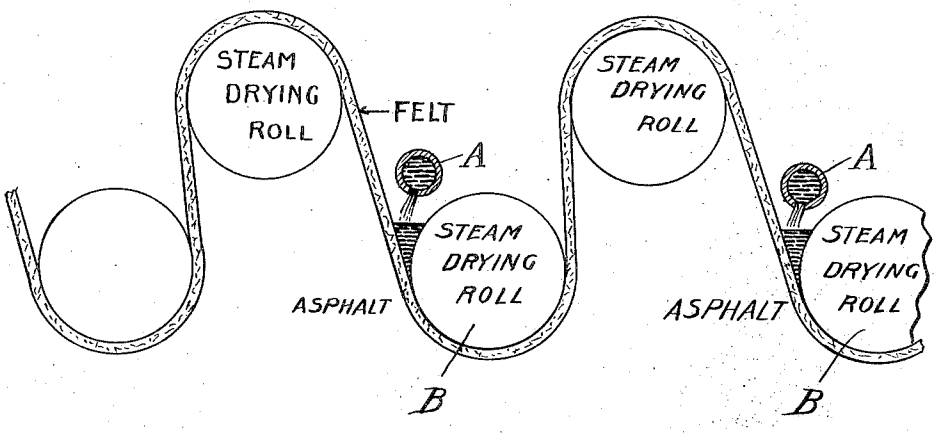
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FIBROUS SHEET PRODUCTION

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FIBROUS-SHEET PRODUCTION

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My invention relates to the production of a felt or other fibrous sheet in which a highly heated fluid body is driven into the inter-fiber spaces and fiber cells of the sheet, to displace and evaporate the moisture carried over from the sheet forming machine.

In the production of asphalt saturated papers and felts, which is the largest single instance in the arts at the present time, of saturating fibrous sheets, the cost of manufacture is excessive, because of the excessive number of drying rolls over which the fibrous sheet must be passed in order to fully dry it out. Also it has always been considered necessary to complete the drying of the felt, winding it up from the felt or paper machine, storing the rolls, and later passing the rolls through a saturating bath, entailing loss of time, and an added operation which uses a costly and cumbersome machine, as well as running the risk of breaking the sheet during saturating.

I have discovered that if a fluid body such as asphalt, or other saturant or heated medium of viscous consistency and temperature sufficient to in and of itself effect the drying of the sheet, is applied to one side of a sheet of fibrous material, that the fluid body passes into the web, displaces the moisture therein, and apparently enters into the phase of the displaced water.

The usual process of saturation by passing a web of fibrous material through a bath of liquefied asphalt, does not result in full saturation because the fibres have become matted, either through the roll winding operations or because of calendering action of the drying rolls or because of actual calendering given to the sheet to provide a smooth surface. Furthermore, felt materials are subject to a crusting action after exposure to the air, which impedes saturation and escape of moisture.

Where a web is taken that is only dried on the outside, and thus has not passed through what has been considered the full complement of drying rolls, the web has a fluffy consistency which more readily permits permeation by the viscous, heated medium.

The action of the heated saturant, in combination with the action of the steam drying rolls of a felt or paper machine where application of the saturant is at one side thereof, is to force the moisture out of the central portions or layers of the fibrous sheet, thereby increasing greatly the speed of final drying out of the web.

Thus in the usual paper or felt machine, it is the inner layers which take the majority of the time to dry out, thereby greatly extending the drying operation after the outer portions or layers have become fully dry. Thus the felt becomes filled with aqueous vapor which is imprisoned in the interior of the web, because the drying rolls cannot be raised above a certain degree of heat, and the outer layers insulate the inner layer, which insulation is hard to overcome in regular practice, as the roll temperature cannot be sufficiently raised without charring the outer layers of the web. The application of my discovery, results in quick drying out of the inner layers, by forcing out and evaporating out the moisture through the surface of the web by means of a saturant capable of assuming a high temperature, sufficient to accomplish the purpose in view. As has been pointed out, also the mode of saturation, particularly at the inner portions of the web, is more effective than ordinary saturation can be, because the saturant assumes the water phase, and thus thoroughly coats and fills the pores of the individual fibers.

The amount of moisture in the web is not subject to definite limits and my experiments have indicated that the amount of moisture makes no difference.

I accomplish my process by those certain steps to be hereinafter more specifically pointed out and claimed, and of which a diagram is submitted in the drawing.

In the drawing, the figure is a diagram of a set of steam rolls, and asphalt applying pipes, showing a felt web passing over the rolls.

In specifying my invention I will refer to felt, but it will be understood that this is but one form of fibrous sheet made into a web and dried over steam rolls, and that the

specific reference is merely to give an example of the process.

The illustration shows steam drying rolls, so marked, which will be understood to be a part of a felt or paper machine, where the felt has come to a stage of dryness of preferably between 25% moisture and 50% moisture. The rolls will ordinarily have steam within them to bring them to a temperature of around from 250 to 300 degrees Fahrenheit. The asphalt is poured on the web from conduits marked A. The felt web, so marked, passes over the top steam drying rolls, thence down over intermediate like rolls B.

The rolls may or may not be steam drying rolls.

At the point where the webs begin to impinge on the lower rolls, an asphalt in a preheated and liquid state, say at around 400 degrees Fahrenheit, is poured into the web, and is caught between the web and the rolls, and is absorbed into the web, and also ironed in by the rolls.

Tracing the course of the web, it passes first over the first rolls, and thence down over the second roll where it is subjected to the bath of asphalt in highly heated liquid state. The great action of the highly heated liquid, tremendously increases the vaporizing action within the web and results in the rapid expulsion of the moisture.

The web then passes over the next steam roll, with the result of heating up the web on the unsaturated side, to further accelerate the vaporization of the watery content, but cannot drive moisture through the viscous asphalt body.

It then passes through as many more asphalt applying steps as are necessary to cause a full penetration of the asphalt through the web. Upon this full penetration there will be no moisture left in the web, and a product having greater saturation by weight of asphalt will be provided than has been possible by any process with which I am familiar.

Furthermore, the nature of the saturation is such that to a large extent, each fiber is completely surrounded and the pores filled by asphalt which has taken the place of the water phase of the fibers, and thus completely protects each fiber.

Finally, there is no danger of the web having any moisture or air imprisoned between an inner and outer saturated layer, which is always possible and hard to avoid in the usual saturating processes, where a web is drawn through a bath of the heated saturant.

A better product is provided both in amount of saturation by weight and in nature of saturation, together with great saving in mechanism and power in drying the web in the first place, and in separately saturating it in the second place.

I do not wish to be limited by the temperature or moisture limitations given, nor by the particular nature of the web specified, nor the number of saturating steps, or the nature of the specified saturant. I consider my invention to have great importance from the point of view of rapid drying of a sheet of fibrous material irrespective of the nature of the highly heated medium employed.

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

1. The process of saturating a moist web which consists in heating the moist web to partially dry the same, then treating one surface of the web with heated asphalt, then heating the surface of the web to which the heated asphalt has been applied, and then heating the opposite surface of the web.

2. The process of saturating a moist web which consists in heating the moist web to partially dry the same, then treating one surface of the web with heated asphalt, then pressing the heated asphalt into the web by pressure from the surface to which the asphalt has been applied, and then heating the opposite surface of the web.

3. A process for preparing fiber webs which consists in forming a web of wetted fibers, then partially drying the web by heating and prior to complete drying of said web, applying to one side thereof a liquid preheated above the boiling point of water, thereby partially drying and displacing the moisture in the web with the heated liquid.

4. A process for preparing fiber webs which consists in forming a web of wetted fibers, then partially drying the web by heating and prior to complete drying of said web, applying to one side thereof, a liquid preheated above the boiling point of water thereby at least partially evaporating and displacing the moisture in the web with the heated liquid, said application of the pre-heated liquid being made in successive stages with heat applied to the untreated side of the web between the successive stages.

5. A process for preparing fiber webs which consists in forming a web of wetted fibers, applying to one side thereof prior to drying a liquid heated substantially above the boiling point of water, thereby evaporating and displacing a substantial amount of the moisture in the web with said heated liquid, said liquid being viscous enough at said temperature to prevent escape of steam through the said liquid, and saturating the web with said liquid.

6. A process for preparing fiber webs which consists in forming a web of wetted fibers, applying in successive stages to one side thereof a liquid heated substantially above the boiling point of water, thereby evaporating

and displacing a substantial proportion of the moisture in the web with said heated liquid, said liquid being viscous enough at said temperature to prevent escape of steam through the said liquid, and intermediate said stages heating the web.

7. A process of preparing fiber webs which consists in forming a web of wetted fibers and subjecting the web continuously to a heating stage, so as to heat the web, and prior to the heating stage applying to the web a liquid heated to a temperature higher than said heating temperature thereby evaporating and displacing the moisture in said web with said heated liquid.

8. A process of drying a moisture wetted thick fiber web which consists in forcing by frictional engagement between the web and a heated member, a hot liquid through the felt from one side, said hot liquid forcing the moisture out through the other side of the web thereby evaporating a substantial quantity of the moisture therein progressively and proportionally as the hot liquid penetrates said web.

9. A process for preparing fiber webs which consists in forming a web of wetted fibers, applying to one side thereof heated and liquefied asphalt, at a temperature of at least 400° Fahrenheit, to the extent of entirely saturating the web with said liquid.

10. A process for saturating fibrous webs with bitumen, which consists in forming a wetted fibrous web, passing one side of the web after partial drying into surface contact with a heated member, and prior to the contact with the heated member disposing heated bitumen at a temperature of approximately 400° Fahrenheit on the contacting side of the web.

11. A process for saturating fibrous webs with bitumen, which consists in forming a wetted fibrous web, passing one side of the web after partial drying into surface contact with a heated member, and prior to the contact with the heated member disposing heated bitumen at a temperature of approximately 400° Fahrenheit on the contacting side of the web, said surface contact adapted to force the bitumen into the fibers and the heat of the bitumen adapted to evaporate the moisture and dispel it through the non-contacting surface of the web, and then drying the other side of the web.

12. The process of saturating a fibrous web with bitumen which consists in preparing a web of wetted fibers, and pressing heated bitumen heated to a temperature of approximately 400° Fahrenheit into one side of the web to replace the moisture and physically displace and boil the moisture from the web.

13. The process of saturating a fibrous web with bitumen which consists in preparing a web of wetted fibers, and pressing heated bitumen to a temperature of approximately 400° Fahrenheit into one side of the web to replace the moisture and physically displace and boil the moisture from the web and heating the side of the web opposite to that to which asphalt has been applied.

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