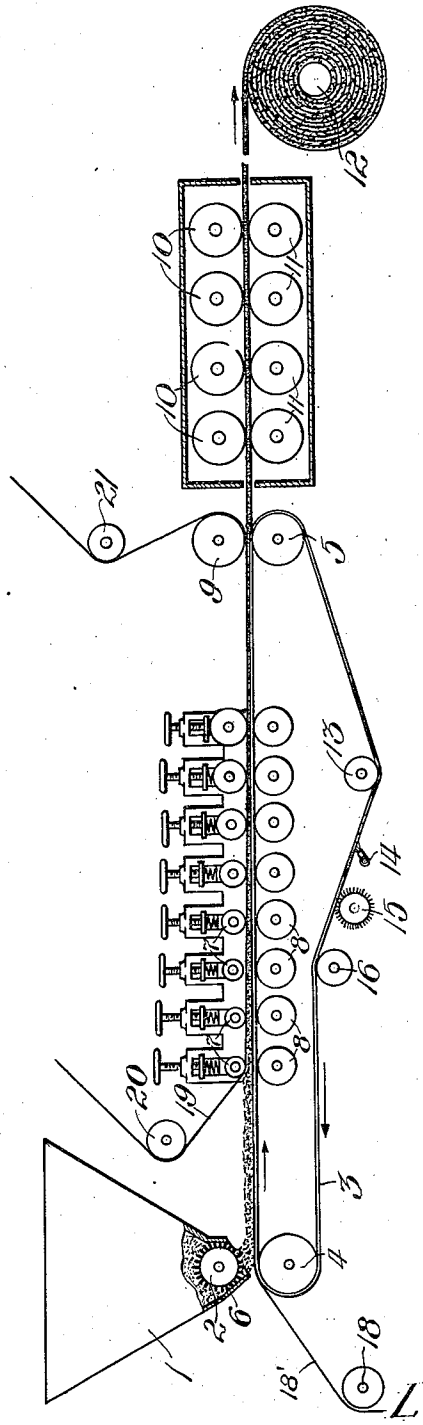
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PROCESS OF MAKING CONTINUOUS WATERPROOF SHEETS AND PRODUCT THEREOF

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PROCESS OF MAKING CONTINUOUS WATERPROOF SHEETS AND PRODUCT THEREOF

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This invention relates to a process for making a continuous waterproof sheet and the product produced thereby, and refers more particularly to a process by which heavy gauge paper or board may be formed from comminuted nonfibrous or fibrous material incorporated in a bond of bitumen or like adhesive substances.

This application is in part a continuation of an earlier application filed by me, under date of March 28, 1921, Serial No. 456,284.

Among the salient objects of the invention are to provide a process for making heavier paper or sheet board of a substantially heavy gauge comprising cork, sawdust or like comminuted materials or fibrous substances such as paper pulp, felted fibres of various sorts, these fibrous and non-fibrous materials being incorporated by means of an adhesive binder and rolled into sheet form; to provide a process which permits of the formation of heavy bituminous fibrous compositions containing an excess of the adhesive binder for instance to an amount exceeding the fibrous material contained in the composition; to provide a process whereby a greatly increased amount of adhesive binder, may be incorporated and bonded in the body of the sheet than can be run over a paper machine; to provide a process in which cheaper materials may be used as the sheets are formed by rolling and do not need the felting qualities required in the formation of a paper web; to provide a bituminous composition which is of greater thickness, of stronger and stiffer body and one that has better waterproofing qualities due to the fact that there is a greater amount of waterproof binder incorporated therein.

The single figure in the drawing is a side elevation of the apparatus for use with my invention, with parts omitted.

Referring to the drawing, prior to introducing the mixture to be run through the machine to the hopper 1, a waterproof binder substance, such as asphalt, rubber or a like waterproof binder, is emulsified in an aqueous vehicle with an emulsifying agent, such as clay, to produce a non-adhesive coating about the binder particles and rendering the same substantially non-adhesive, the binder particles constituting the dispersed phase and the water the continuous phase of the emulsion. This emulsion is combined with the fibrous or non-fibrous material, such as paper stock or other fibrous pulp, cork, sawdust or the like, in a pug mill and there thoroughly mixed while the stock is disintegrated to the amount best adapted to produce the sheeted composition. Generally this is accomplished by charging the pug mill or disintegrator first with the emulsion, which is in a stiff pasty condition. By stiff pasty condition, I refer to an emulsion, for example, which might contain 40% more or less of water and 60% more or less of binder, emulsifying agent or other solids. In other words, it is desirable to have a minimum amount of water in the emulsion and still produce the desired disintegration of the paper stock. The dry paper is then fed into the mixer and disintegrated in the presence of the emulsion, some of the water of the emulsion being absorbed by the paper.

The paper need not perhaps, in some cases, be entirely dry. The process is to be distinguished from that type of process in which there is an admixture of the emulsified pitch and paper stock carrying with it an amount of water many times the amount of solids present, such as would be required for preparation for a paper machine.

This transfer of water from the emulsion to the paper causes the charge to assume a very thick consistency or body with sufficient internal friction to readily cause the paper stock to be disintegrated to a fibrous condition. It will be understood that there is still sufficient water present to maintain the emulsion form of the bituminous binder and care must be taken to maintain sufficient quantities of protective emulsifying agent about the binder as otherwise the emulsion state will be disrupted. In this latter event the water will then collect and separate from the mass and the asphalt will agglomerate to produce a gummy mass which is no longer adapted for the process. Should the operator note any tendency for water to separate, which is an indication of impending de-

mulsification, immediate additions of the emulsifying agent, such as clay, will avoid or remedy this condition.

The mixture coming from the pug mill (not shown) is introduced into the hopper 1 and is fed by means of a roll 2 rotating in the bottom of the hopper to an endless belt or carrier 3 operating over rolls 4 and 5. The roll 2 has mounted upon its periphery a plurality of small spike members or projections 6 which serve to feed the stock in a uniform manner upon the band or belt 3. The belt is driven in any suitable way in the direction shown by the arrows and the stock laid thereon is passed between upper and lower pressure rolls 7 and 8. The machine is fitted with a series of these pressure rolls, each set having an adjustment for the upper roll by means of which the pressure on the respective sets may be positively controlled. The initial set of rolls will be adjusted so that little pressure will be imposed upon the stock and as it proceeds the pressure will be increased in order that the stock will be formed in a uniform sheet. In this manner, in conjunction with the rate of feed of stock from the hopper the thickness of the sheet may be regulated.

The mixture, comprising a comparatively cool emulsion of adhesive binder and fibrous or non-fibrous stock, being rolled, out in this manner, is non-adhesive in character and after passing through the final set of pressure rolls is directed through guide rolls 9 and 5 and then introduced to a hot chamber in which it is run through a series of drying rolls 10 and 11. This hot chamber serves to set the adhesive binder and cause it to permeate uniformly between the interstices of the material with which it is formed. On emerging from the hot chamber, the sheeted bituminous composition may be run over driers (not shown) or run directly on to a roll 12 from which the rolled sheets may be placed in storage.

The endless belt or band 3 carrying the composition is returned over the roll 5 and passed over a guide roll 13, the surface being subjected to a water spray at 14 and a stiff brushing by means of the rotary brush 15 after which it passes over the guide roll 16 and is returned to receive an additional charge of the stock over the roll 4. The particular type of drive has been purposely omitted as it would unnecessarily involve the novelty of the invention and its details are of no particular importance other than that it is necessary to drive the belt at a uniform and regulated speed.

It has been found that the thickness of a paper sheet which is produced on a continuous web paper machine is limited and likewise, this limitation holds when an adhesive binder is to be incorporated in the body of the sheet.

In making heavy gauge paper a multi-cylinder machine may be used but even here the thickness is limited to approximately 65 points. Also, it has been found that the stock is limited in the amount of the bituminous binder it is able to carry as the binder is supported by the particles of the stock and after a certain point has been reached, overloading will cause difficulties due to the excess of adhesive binder.

In making flooring composition a burlap backing 18′ may be united to the sheet by introduction over the roll 18 and fed beneath the stock so that the stock is actually formed on the sheet instead of the endless belt. Likewise in order to avoid adherence to the rollers a thin sheet 19 may be continuously fed to the upper surface over roll 20 and removed after passing through the guide rolls over roll 21. After passing through the pressure rolls enough water has been pressed into the strip 19 to permit its ready separation from the sheeted composition.

By use of the machine described, a process has been evolved which permits the incorporation of amounts of binder to several hundred per cent of the fibrous or non-fibrous material present in the finished composition, i. e., to 100 parts by weight of fiber and other non-bituminous matter, there may be used 200 parts by weight of bituminous binder. This not only produces a more waterproof product but decreases materially the waste resulting in producing a sheet of this character. It will be noted also that the sheet is not made by combining a series of plies but is run as a single ply through the machine.

By emulsifying the adhesive binder prior to mixing it with the stock, the binder is made non-adhesive and lends itself admirably to the rolling process through which it is run. The fact that the binder and stock are run together, first being thoroughly mixed, uniformly disperses the former throughout the body of the sheet, making the sheet a compact composition with the binder very uniformly incorporated in its body.

This process is particularly adapted for use where the binder comprises linseed oil with suitable bases, soft stearine pitches and analogous waterproof substances readily colored and which do not lend themselves so readily to the degree of non-adhesiveness requisite to satisfactory manipulation on a paper machine.

By means of this process, a roofing sheet or roofing element such as strip shingle or individual shingles may be made which permits of a much greater strength, thickness and water resisting character, than is the case with the ordinary asphalt saturated roofings of commerce. The ordinary roof-

ing felt of commerce scarcely ever exceeds ninety one thousandths of an inch in thickness and even after saturation with asphalt, is still capable of absorbing ten to twenty per cent of water in twenty four hours. The product made by this process, however, may vary in thickness from a few thousandths of an inch to a half inch or more in thickness, and its water absorbing properties reduced to as low as three to five per cent or less in twenty four hours. Also such a roofing element will have a much larger percentage of binder than is the case with the prior art above referred to.

The apparatus for carrying out the above process forms the subject matter of a separate copending application, Serial No. 641,114 filed May 24th, 1923.

I claim as my invention:

1. A process of producing an unfelted compressed sheet comprising thoroughly intermixing fibrous material introduced in a relatively dry state and a water-repellant binder in the form of a non-adhesive viscous aqueous emulsion to transfer water from the emulsion to the fibrous stock, in sheeting and compressing the mixture while the binder is maintained in an emulsified condition, and in then heating the sheet to cause the binder to permeate the interstices of the material in which it is contained and become adhesive.

2. A process of producing a non-felted compressed sheet which comprises thoroughly intermixing filler material introduced in a relatively dry state and a water repellent binder in the form of a non-adhesive aqueous emulsion to transfer water from the emulsion to the filler material, sheeting the composition by compression into a sheet of substantially uniform thickness while maintaining the binder in an emulsion state, and subsequently causing the binder to permeate the composition by removing the water.

3. A process of producing a non-felted compressed sheet which comprises thoroughly intermixing filler material introduced in a relatively dry state and a water repellent binder in the form of a non-adhesive aqueous emulsion to transfer water from the emulsion to the filler material, sheeting the composition by compression into a sheet of substantially uniform thickness while maintaining the binder in an emulsion state, and subsequently causing the binder to permeate the composition by subjecting the sheet to heat to remove the water.

4. An unfelted waterproof composition, comprising a mixture of fibrous stock and a comminuted non-fibrous filler combined with a fusible waterproof bituminous binder, and said binder being derived from an emulsion of waterproofing material and an emulsifying agent for the bituminous binder.

5. An unfelted waterproof composition, comprising a mixture of fibrous stock and comminuted resilient filler combined with a fusible waterproof bituminous binder, and said binder being derived from an emulsion of waterproofing material and an emulsifyin agent for the bituminous binder.

6. A compressed unfelted continuous waterproof sheet, comprising a mixture of fibrous stock and comminuted resilient non-fibrous filler bonded with a fusible waterproof binder derived from an emulsion of waterproofing material, and an emulsifying agent for the bituminous binder, the binder being in excess of 150 parts thereof relative to 100 parts by weight of the non-binding material.

7. A compressed unfelted continuous waterproof sheet, comprising a mixture of fibrous stock and comminuted resilient non-fibrous filler bonded with a fusible waterproof binder derived from an emulsion of waterproofing material, and an emulsifying agent for the bituminous binder, the binder being in excess of 150 parts thereof relative to 100 parts by weight of the non-binding material, and a fibrous backing material.

8. A process of producing a non-felted compressed sheet which comprises thoroughly intermixing filler material and a water repellant fusible binder in the form of a non-adhesive aqueous emulsion, sheeting the composition by compression into a sheet of substantially uniform thickness while maintaining the fusible binder in an emulsion state, and subsequently causing the fusible binder to permeate the composition by removing the water.

9. A process of producing a non-felted compressed sheet which comprises thoroughly intermixing filler material and heat liquefiable asphalt in the form of a non-adhesive aqueous emulsion, sheeting the mixture by compression into a sheet of uniform thickness while maintaining the asphalt in an emulsion state, and subsequently causing said asphalt to permeate the sheeted mixture by removing the water.

10. A compressed unfelted waterproofed sheet comprising a mixture of comminuted resilient non-fibrous filler bonded with a fusibe waterproofed binder derived from an emulsion of waterproofing material and an emulsifying agent for the binder.

11. A compressed unfelted waterproofed sheet comprising a mixture of comminuted filler bonded together with a coalesced fusible waterproofed binder derived from an emulsion of bituminous material and an emulsifying agent, the binder being present in proportions greatly in excess to that of the filler.

12. A compressed unfelted waterproofed sheet comprising a thorough interadmixture

of filler material and a water-repellant fusible coalesced binder derived from an aqueous emulsion containing an emulsifying agent rendering the binder non-adhesive until coalesced, said sheet being compressed to substantial uniform thickness and having the water from the emulsion removed to cause the binder to permeate the filler and coalesce.

13. A compressed unfelted waterproofed sheet comprising a mixture of comminuted resilient non-fibrous filler bonded with a fusible waterproofed binder derived from an aqueous emulsion of bituminous material and an inert emulsifying agent for the binder, the water being removed and the binder being coalesced and interlocked with the filler.

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