

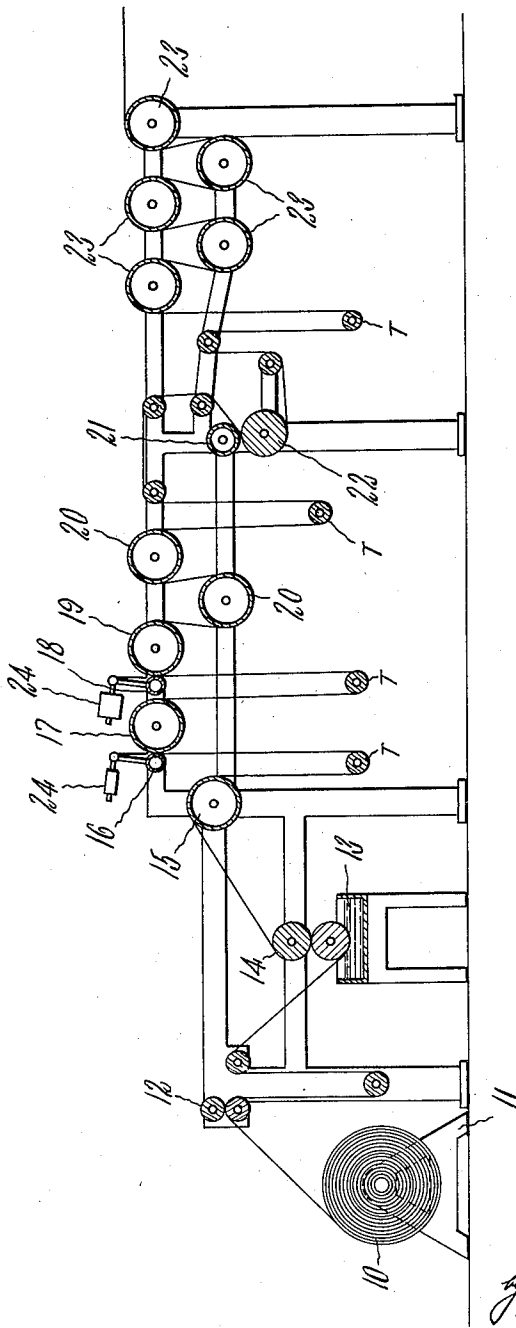
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MANUFACTURE OF SMOOTH FACED WEBS OF INTERFELTED FIBER

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MANUFACTURE OF SMOOTH-FACED WEBS
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This invention relates to the manufacture of smooth-faced webs of interfelted fiber. While not limited thereto, it relates more particularly to smooth-faced webs or felts that have been impregnated either in the course of their manufacture or afterwards with binders that are incorporated into the webs or felts as in the presence of water, for instance, water-dispersed binders that are added to and fixed onto the bulk fibrous stock from which the webs or felts are made or that are introduced into the prefabricated webs or felts.

In accordance with the present invention, a smooth surface is imparted to a web of interfelted fibers and more particularly to a binder-impregnated one as it is being gradually dried from a wet state by the application of smoothing pressure to the web in separate stages of increasing intensity as the wetness of the web decreases. Such practice is of great value when applied to a prefabricated web or felt that is put through impregnation with rubber latex and drying, particularly when the rubber-impregnated product is to be used as an artificial leather for such purposes as shoe-upper material, since for such purposes the surface of the impregnated product must be uniform enough to take on a smooth, thin coating or skin imparting to the product the appearance, feel, and other qualities of the skin side of natural leather. The usual waterlaid webs of interfelted fiber, especially when made of such absorbency or compactness as to be readily and uniformly impregnated with rubber latex, are apt to have surface irregularities that cannot be masked or obliterated by the thin coating or skin deposited thereon. On the contrary, such pits, fissures, or other surface blemishes that may and usually do occur in the impregnated web are apt to be brought into prominent relief by the thin coating or skin, particularly when the latter is dyed or pigmented to a black or very dark hue. If it is attempted to correct this fault by calendering or plating the rubber-impregnated web prior to coating, unreliable results are had, for the rubber impregnant is elastic, especially in the vulcanized state, and springs back or recovers to an objectionable degree after the smoothing pressure is released.

In applying the principles of the present invention to a web or felt that has undergone impregnation with rubber latex, a preferred practice is to pass the impregnated web progressively over hot rolls to evaporate its water content and to set the rubber gradually therein, and to cause smoothing rolls to bear down on the web in sep-

arate stages of increasing intensity as the web is passing over the hot rolls and its wetness decreases, each smoothing roll bearing down on the web as the web is being backed up by a hot roll-periphery. I have found that the latex shows little, if any, tendency, to gum the hot rolls or the smoothing or calendering rolls. While there may be a slight tendency for the first smoothing roll to foul, especially if pressed too heavily against the wet, latex-impregnated web, I have found that such tendency may be overcome by keeping its periphery cool, as by circulating cold water through the interior of such roll.

With the foregoing and other features and objects in view, I shall now describe my invention in greater detail with reference to the accompanying drawing which illustrates more or less diagrammatically and conventionally a machine for producing a smooth-faced artificial leather from a web of interfelted fiber and rubber latex as raw materials.

In the drawing, at 10 is shown a roll of water-laid web or felt which may be of a comparatively soft and fluffy texture and consist of refined cellulose fibers, for instance, wood pulp having an alpha cellulose content of upwards of about 93%. The roll may include a hollow core within which may be a mandrel for rotatably supporting the roll in a pair of spaced frames 11. The web is unwound from the roll by a pair of driven propelling rolls 12 and is guided into and through a bath 13 of suitably compounded rubber latex and thence between a pair of driven squeeze rolls 14 which serve to remove excess latex and thus to regulate the amount of solids introduced as impregnant into the web. It is generally desirable to have the rolls 14 clear each other by about the thickness of the dry or unimpregnated web. The latex may contain various compounding ingredients, including sulphur and a suitable accelerator of vulcanization, so as to foster a vulcanization of the rubber impregnant during the subsequent drying of the impregnated web. The wet, impregnated web is then passed over the steam-heated drying roll or drum 15, thence into the nip defined by a smoothing roll 16 and a steam-heated drying roll 17, thence into the nip defined by a second smoothing roll 18 and a steam-heated drying roll 19, thence over some more steam-heated drying rolls 20, thence into the nip defined by a steam-heated roll 21 and a smoothing roll 22, and finally over a bank of steam-heated drying rolls 23. The steam supplied as the heating medium to the hollows or interiors of the various drying rolls or drums may be under a pressure of, say,

5 to 15 pounds gage. The smoothing rolls may be driven by sectional drives (not shown) in between which may be placed tension rolls T free to rise and to fall within limits as the draw tensions between the sectional drives are adjusted. The first smoothing roll 16 may be cooled by the circulation of cold water at a temperature of, say, 40 to 80° F., through its interior. The others may be warmed by contact with the hot web. In regulating the pressures of the smoothing rolls against the web, weights or spring-tensioning means may be used; or fixed spaces or clearances of the proper dimensions may be left between the successive sets or pairs of smoothing and drying rolls. In the first case, illustrated in the drawing by the weights 24 applied to the first two smoothing rolls 16 and 18, the weights are increased from one smoothing roll to the next succeeding one; and, in the second case, the spaces or clearances are decreased from one set of smoothing and drying rolls to the next succeeding set.

The squeezing pressure exerted by the first smoothing roll 16 against the wet, latex-impregnated web as it passes over the hot periphery of the drum 17 is a comparatively gentle one, preferably slightly short of that which would crush the web. Through the combined influences of the pressure of the smoothing roll and the heat of the drum, the rubber evidently sets more especially near the surface of the web, whereat maximum evaporation of water is taking place, and imparts to the web sufficient strength or tenacity so that a few moments later it can withstand without crushing or rupture the pressure of the second smoothing roll 18 which is caused to exert much heavier smoothing pressure thereon. The last smoothing roll 22 may be advantageously made to exert a very high smoothing pressure against the web as it is resting on the heated roll 21. By the foregoing practice, it is possible to produce consistently a rubber-impregnated web practically perfect in surface texture, so that when it is surfaced with a thin coat or skin, an artificial leather remarkably free from blemishes and hence admirably adapted for such uses as shoe-upper material is realized.

As already indicated, it may be desirable to cool the first smoothing roll in order to ensure its remaining spotlessly clean indefinitely. It is perhaps the thin film of moisture continuously condensing on the cooled periphery of the roll where contact is made with the heated wet, latex-impregnated web that serves to keep it clean. But on the succeeding smoothing or finishing rolls, no rubber is evident even though these rolls may not be cooled. It is hence the proper application of smoothing pressure while the wet, impregnated web is being dried under heat that results in the impartation of the desired smoothness or finish to the web without loss of impregnant and without fouling the smoothing rolls or hot, drying rolls. The foregoing statement holds true even when, as may be done, the first smoothing roll is maintained cool, as the wet, impregnated web in contact with such roll is hot because it has already contacted with one or more hot, drying rolls and/or it is backed up by a hot roll-periphery as the first smoothing roll is acting thereupon.

The practice of the present invention may be applied not only to a prefabricated web that has been passed through a bath of water-dispersed impregnating binder but also to webs or felts prepared from fibrous furnishes into which the binder has been incorporated in finely divided or dis-

persed form. Thus, the web or felt as produced on the wet end of a paper-making or felt-making machine may contain rubber or other binder therein through the addition of rubber or other binder in the form of an aqueous dispersion to the water-slushed stock and, if desired, the precipitation or fixation of the dispersed binder on the stock preparatory to its being delivered to the paper-making or felt-making machine. In such case, the dry end of the machine may be equipped to do the work of drying the wet web under heat and of applying smoothing pressure to the wet web in separate stages of increasing intensity as the wetness of the web decreases. In some instances, it may be preferable to have the smoothing rolls hot and the rolls or drums serving to back up the web cold, or to have both cold, depending upon the nature of the impregnant. Generally speaking, the face of the web against a hot roll is smoothed to a greater extent than the face against a cool roll.

From another aspect, my invention may be considered as residing in the production of a binder-impregnated web presenting a smooth surface by a practice that involves incorporating the binder in an unset but settable condition into the web, progressively setting the binder in the web, and applying smoothing pressure to the web in separate stages of increasing intensity as the set condition of the binder in the web increases. This condition of affairs obtains when rubber latex or other water-dispersed binder capable of progressively setting as it is being dried is introduced as the impregnant into a prefabricated web of interfelted fibers and the impregnated web is dried. By gradually increasing the smoothing pressure to comport with the degree of set of the binder at any particular time, it is possible to avoid losing impregnant, fouling the instrumentalities employed in the process, or crushing or rupturing the impregnated web. Considered in this light, it can be seen that my invention is applicable when the unset but settable binder consists of aqueous solutions or organic solvent solutions of various binders or molten binders which gradually lose their plasticity and set as their solvents are evaporated or as they are cooled, thereby permitting the webs or felts into which they have entered as impregnants to be smoothed on their surface in separate stages of increasing intensity as the set condition of the binder in the web increases.

The practice of the present invention is advantageous not only when applied to waterlaid webs, but also when drylaid webs or carded or true felts are involved, for such webs, as in the case of the waterlaid webs, are apt to be of coarse or non-uniform surface texture when compared with natural kid or calf skin.

I claim:—

1. A method of producing a binder-impregnated web of interfelted fibers presenting a smooth surface, which comprises impregnating a prefabricated web of interfelted fibers with settable liquid binder in a volatile liquid vehicle, said binder progressively setting as said vehicle is evaporated therefrom, progressively drying said impregnated web to evaporate said vehicle and to set said binder, and, as said web is progressively being dried, subjecting it to smoothing pressure in separate stages of increasing intensity each controlled to avoid squeezing binder from said web or crushing or rupturing said web.

2. A method of producing a binder-impregnated web of interfelted fibers presenting a

smooth surface, which comprises impregnating a prefabricated web of interfelted fibers with an aqueous dispersion of binder tending to set progressively in said web as water is evaporated therefrom, progressively drying said impregnated web under heat to evaporate the water and to set said binder, and, as said web is being progressively dried under heat, subjecting it to smoothing pressure in separate stages of increasing intensity each controlled to avoid squeezing dispersion from said web or crushing or rupturing said web.

3. A method of producing a rubber-impregnated web of interfelted fibers presenting a smooth surface, which comprises progressively impregnating a prefabricated web of interfelted fibers with rubber latex, progressively passing the impregnated web over hot rolls to evaporate its water content and to set the rubber, and causing smoothing rolls to bear down on said web in separate stages of increasing intensity as said web is passing over said hot rolls and as its wetness decreases, each said smoothing roll being caused to bear down on said web, as said web is being backed up by hot roll-periphery, under pressure controlled to avoid squeezing of rubber from said web, fouling of said rolls, or crushing or rupturing of said web.

4. A method of producing a rubber-impregnated web of interfelted fibers presenting a smooth surface, which comprises progressively

impregnating a prefabricated web of interfelted fibers with rubber latex, progressively passing the impregnated web over hot rolls to evaporate its water content and to set the rubber, causing smoothing rolls to bear down on said web in separate stages of increasing intensity as said web is passing over said hot rolls and as its wetness decreases, each said smoothing roll being caused to bear down on said web, as said web is being backed up by hot roll-periphery, under pressure controlled to avoid squeezing of rubber from said web, fouling of said rolls, or crushing or rupturing of said web, and maintaining the peripheral surface of at least the first-stage smoothing roll cool to promote a maintenance of such surface in unfouled condition.

5. In a method of producing a binder-impregnated web of interfelted fibers presenting a smooth surface and more especially a method involving the impregnation of a prefabricated web of interfelted fibers with a settable liquid binder and the progressive setting of said binder therein, that practice which comprises subjecting said impregnated web in the course of the progressive setting of the liquid binder therein to smoothing pressure in separate stages of increasing intensity each controlled to avoid squeezing binder from said web or crushing or rupturing said web.

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