Jan. 30, 1934. G. L. SCHWARTZ 1,944,906

ABSORBENT FELT AND ARTIFICIAL LEATHER PRODUCTS MADE THEREFROM

Filed June 9, 1932

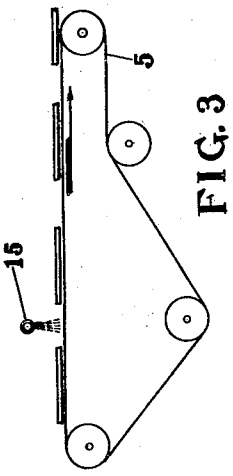


FIG. 3

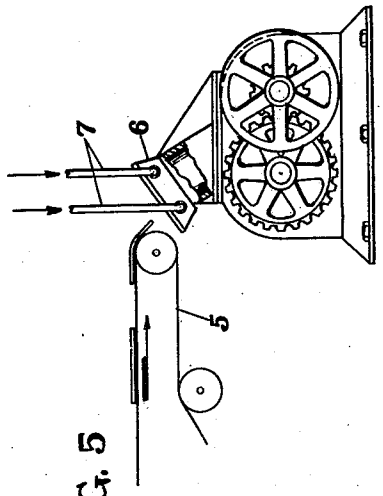


FIG. 4

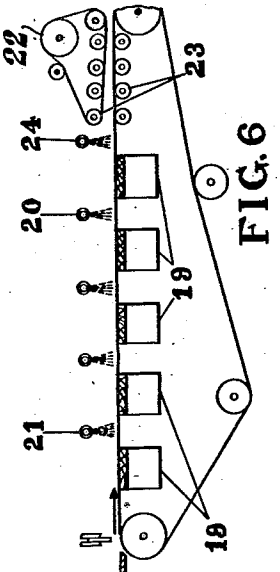


FIG. 6

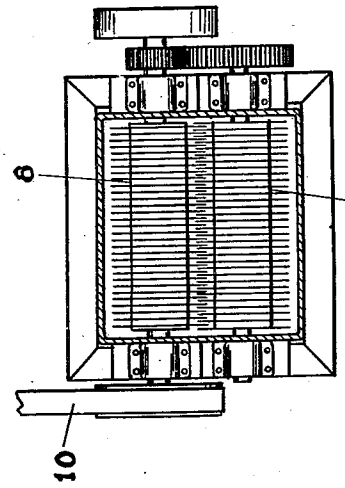


FIG. 5

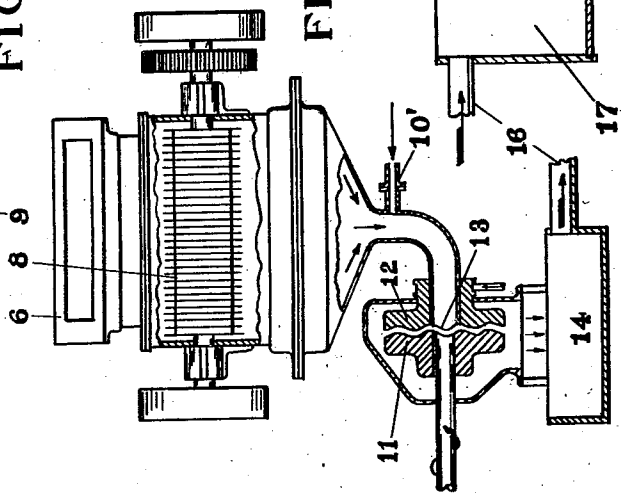


FIG. 2

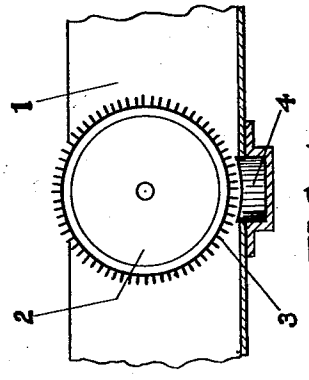


FIG. 1

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Patented Jan. 30, 1934

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ABSORBENT FELT AND ARTIFICIAL LEATHER PRODUCT MADE THEREFROM

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Application June 9, 1932. Serial No. 616,323

18 Claims. (Cl. 92—20)

This invention relates to an absorbent paper, and more particularly to a felt-like product particularly suitable as an impregnating base for the manufacture of artificial leather.

Prior attempts to hydrate paper pulp which has been treated with caustic of mercerizing strength by beating the treated pulp with water have been generally unsuccessful and have served no useful purpose. This is evident by the statement in the patented art that mercerization tends to lower the strength of the pulp very materially and, on beating, such pulp does not tend to hydrate or gel, the beating operation tending to merely macerate or shred the fiber and resulting in a paper of low strength. I have discovered, however, that if the treatment of the pulp with the mercerizing caustic is conducted so as to cause not substantially more than a superficial mercerization or skin effect, as disclosed in Patent 1,857,100 issued to Frank H. McCormick and myself, and if the beating of the pulp with water is effected in the special manner described hereinafter, a hydrated pulp is obtained which may be made into an absorbent felt having certain remarkable properties particularly adapting it for use an an impregnating base.

This invention has as an object paper or felt somewhat denser and of greater strength than that disclosed in the above mentioned patent but which is still sufficiently porous to absorb colloidal dispersions like the best rag felts. Another object is to make from paper making fibers a strong well closed sheet which acquires maximum impregnating strength with relatively small amounts of saturants. Another object is to make a felt having a high residual porosity after saturation with sufficient material to give satisfactory strength as a base for artificial leather. A further object is to make a felt which has a satisfactory paper break after impregnation with colloidal dispersions. A still further object is to provide a new and economical process of producing a strong, absorbent felt suitable for use as a base for artificial leather and like products. Other objects will appear hereinafter.

These objects, in the preferred embodiment of my invention, are accomplished by the steps which consist in treating ordinary paper pulp with strong caustic solution under conditions which avoid drastic action between the caustic and fiber such as takes place in processes for making highly purified or high alpha cellulose pulp, and then beating the caustic treated pulp with water in a special manner which causes hydration of the pulp without substantial shortening of the fiber length through the cutting action which takes place in the conventional processes for beating pulp in the manufacture of high grade or writing papers.

In carrying out my invention, I use as the initial material pulp such as wood pulp composed of fibers that are long enough (2.0 mm. to 4.0 mm. mean fiber length) for making strong paper. The pulp may be made by any of the usual chemical methods of manufacturing paper pulp from the raw cellulose material. The fibers are not purified further than that which takes place in the ordinary sulfate, sulfite, or soda processes of cooking the wood chips in the manufacture of the pulp which constitutes the raw material in the present process. Rope, flax, hemp and other long fibers may be used, providing the fiber length has been reduced by cooking or beating, or both, to a fiber length of 2.0 to 4.0 mm. average length. A highly purified pulp is undesirable in the practice of my invention and I therefore hydrate the pulps having a pentosan content above 5% and an alpha cellulose content below 94%.

In producing a superficially mercerized pulp which is to be subsequently hydrated as described hereinafter, I proceed in accordance with the process set forth in detail in the patent mentioned above. Briefly, this consists in dispersing the pulp with caustic of mercerizing activity and promptly diluting the caustic in contact with the pulp below mercerizing activity as soon as the pulp has been dispersed into the caustic liquor. In the present process, however, it is not desirable to use concentrations of sodium hydroxide above 14% because of the long time required to hydrate the pulp by beating it in water. It is to be understood, however, that with the exception of this disadvantage the higher caustic concentrations up to 35%, where the wetting properties of the solution become very poor, can be used, but in any event the best results are obtained when the treatment is conducted so as to prevent extended time action of the strong caustic on the pulp. In the practice of my invention, I may use sodium hydroxide concentrations above 6.5%, which is just slightly below the concentration required for a solution of mercerizing activity. A concentration of 8% is preferred. The concentrations mentioned are those used at room temperatures. In order to minimize the drastic action of the caustic on the pulp and to prevent the action of the strong caustic on the fibers from extending beyond a superficial or skin effect, the pulp is dispersed at high consistencies, i. e., consistencies above 10% and preferably about 18%, the ratio of caustic to pulp at an 18% consistency being 4.56 parts by weight of liquor for one part by weight of pulp. The ratio of the treating solution to the dry fibers is very important for the reasons just mentioned and because of the economy of operation, reduction of weight loss, as well as certain mechanical advantages obtained by dispersing the pulp with the caustic at high consistencies. The speed with which the sodium hydroxide solution is dispersed into the pulp is

very important, slow dispersion results in obtaining fibers treated with different concentrations due to dilution, especially when the moist pulp is used. The best conditions are obtained when a sodium hydroxide solution is dispersed into the pulp instantaneously. A longer time of treatment than is required for good dispersion of the pulp with the caustic is undesirable chiefly because of lower production and increased loss of valuable material. The freeness of the pulp treated with the caustic alkali solution in the manner just described, as tested by the special freeness tester mentioned in the patent noted above, will as a rule vary from 60 seconds for a 6.5% caustic treatment to 31 seconds for a 14% caustic treatment, these values being also dependent upon the kind of fibers used.

The mechanism for dispersing the pulp with the caustic and for hydrating the pulp following the caustic treatment is better described in connection with the accompanying drawing in which

Fig. 1 illustrates a form of apparatus that may be used in carrying out the invention;

Fig. 2 is an elevational view partly in section of another mechanism for carrying out the invention;

Fig. 3 is a diagrammatical view of the conveyor for supplying the mechanism of Fig. 4 with pulp;

Fig. 4 is an elevational view of the upper portion of Fig. 2 showing arrangement of the hopper and conveyor;

Fig. 5 is a plan showing the arrangement of the toothed rollers in the mechanism of Fig. 4; and

Fig. 6 shows the conveyor on which the treated pulp is washed or washed and felted.

The preferred mechanism for mixing or dispersing the pulp with the caustic solution and promptly diluting the caustic in contact with the pulp after dispersion has been effected, is that shown in Figs. 2 to 6. Air-dry pulp compressed into the usual commercial pulp board is fed onto a wire screen conveyor 5 where a shower 15 of sodium hydroxide solution of 8% concentration at room temperature falls upon them. The excess caustic solution which runs off the sheets is stored for further use by means not shown. Considerable of the caustic solution is absorbed by the sheets which causes them to swell and soften. These sheets promptly drop from the conveyor into the hopper 6 (Fig. 4) of a shredder shown in plan Fig. 5 and in elevation in Fig. 2. As the sheets enter the shredder they are showered with more caustic solution of 8% concentration from spray pipes 7. The rolls 8 and 9 are armed with teeth which overlap between the rollers and which tear sheets into pieces of about one-half inch in diameter. These rolls are driven by the belt 10 at different speeds, such as 100 r. p. m. and 600 r. p. m., respectively, by means of the smaller gear on the driven shaft of the roll 8 which meshes with the larger gear on the shaft of the roll 9. The pulp then drops down in a disc refiner where additional caustic is supplied through pipe 10' in such quantity as will bring the total amount up to a ratio of 4 parts solution to one part of pulp (20% consistency). As previously noted, the concentration of the solution may be made sufficiently higher than the final concentration desired in order to compensate for the water in the pulp. The pulp then passes to the center of the disc refiner constituted by the discs 11 and 12 where the fibers are dispersed from the mass and wet with the caustic without abrasive action on the fibers. The discs 11 and 12 have smooth interfitting corrugated faces as shown and are driven in opposite directions by a mechanism not illustrated at a relatively high speed and are set with a clearance of $\frac{1}{16}$ inch to $\frac{1}{8}$ of an inch so that each fiber is freed from the mass in the passage 13 which extends from the entrance at the center of the disc to the edges where they are thrown off by centrifugal force. From this disc refiner the pulp drops into a trough 14 where the reaction between the caustic and fibers is stopped by diluting the caustic which also lowers the stock density to a pumping consistency. The duration of the treatment, that is the time elapsing between the application of the caustic on the conveyor from pipe 15 and the deposition of the pulp into the diluted solution in the tank 14, is not more than 15 seconds. The pulp passes through the conduit 16 to the chamber 17 whence it passes over a wire screen 18 where it is formed into a thick sheet and washed free from excess caustic solution. While fresh water may be introduced into the trough 14 to wash out the caustic to stop the reaction, I prefer to use the caustic (below 4%) resulting from the countercurrent washing system on the screen 18 so as to avoid dilution of the solution to the point where recovery of the caustic from the solution is no longer profitable. The numeral 19 designates a series of suction boxes between which the washing showers of water are directed. The show 20 is water and the weak caustic washed through the sheet into the last suction box is pumped to the preceding shower forming a stronger solution in the suction box below. The concentration progressively increases until the solution in the second suction box resulting from the shower 21 contains about 4% caustic concentration which is pumped back into the tank 14. The solution from the first suction box, which precedes the shower 21 and which removes the excess weak caustic resulting from the treatment of the pulp in tank 14, is run into a concentrator for recovering the caustic by raising the concentration of the solution to the value required for conducting the process. After passing over the suction boxes the sheet passes under another wire screen 22 where it is pressed between two or more sets of squeeze rolls 23. If the treated pulp is not free from caustic solution before passing through the wires 18 and 22, a shower of dilute hydrochloric acid from the pipe 24 is sprayed onto the sheet ahead of the squeeze rolls. The squeezed pulp is now formed into wet laps which are ready to be charged into the beater for making into paper.

After the pulp is dispersed in the strong caustic solution and diluted with water or dilute caustic solution, it should be washed free from caustic as soon as possible. Mechanical treatment in this stage is unnecessary but it is not so injurious as in the strong caustic stage. After the pulp has been freed from caustic solution, it may be stored indefinitely as wet laps or in dilute pulp form or as dry pulp, and is ready for forming into sheets of felt at any time.

The pulp introduced into the hopper 6 of the disc refiner may be in any one of several forms such as the dry pulp referred to above which usually contains from 20% to 5% moisture. The pulp may also be added to the dispersing mechanism in the form of sheets or in fluffed form, or as moist pulp such as wet lap or cake from a Voith screw press so long as the sodium hydroxide concentration of the treated liquor is adjusted to give the desired concentration of sodium hy-

droxide in contact with the fibers. When pulp other than pulpboard is used, it is, of course, not necessary to pass the pulp through the shredding machine.

In the treatment of the pulp with the caustic the temperature is a very important factor and room temperature, that is a temperature between 20–40° C., is preferred. For temperatures below 20° C. the concentrations of treating liquor must be reduced to conform to the increased mercerizing effect. However, treatments at low temperature solutions give products that are much more difficult to hydrate by heating than products obtained at room temperature or above. Temperatures above 40° C. are avoided because of the considerable degradation of cellulose which takes place at higher temperatures.

The beater shown in Fig. 1 may be used also to disperse the pulp with the caustic as well as to hydrate the superficial mercerized pulp by beating it in water in the manner described hereinafter. The beater consists of a receptacle 1 in which the power driven roll 2 may be raised so that the longitudinal bars 3 may clear the bed plate 4. The caustic solution and the air-dry pulp in a ratio to give a consistency above 10% is put into the beater with the roll raised slightly from the bed plate as shown in the drawing so that the bars 3 will squeeze the pulp against the bed plate and separate the individual fibers from the pulp mass and secure contact between the fibers and the caustic solution and cause wetting of the fibers in the shortest possible time without any abrasive or cutting action.

The method of practicing my invention may be better understood by reference to the following example:

Kraft pulp from northern spruce—	
freeness 67.0 seconds, containing	
60% moisture	2,500 pounds
(Water in pulp)	1,500 pounds
Sodium hydroxide solution, 12.8%	2,500 pounds
Consistency	20%
Sodium hydroxide solution in contact with the fibers	8%
Temperature of treated pulp	26.0° C.
Freeness of washed, treated pulp	51.0 seconds

The pulp in wet lap form was shredded into small pieces and was fed by a belt conveyor continuously into the hopper of the disc refiner or pulper in which the sodium hydroxide solution was also fed continuously at a rate adjusted to give an outgoing pulp consistency of 20%. The treated pulp was completely dispersed in the fibers as it came from the discs and it fell into a stream of 4.0% sodium hydroxide solution within 5 seconds from the time it came into contact with the strong sodium hydroxide solution. This dilution lowered the consistency to 0.5%. This suspension was promptly conveyed to a suction filter where it was washed by the counter current washing system until the alkali concentration of the liquid in contact with the fibers was .06% and the pulp consistency was 13.7%. It was then repulped in sufficient water and diluted sulfurus acid to make the pulp neutral to litmus paper, it was passed over a washer where most of the salts were removed and where it was thickened to a 5% consistency. It was then pumped into a Hollander type beater (Fig. 1) where it was beaten with the roll in a light brushing position for eight hours until the freeness was 130 seconds. It was then passed through a Jordan without cutting. The consistency was then lowered to .40% and it was passed over a Fourdrinier machine. The suction filter and washer shown in the drawing may, if desired, be replaced by a segmented cylinder or washer.

In beating the treated and washed pulp with water the beater roll must be close enough to the bed plate to cause pressure and squeezing action on the pulp but without cutting or abrasion of the fibers. In order to get the proper squeezing action it is important not only that the beater roll be set at a light brushing position to avoid cutting the fibers, but that the water and pulp be present at a consistency somewhat higher than is ordinarily used in processes involving beating pulp in water. For this reason I prefer to operate with consistencies between the limits of about 4% to 5%. While it is possible to operate with consistencies as low as 3% and as high as 6½%, this practice is undesirable because of the excessive care required to prevent bruising or cutting at the lower consistencies and to prevent overheating with consequent retardation of hydration at the higher consistencies. Those skilled in the art will understand what is meant by a light brush setting of the beater roll which does not reduce the freeness appreciably by cutting action. The following is a description of the beating conditions in terms of units of measurement for a 10 pound laboratory beater: Consistency of pulp in water—5%; temperature range during beating 25° to 40° C.; bed plate 12" x 3" with ⅛" bars and 1/16" between bars, bars set diagonal to beater bars; beater bars ⅜" broad with 1" spacings; roll—12" face and 14" diameter; peripheral speed of roll—1570' per minute; pressure on bed plate which is movable, 27,000 grams (this pressure is obtained by a leverage ratio of 4:1).

The time of beating, which is usually about eight hours when beating to a 135 sec. freeness, may range from 2 to 12 hours depending upon the kind of pulp, the manner of its manufacture and the degree to which it has been mercerized. The temperature during the beating of the pulp with water should not be allowed to rise above 50° C.

The artificial crinkling and superficial mercerization of the pulp, as effected by the caustic treatment previously described, causes an increase in freeness whereas its hydration by beating with water lowers the freeness from its initial value of about 31 seconds to 70 seconds to about 85 to 200 seconds. I prefer to hydrate the pulp to an extent which brings its freeness to about 135 seconds. While a more or less completely mercerized or highly purified pulp may be successfully hydrated by conducting the beating in water under the special conditions described above, the beating time required is greatly increased and the product obtained is less desirable for the purposes of the invention. The high freeness of the treated pulp which is subjected to the hydration treatment and the beating in water at high pulp consistency with the roll in a light brushing position to prevent abrasion or cutting of the fibers are factors contributing to the fast freeness of my hydrated pulp. A purified or mercerized pulp beaten in the usual way for the manufacture of high grade papers has a freeness seldom less than 300 seconds and which may be as high as 1000 seconds.

It will be understood that the hydration referred to in the present invention is reversible by boiling with water as distinguished from the hydration caused by caustic treatment which is

not so reversible. The pulp produced in accordance with the present invention responds to the conventional tests for the mercerization and hydration of cellulose fibers. The mercerization of the fibers may be identified by viewing them through the microscope and noting the change from the natural ribbon-like form, characteristic of cellulose fibers, to a wire-like form substantially circular in cross section. When the mercerizing solution used is sodium hydroxide, as is the preferred practice, the product shows a blue stain when treated with zinc chloriodine solution in the manner fully described in the mentioned patent. The light blue stain obtained when the sodium hydroxide concentration used was just at the border line of mercerizing activity, around 7% at room temperature, as well as the darker stain obtained with pulp treated with higher caustic concentrations, is easily distinguished from the slight coloration imparted to pulp which has been manufactured by cooking wood chips with sodium hydroxide and which has not received further treatment with mercerizing caustic as described herein. The hydration of the pulp is evidenced by the increase in freeness which takes place when the pulp is boiled in water, the increase in freeness obtained by 15 minutes boiling being at least 15%. In some instances, this reversal of hydration through boiling with water will cause a 90% increase in freeness.

Inasmuch as the pulp treating process described above avoids extended time action of the caustic solution on the pulp, the process does not result in any appreciable purification of the cellulose by extraction of the pentosans and other non-alpha cellulose material. The product obtained when ordinary paper pulp is used as the initial material has a pentosan content above 5% and the alpha cellulose content is less than 94%.

The mullen strength of the products of my invention, for a 240 pound paper, using a ream base of 25''x38'' and 500 sheets, is between the limits of 58 to 150 pounds. The material described herein differs from that produced in accordance with the mentioned Patent 1,857,100 in that it is denser, smoother, stronger and stiffer and in that it reaches its maximum tearing strength with an absorption of about 30% rubber from latex based on the final weight of the product, the maximum tearing strength for the material mentioned in the patent requiring about 50% of rubber. The maximum tearing strength of the present product with other impregnating materials is also in general reached with a lower saturant content than is obtained from the impregnation described in the mentioned patent.

The properties of the sheet produced in accordance with the example given above correspond to those given in connection with sample 3 in the following table:

Unimpregnated sheets

Sample no.	Kind of fiber	NaOH treatment prior to hydration with water	Freeness seconds	Porosity seconds	Kerosene absorption	Mullen bursting strength pounds	Saturation time 15% latex seconds
1	Kraft	None	130	3.42	152%	145	7.8
2	Kraft	8% (not subsequently hydrated)	57	0.8	250%	57	0.8
3	Kraft	8%	130	1.60	184%	127	0.9
4	Kraft	6.5%	130	2.05	185%	130	1.2
5	Kraft	12%	130	0.90	206%	95	0.8
6	Unbleached sulfite	8%	130	2.20	196%	58	1.0
7	Rope	10%	130	2.10	190%	140	1.4
8	Rag	None	130	1.40	195%	130	0.9
9	Rag	None (only slightly beaten in water)	64	0.51	239%	45	0.8

Products corresponding to samples 4, 5, 6 and 7 in the above table were obtained by treating the pulps with the caustic concentrations indicated in the table at room temperature and then hydrating the pulp in the manner given in detail in the foregoing example. This table gives a comparison of the products of the present invention with representative saturated papers, samples 8 and 9, and with kraft pulp which has been hydrated without the caustic treatment, sample 1, and with the felt obtained from the superficial mercerized fibers without hydration, sample 1. All samples except 2 and 9 were beaten to a freeness of 130 seconds. The sheets were approximately 0.40'' thick and weighed 25.8 grams per 10 x 10'' area.

The felt produced by the process described in the example above was impregnated with natural rubber latex containing 16.0% rubber by a continuous process in which the sheet was drawn over a continuous wire screen where the latex was poured onto it. Then it was passed beneath an additional continuous wire screen where excess latex was expressed by means of press rolls. The sheet then passed from the screens over a regular paper dryer can system equipped with dryer felts, where it was dried at a steam pressure of 8 pounds to a moisture content of 8%. The finished product had an Elmendorf tear of 1,470 grams, a Gurley porosity of 25.0 seconds and a pliability of 16.0. It did not give a paper break when bent over a 0.5'' mandrel.

Sample No. 3 of the following table shows the properties of the felt when impregnated with latex to the extent of 20% rubber based on the weight of the final product:

Impregnated sheets containing 20% rubber as latex

Sample No.	Porosity seconds	Paper break diameter of cylinder	Pliability	Elmendorf tear—grams
1	97	1.0''	21.0	1470
2	3	0.3	12.0	1000
3	25	0.5	16.0	1470
4	36	0.6	19.5	1430
5	14	0.5	16.0	1100
6	42	0.3	11.0	1100
7	28	0.6	17.5	1720
8	24	0.3	14.5	1400
9	3	0.5	12.5	1150

The base materials in the above table, identified by sample numbers corresponding respectively to the sample numbers of the unimpregnated sheets in the preceding table, were also impregnated with 20% rubber from latex.

An artificial leather product closely resembling real leather was obtained by applying the following coats to the impregnated product resulting from the process described in the example:

	Parts
Pyroxylin	4.00
Orange shellac	4.00
Ethyl alcohol—denatured	25.00
Ethyl acetate	22.50
Butyl acetate	2.50

This coat was dried at 105° C. for 10 minutes. It was then given two coats of the following composition, with 15 minute drying periods at 105° C. after each coat:

	Parts
Pyroxylin	1.00
Castor oil	1.90
Pigment	0.60
Ethyl alcohol—denatured	5.00
Ethyl acetate	4.50
Butyl acetate	0.50

The coated material was then embossed in a Skiver grain. The finished product resembled a good grade of heavy leather, could be skived readily in order to make good glued joints, could be stitched without tearing, and in general could be handled like leather of the same pliability and thickness.

The same result, with minor variations, may be obtained by substituting for latex other colloidal impregnating materials such as pyroxylin-oil compositions, asphalt in toluol solution, shellac in alcohol solution, blown linseed oil in benzol solution, and a latex of chloro-2-butadiene-1, 3 polymer. Rubber dispersions in organic solvents are, however, less satisfactory as impregnating media. The following are examples of the type of materials suitable generally as impregnating media; artificial aqueous dispersions of rubber as well as the natural latex; cellulose esters; cellulose ethers; polymerizable substances, such as urea-formaldehyde and chloro-2-butadiene-1, 3 polymers; bituminous substances such as bitumens, pyrobitumens, pyro-liquors, distillates, tars, and pyrogenous residues from the manufacture of oils, fatty acids, fats, or waxes; natural resins, such as rosin, damar, copal, shellac; synthetic resins such as glyptals, styrene and vinyl resins; waxes such as paraffin, Canauba, and ozokerite; greases such as petrolatum; drying oils such as blown linseed oil, blown China-wood oil, blown fish oils.

The sheet material impregnated with any of the substances mentioned may be coated with pyroxylin compositions, blown drying oil compositions, rubber compositions, caseine compositions, etc., for the production of various types of artificial leather products.

Very fine pigments in limited ratios can be incorporated into the impregnating media, and these are carried into the center of the felt without straining. The impregnating base described herein can also be impregnated satisfactorily with the previously mentioned substances when they contain other constituents than pigments, such as dyes that are used for colored pyroxylin compositions, latices, and resins. Some of the impregnated products are useful without further treatment. Where certain surface effects are required the impregnated products are coated with cellulose ester compositions, rubber compositions, drying oil compositions and the like. In cases where the sheets are impregnated to the maximum limit in order to obtain greater strength and other properties, such as water resistance, a primer coat is required like that given in the example.

Although the felt of the present invention has unusual advantages as a saturating base, it has other applications that are very useful. Its high porosity combined with high strength makes it useful as a dry unimpregnated insulation for wires, dust filters, heat insulators, blotters and the like.

The term "colloidal impregnating material" used herein refers in general to non-crystalline film forming materials which includes not only true colloids such as latex, but also those impregnating materials which, because of their high viscosity or because of other properties, offer the same difficulties in the impregnation of ordinary absorbent papers which tends to strain out the pigments and large colloidal particles on the surface and prevent uniform impregnation of the interior of the sheet.

Among the advantages possessed by my improved product the following may be mentioned: High strength with sufficient porosity to permit dispersions with colloids or viscous liquids without the sheet breaking or destruction of the felt structure; a high impregnated porosity which gives good anchorage for final coats; less cement or other impregnating material is required than in the case of the more porous felts such as the products in the mentioned patent, or cotton linters and roofing felt, to give the equivalent strength; the impregnated product is resistant to heat treatment after saturation which enables resins such as Bakelite impregnated in the sheet to be changed to the infusible stage. The impregnated product has a high pliability, especially when impregnation is followed by embossing. The sheet absorbs cements uniformly—there is as much cement material in the interior of the sheets as there is on the surface. The sheet can be saturated uniformly in such great thicknesses that lamination of thin sheets is not necessary. The high rate of wetting and saturation of the impregnated base with colloid dispersions is of decided advantage in the economic production of impregnated felts; saturated products, especially those that are embossed, are relatively freer from paper break than felts made from untreated pulps. The process of the present invention also makes some low cost raw materials available for new uses in higher price fields.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that I do not limit myself to the specific embodiments thereof except as defined in the following claims:

I claim:

1. A process which comprises treating mercerized but substantially unpurified paper pulp of pentosan content of more than 5% with water until the pulp is hydrated.

2. A process which comprises hydrating mercerized but substantially unpurified paper pulp by subjecting the pulp admixed with water at a consistency within the limits of about 3 to 6.5% to a continuous mixing involving a squeezing action without any substantial cutting of the fibers, said mercerized paper pulp having a pentosan content more than 5% and an alpha cellulose content less than 94%.

3. A process which comprises beating substantially unpurified mercerized paper pulp fibers in water without any substantial abrasive or cutting action until the freeness of the pulp is reduced to within the range of 85 to 200 seconds.

4. A process which comprises dispersing paper pulp with a solution of caustic alkali having a

strength equivalent to that of a sodium hydroxide solution above 6.5% at room temperature, washing out the solution before the action of the caustic proceeds substantially beyond a superficial or skin effect, and hydrating the pulp by beating it in water without substantial abrasive or cutting action on the fibers.

5. A process which comprises dispersing ordinary chemical paper pulp having a mean fiber length of 2—4 mm. with sodium hydroxide within the range of concentration of 6.5% to 14% at a consistency above 10% and at a temperature of from about 20° C. to 40° C., washing out the caustic, and beating the pulp with water at a consistency of about 4% to 5% with the beater roll set at a light brushing position until the freeness is reduced within the range of 85 to 200 seconds.

6. A process which comprises dispersing ordinary chemical paper pulp having a mean fiber length of 2—4 mm. with sodium hydroxide within the range of concentration of 6.5% to 14% at a consistency above 10% and at a temperature of from about 20° C. to 40° C., washing out the caustic, and beating the pulp with water at a consistency of about 4% to 5% with the beater roll set at a light brushing position until the freeness is reduced to about 135 seconds.

7. A process which comprises dispersing ordinary chemical paper pulp having a mean fiber length of 2—4 mm. with sodium hydroxide within the range of concentration of 6.5% to 14% at a consistency above 10% and at a temperature of from about 20° C. to 40° C., washing out the caustic, beating the pulp with water at a consistency of about 4% to 5% with the roll set at a light brushing position until the freeness is reduced within the range of 85 to 200 seconds, and felting the treated pulp into paper.

8. The process set forth in claim 5 in which the chemical paper pulp is kraft pulp.

9. The product substantially identical with that obtainable by the process set forth in claim 5.

10. The product substantially identical with that obtainable by the process set forth in claim 6.

11. The product substantially identical with that obtainable by the process set forth in claim 7.

12. Hydrated mercerized paper pulp having a freeness of from 85 to 200 seconds, and a pentosan content of more than 5% and an alpha cellulose content of less than 94%.

13. An absorbent paper comprising felted hydrated mercerized paper pulp, said pulp having a freeness of from 85 to 200 seconds, a pentosan content of more than 5% and an alpha cellulose content of less than 94%, and a mullen strength of 58 to 150 pounds.

14. An artificial leather comprising a felt of hydrated mercerized paper pulp impregnated with colloidal impregnating material.

15. The product set forth in claim 12 wherein the colloidal impregenating material is rubber latex.

16. An artificial leather comprising a felt of hydrated mercerized paper pulp impregnated with impregnating material selected from the class consisting of fatty oil, bituminous materials, resins, rubber, cellulose esters, cellulose ethers, waxes and greases.

17. The product set forth in claim 14 wherein the pulp is substantially unpurified and has a pentosan content of more than 5%.

18. The product set forth in claim 16 wherein the pulp is substantially unpurified and has a pentosan content of more than 5%.

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