March 30, 1954 J. W. WENDELL 2,673,819

FIBROUS SHEET MATERIAL AND METHOD OF MAKING IT

Filed May 26, 1949

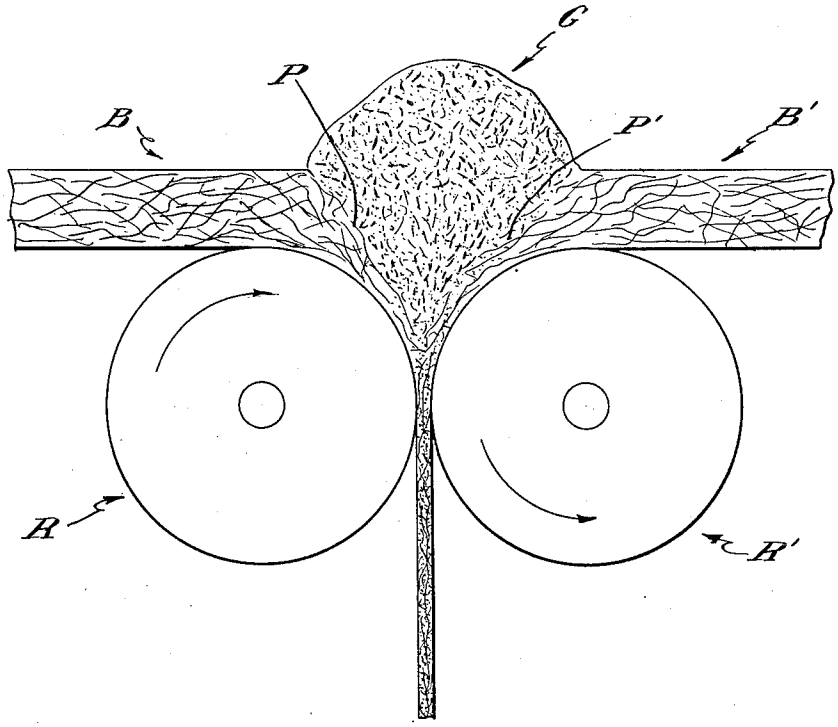


Fig. 1

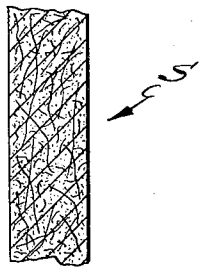


Fig. 2

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Patented Mar. 30, 1954

2,673,819

UNITED STATES PATENT OFFICE

2,673,819

FIBROUS SHEET MATERIAL AND METHOD OF MAKING IT

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Application May 26, 1949, Serial No. 95,579

10 Claims. (Cl. 117—140)

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This invention relates to a novel fibrous sheet material and to a method of making it, more especially to a base fabric having a wide field of utility in the manufacture of lamp shade and curtain materials, chintzes, stiff finish goods, and yard goods requiring special finishing and/or printing qualities, for example, for use in making bureau scarves, bridge table covers; or which, for example, may be impregnated or saturated for the making of artificial leather, and to such base fabric so saturated or impregnated, the present application being a continuation-in-part of my copending application Serial No. 784,829, filed November 8, 1947, and now abandoned.

When a sheet consisting of unspun fibers of substantially uniform length more or less felted together is saturated with an impregnant material and dried, the chemical solids are deposited on the fibers as a thin coating. If the fibers are absorbent they will swell and take in some of the saturant. Unless the fibers are very close together in a dense mass the air spaces will remain much the same and the fibers will be stuck together only where they are close or come in contact, and unless the fibers are pressed together firmly the saturated fabric will have little strength.

It has long been recognized in the art of preparing sheet materials from unspun fibers, that long fibers, that is to say, fibers of textile length, when adequately bound together, provide resistance to tearing and tensile stress, while short fibers alone, that is to say, those of paper-making length or less, when made into sheet material, provide a dense, smooth surface suitable for finishing but which is weak and tears easily.

Obviously, it would be desirable, if possible, to associate short and long fibers in the same fabric so as to combine the good characteristics of both kinds of fiber. Thus, when so combined, the short fibers will provide inexpensive bulk or plumpness to the sheet material and, even though but a small amount of binder be employed, will provide continuity of texture and may completely conceal the long fibers; short fibers, properly dispersed, provide uniformity of thickness, whereas, with long fibers alone it is only with the greatest difficulty, and then only in thick sheets, that approximate uniformity of thickness may be obtained; a combination of long and short fibers properly associated, whether with or without a binder, will take a smooth surface finish, without becoming stiff, merely by the application of heat and pressure.

Heretofore the preparation of base fabrics from

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unspun fibers has usually involved some modification of customary paper-making practice. For example, it has been proposed to lay a bat of textile length fibers upon a paper-making screen and then to flow onto the bat a water suspension of short (paper length) fibers in which, for example, the short fibers constitute approximately ½% of the fluid with the intent that the short fibers be drawn down into the interstices of the bat by the down-flowing water.

However, it is a matter of common knowledge that fibers floating in a very shallow stream of water, even though they be as short as 250 microns in length, will plug up even a coarse screen because of the tendency of the fibers to assume a horizontal position in which their lengths are perpendicular to the direction of fluid flow. In other words, they travel broadside instead of endwise. Thus, any attempt at mingling the short fibers with fibers of textile length, disposed in a bat by a procedure which involves the use of a simple water suspension of the short fibers, is doomed to failure since the short fibers merely produce a dense surface layer on one side of the bat. When the short fibers are thus filtered out and remain on the upper surface of the bat, no amount of pressing, either wet or dry, will substantially increase the penetration of the short fibers into the bat.

A principal object of the present invention is to provide a base fabric of unspun, unwoven fibers comprising long fibers and short fibers and wherein the short fibers are so interspersed among the long fibers as to form a web of substantially uniform thickness, wherein the voids between the long fibers are substantially filled by the short fibers and wherein the constituent fibers are anchored in place by the use of a relatively small amount of binder so that the base fabric is highly absorbent and readily impregnated by any desired saturant. A further object is to provide a novel method of preparing such a base fabric. A further object is to provide a method whereby a completed, saturated fabric may be made in a single operation.

Another object is the provision of a base fabric having novel characteristics whereby, when properly impregnated with a suitable impregnant, for example rubber latex, the resultant fabric behaves in many ways substantially like natural leather and is capable of taking a durable finish closely resembling the finishes which can be imparted to natural leathers.

Another object is to provide a sheet material capable of production, if desired, in substantially

unlimited lengths and in substantial widths and at a cost making it acceptable as a substitute for real leather, and which, in respect to strength, toughness, resistance to tearing, flexibility, perviousness to gas and moisture; capability of receiving a wide variety of surface finishes, draping qualities and feel; capability to receive and to retain sewing stitches, and in internal structure, closely resembles natural leather. A further object is to provide a fabric comprising a strong porous fibrous base including short fibers so associated with longer fibers as to provide a relatively firm, dense, smooth and level surface integral with the body of the fabric. Other and further objects and advantages of the invention will be pointed out hereafter.

The attainment of the above objects is made possible according to the present invention by the discovery that sheet material having the desired characteristics may be prepared successfully, and on a commercial scale, if in place of the usual suspension media (for example water) for the short fibers, which are to be incorporated with the long fibers, a non-sticky carrier or suspension medium having gel-like characteristics be employed.

Fig. 1 is a diagrammatic, vertical section illustrative of one embodiment of the method of the present invention; and

Fig. 2 is a diagrammatic section, to large scale, illustrative of the fibrous structure of the sheet material resultant from the method illustrated in Fig. 1.

Briefly, the procedure to be followed in accordance with the present invention includes first the preparation of a web or bat consisting of relatively long (textile length or longer) fibers, usually but not necessarily of cellulosic origin, either natural or artificial; the provision of discrete fibrous particles, for instance cellulosic fibers of paper stock length, the particle size being within the range of 100 to 3000 microns; the provision of a gel-like carrier in which the short discrete fibrous particles are substantially uniformly distributed, and the forcing of this carrier into the basic web or bat, the above operations being followed, if desired, by a saturation or impregnation of the sheet with a saturant appropriate to the purpose for which the completed material is desired and/or to drying, pressing and surface-finishing operations.

In preparing the basic web, the fibers, for example textile cotton fibers of from ⅝ to ¾ of an inch in length, are first cleaned and are then formed into a sheet in such a way as to crowd as many fibers into each square inch as is practicable. These fibers may first be disposed in a random fashion in many different ways. Thus they may be deposited from an air stream or blown onto a screen or traveling conveyor, for instance in apparatus of the general type described in the patent to Stevens 1,717,633, June 18, 1929. A carding machine or garnett may be modified so as to give a randomized arrangement or a camel back or lapper may be used, as for example as shown in the patent to Schorsch 1,612,178, September 13, 1927, to ply a fleece from an ordinary card back and forth over a traveling apron. In order to obtain the desired density, the machine employed in forming the sheet may be so slowed down in its delivery that the fibers will be crowded together, as compared with the normal arrangement when the machine is delivering at full capacity. While other fibers than cotton fibers may be used, it has been found that cotton fibers of textile length, for example, of the order of ⅝ inch long, and which are coarse and crinkly, pack together very well to form the desired density of bat. When a garnett is used for forming the sheet it is desirable to use a garnett having fine metallic wire, and the resultant web is fed to a lapper. By such procedures it is possible to produce a well distributed randomized arrangement of the fibers in a web having a density of from ½ to 8 ounces per square yard of 0.100 inch to 0.250 inch thick. The degree of actual felting will depend upon the kind of fiber and the length and type of treatment.

When herein, reference is made to fibers of "textile" length, it is understood to means fibers (which may be of any of the kinds used in making textile fabrics) which range from approximately ⅜ inch long to approximately 1½ inches long; and when reference is made to fibers of "paper stock" length, it is understood thereby to designate fibers not substantially exceeding ¼ inch in length.

Having in any appropriate way provided the discrete fibrous particles, for specific example cellulosic fibers of paper stock length, the carrier or suspension medium for these discrete particles is prepared.

While this carrier or suspension medium is like a true gel in action and probably in its structure, the term "gel-like" as here employed is intended to include media which do not fall within the strictest definition of gels. For instance, the medium employed may have its origin in a true solution with a particle size below one milli-micron; in a sol with particle size of 1 milli-micron but not over 1 micron; or a suspension of particle size over 1 micron but, in any event, having the structural cohesion characteristic of true gels and which is substantially independent of viscosity. While true gels are very stable, the gel-like medium employed in accordance with this invention may be of a type in which dispersed particles will gradually settle.

So far as is known, no prior use has been made of such gel-like media to form a basis for secondary dispersions of non-gelating substances such as fibers, in particular, as a medium for intermingling short fibers with long fibers. It will be understood that a practically endless variety of materials such as pigment colors, talc, inorganic earths, resins in powdered form or as emulsions, etc., etc., may be added to the solution or incorporated in the gel-like mass to give a great variety of effects to the finished products.

The gel-like mass here employed is of a kind which frees liquid when subjected to pressure. This freed liquid will usually be predominantly water, but will ordinarily carry with it some portion of the gel-forming substance.

In accordance with the present invention, the short fibers are first dispersed in a thin solution of the selected binding material, for example, a resin, and this suspension is caused to gel. As noted, the gel, consisting of a fluid, a solid and the fibers, is of a nature which loses liquid under a pressure which may be as low as five pounds to ten pounds per square inch. Thus, when such a gel, containing evenly dispersed short fibers, is pressed into a bat of longer fibers, the gel is forced by pressure into and through the bat, forming a slimy, slippery carrier for the short fibers, which are embedded in the gel, each fiber being separated from the others by a film of gel-liquid, so that they are no longer free to take up positions in which their lengths are perpen-

dicular to the direction of motion. In passing through the bat, the gel loses some liquid to the surrounding long fibers, due to the pressure, and is deposited with the short fibers in the interstices of the bat while still retaining its quality of ability to flow under pressure.

Preferably a gelling medium is employed which, in a 1½ to 2% solution, forms a rather firm gel which loses liquid when exposed to pressure. The gelling medium employed also provides the substance for permanently anchoring the fibers together. Thus, as above suggested, the gelling material usually will be of a resinous character. Employing a gel, such as just above suggested, wherein the gelling medium forms from 1½ to 2% of the whole, it is possible to disperse sufficient short fibers in such a medium to provide a 9 to 15% by weight concentration of fiber. An increase in the percentage solution of the gelling medium permits an even greater concentration of short fiber which is useful when it is desired to incorporate a large proportion of short fibers with the long fibers of the bat.

Many substances are capable of forming a base for such gel-like structures, these include hydrous oxides such as silica, etc., gelatin, albumen and serum, starches and gums, some soaps in organic media, nitrocellulose in various media and some of the new resins in various media.

A gel-like solution of starch, for instance, would consist of a 3% solution of cornstarch in water, cooked and allowed to cool.

Ten grams of Gum Tragacanth dissolved in 1000 cc. of water forms a gel-like mass.

Fifty grams of glue dissolved in 1000 cc. of water will form a gel when treated with 5 cc. of a 37% solution of formaldehyde.

The gel-forming material may be caused to gel before incorporation of the short fibers, but preferably for ease in securing a proper dispersion, it is preferable to disperse the fibers in the thin solution before the latter gels. When the gelling substance is such that a gel is formed during the cooling of a hot solution, the fibers may be introduced during the cooling and just before setting of the gel takes place. Best results have been found by the use of gels which set at temperatures between 60° and 100° F. This gel-like carrier or suspension medium with its dispersed discrete fibrous particles is forced into the bat by pressure (assisted, if desired, by suction).

For instance, the gel may be applied to the web by passing the web and the gel through squeeze rolls in much the same way that a rubber compound is calendered onto a fabric base, except that much lighter pressures are used to avoid breaking down the gel and making the web dense, until after the maximum penetration is accomplished. The greatest penetration occurs when the bat is loose and wide open when it comes in contact with the hydrostatic pressure of the gel bank. Since the gel-like carrier is not sticky, it does not tend to adhere to the rolls, and thus does not cause adhesion and tearing or bunching of the web. This pressure will go as high as one-half pound per square inch. As the rolls turn, the "squeeze" effect takes over and assists the penetration, but also limits it by closing up the bat. The "squeeze" levels off the sheet and in the process some liquid is expressed and wets down the long fibers of the bat, which up to this point have remained dry and not subject to the densing effect of being wet-out. Enough liquid remains in the fiber-bearing gel, however, so that the mass will mold under pressure. The result is that the fiber-carrying gel flows around the long fibers under light pressure up to the back surface of the bat where it is stopped by the back roll. The nip pressure is regulated to give the desired smoothness and density.

As a specific example, a fibrous bat consisting of cotton fibers of textile length, deliberately arranged in heterogeneous interlacing relationship, is taken as it comes in continuous lengths from the forming machine which may be a card, garnett or the like, and is passed between heavy rolls arranged side by side and turning about horizontal axes and with provision for moving one relatively to the other to vary the pressure. The gel, in which short cellulose fibers of papermaking length have been substantially uniformly dispersed, is applied to one or both sides of the bat of long fibers as the latter is passed between the rolls. The rolls, assisted by the hydrostatic pressure of the gel bank, carry a certain amount of the fiber-containing gel into the bite of the rolls, the amount which is forced into the bat depending upon the pressures and the consistency of the gel. The result is to produce a uniformly-thick sheet material into one or both sides of which the fiber-bearing gel has been pressed. If the original bat of long fiber be of a thickness such as not substantially to exceed 1½ ounces per square yard, the fiber-carrying gel will be forced all of the way through the bat. The material in this wet state has great strength to resist linear stress so that it is easily handled, for example, in passing it over a set of conventional drying cans to dry out the liquid of the gel. For example, when the sheet is dry the binder need not exceed 5% by weight of the material, and the short fibers so fill the spaces between the longer fibers that the voids are of capillary size not exceeding 300 microns in greatest dimension.

A desirable procedure for use in making a heavier material is illustrated in Fig. 1 wherein two batts B and B', respectively, of the long fibered material are advanced in opposite directions toward the nip of the oppositely turning squeeze rolls R and R' (which may be of conventional type) the batts being advanced toward the rolls by means of endless conveyor belts or other appropriate devices not shown. The gel carrying the short fibers is piled up to form the bank G directly above the nip of the squeeze rolls and as the batts B and B' move downwardly about the respective rolls, gel from the bank G intermingles with the long fibers of the batts at the areas P and P', respectively, but without wetting and thereby compacting the long fibers. The gel slips into the inter-spaces between the long fibers carrying with it, in suspension, the short fibers and thus as the gel penetrates the batts B and B' the short fibers are carried into the spaces between the long fibers of the batts. The spacing of the rolls R and R' determines the percentage of gel which will enter the long fibered batts. As the batts, with their impregnant gel, enter the nip of the rolls the gel liquid is released so as to wet out the sheet, leaving the short fibers filling the inter-spaces between the long fibers. If desired the combined batts from the first set of rolls may be led to a second pair of rolls, where fiber-bearing gel may be applied to one or both exposed surfaces of the united bats, the result being to produce a uniformly thick, bulky material, one or both outer

surfaces of which are dense and smooth. Bats weighing from ½ ounce per square yard to from 6 to 8 ounces per square yard are easily treated by this method at speeds limited only by the bat-forming process or by the drying operation. It is thus possible to make a wide range of fabric bases suitable for finishing into artificial leathers, curtain materials, cretonnes, etc.

The gel employed in the above treatment may, for example, be of any of the following compositions:

	Parts
High viscosity P. V. A.[1]	1.65
Water	110.00
Cotton fibers	10.00
Rubber latex (if used), 30%	15.00
Borax (2½% sol.)	4.00
Solids about 15%	
	140.65

[1]P. V. A. = polyvinyl alcohol.

	Parts
Cornstarch	3
Water	100
Wood fibers	10
Rubber latex (if used), 30%	15
	128

	Parts
Hide glue	10
Water	100
Cotton fiber	10
37% Sol. CH_2O	2
	122

With talc for a smooth feel:

	Parts
High viscosity P. V. A	1.65
Water	110.00
Wood pulp fibers	8.00
Talc	3.00
Borax (2½% solution)	4.00
	126.65

With a thermoplastic vinyl co-polymer:

	Parts
High viscosity P. V. A	1.65
Water	110.00
Cotton fibers	5.00
Vinyl co-polymer	20.00
Borax (2½% sol.)	4.00
	140.65

With ground pigment for color:

	Parts
High viscosity P. V. A	1.65
Water	110.00
Cotton fibers	9.00
Ground pigment	4.00
Rubber latex (if used), 30%	15.00
Talc	3.00
Borax (2½% sol.)	4.00
	146.65

Neoprene or other synthetic latices may be substituted for rubber latex, or other saturants may be used to obtain different effects in the finished products.

The viscosity of the dispersion of gel-forming substances in water (without suspended solids) and within the range of consistencies which are useful for the practice of the present invention varies from a low of 125 centipoises to a high of 400 centipoises at 20° C. At the low point the material has a long stringy pull which shortens as the high point is approached. Using the same formula and including the short fibers the viscosity range varies from a low of 150 centipoises to a high of 500 centipoises and over. As just noted, the addition of the short fibers increases the viscosity. For example, if the viscosity of the clear suspension be 320 centipoises at 20° C., the viscosity, after adding the required amount of short fiber, may be approximately 360 centipoises at 20° C.

The addition of the short discrete fibers shortens the "break" or pull. This is important because a short break is characteristic of a composition which will work well on the rolls. Variation of the water by as much as 10 parts in 100 will change the viscosity from extreme high to extreme low so that a very close control is thus obtainable. The gel-forming base ordinarily remains as a permanent part of the material, constituting the means for anchoring the short fibers to the long fibers, but at most would constitute not more than 5% of the total fabric weight.

By varying the thickness of the bat and the firmness of the fiber-bearing gel, and by varying the pressure of the applying rolls, the short fibers can be forced into and through up to the opposite surface of a web of from 1 to 1½ ounces per square yard of long cotton fibers. If the fiber-bearing gel is applied between two approaching bats, it is readily possible to saturate a thickness of each bat to a depth corresponding to a weight of 1½ ounces per square yard, and, by associating three or more plies of batting, each penetrated with the fiber-bearing gel, and pressing them together in the wet state and then drying them as a unit, it is possible to provide a sheet of almost any desired thickness but yet characterized by the presence of uniformly distributed air cells so small as to furnish excellent capillary attraction when the fabric is wet with any of the saturant or impregnant solutions which may be employed in converting the base fabric to the desired finished product.

(1) Since two bodies can not occupy the same space at the same time, the fiber-bearing gel is pressed into the voids in the web where the long fibers are absent, which provides a positive leveling effect and therefore uniform thickness plus a level compact surface of mixed long and short fibers.

(2) The short fibers dispersed along the length of every long fiber form thousands of contact points which are locii for cementing action by saturants.

(3) Capillaries are so small that any saturant is dispersed evenly through the sheet.

(4) The structural arrangement of short and long fibers obviates the necessity for the use of plasticizers in saturants because rolling or "working" the material serves to soften it.

(5) Since long fibers are in contact along their whole length with short fibers or other long fibers no necessity exists for severe calendering to provide this contact.

(6) Very little saturant is required to give adequate cementing action and density of product.

(7) Any thickness up to ⅛ inch or more can be constructed without any marked lines of delamination because obviously the structure provides the contact points for cementing which are as effective in resisting strains in a vertical direction as in a horizontal direction.

One of the most important functions of the short fibers is to add weight (a corollary to added

bulk). It is well known that in the saturation of usual fibrous base fabrics a retention, of 100% of the weight of the base, of a dry solid impregnant is the limit beyond which the impregnated material loses its characteristics as a fibrous sheet and assumes all of the characteristics of a continuous sheet of the solid saturant employed. For example, a bat of long fibers weighing 4 ounces per square yard, saturated with a rubber saturant in which the rubber constitutes 75%, and filler 25%, will retain about 80% of the saturant solids on drying, that is to say, 80% of its weight. The resultant saturated material will consist of 55% of the long fiber, 34% rubber and 11% filler.

However, if, in accordance with the present invention, a base fabric be prepared wherein short fibers are incorporated with the long fibers of the bat in the proportion of 4 ounces per square yard of long fibers and 2 ounces per square yard of short fibers, and then this fibrous base material be saturated to provide 100% pure rubber solids, the resultant material still retains its fibrous character, although the rubber content is now 6 ounces per square yard instead of 2.4 ounces per square yard as in the previous example. That is to say, it contains 2½ times as much rubber. Obviously, by following this procedure, it is possible to reduce the amount of rubber per square yard, while increasing strength and pliability and improving texture and other desirable qualities by reason of the greater amount of fiber per square yard as compared with prior practice. The same advantages follow regardless of the type of binder employed, the permissible reduction in the amount of binder or saturant resulting in the attainment of a flexibility, porosity and texture never before secured in such materials.

The distinct characteristics of natural leather as compared with prior artificial leathers are due in large measure to the internal structure of the leather, the latter comprising fibers of many different lengths. The grain surface of the leather is close and dense while the flesh side of the leather is relatively loose and open. When the leather is subjected to bending, the thin, dense grain side acts as a hinge while the open, loose flesh side resiliently expands and contracts, offering but little resistance to bending. The mid-portion of the leather consists of intimately laced fibers and is tough and strong so that it will bend smoothly without "breaking."

In a piece of leather of a density of 0.5000 gram per cubic centimeter, which is a fairly dense piece of split leather, the air spaces approximate 76% of the volume and the fibers and other solids only 33%. A grain piece of chrome tanned calf will have a density of approximately 0.65 gram per cubic centimeter, the air spaces being approximately 56% of the volume and fibers and other solids 44%. In materials of this type the air cells are very minute and therefore the capillary action is very efficient, which accounts in large part for the manner in which moisture is transferred from one surface to the other although the air porosity is low.

The material of the present invention has a strong yet flexible and porous internal structure, and when the base fabric is impregnated or saturated with a medium proper to impart the surface finish and appearance of natural leather, the resultant material has approximately the same density as natural leather but without having a continuous, impervious film of the impregnant, the solid matter in the sheet approximating 30% of the sheet and the air spaces 70% of the sheet, the capillary spaces being exceedingly small and thus efficient in the transfer of moisture as in the case of leather.

As above noted the gel itself may include substances designed to impart the desired characteristics to the completed material. For example, the gel may include inert substances such as talc; powdered pigments; or rubber or synthetic latices. For convenience, these additional materials which are introduced into the base fabric to give it the final desired characteristics and finish, whether introduced with the gel or as impregnants into the completed base fabric, may hereafter be referred to under the general term "filler."

It will be clear that if the filler materials be added to the gel, the completed material may be produced in a single operation. On the other hand, as already suggested, the base fabric may first be prepared and then impregnated with any desired saturant.

I claim:

1. That method of preparing fibrous sheet material which comprises as steps preparing a bat of fibers of textile length, dispersing discrete fibrous particles of paper-making length in a water solution of polyvinyl alcohol, adding to the solution a gelling reagent thereby to cause the solution to gel, introducing the gel into the substance of the bat and thereafter drying the bat.

2. That method of preparing fibrous sheet material which comprises as steps preparing a bat of fibers of textile length, dispersing discrete fibrous particles of paper-making length in a water solution of polyvinyl alcohol, adding to the solution a gelling reagent thereby to cause the solution to gel, forcing the gel into the substance of the bat by the application of pressure sufficient to release liquid from the gel, and thereafter drying the bat to cause the polyvinyl alcohol to set and permanently unite the fibers at their crossing points.

3. That method of preparing fibrous sheet material which comprises as steps preparing a bat of fibers of textile length, dispersing discrete fibrous particles of paper-making length in a water solution of polyvinyl alcohol, adding to the solution a gelling reagent thereby to cause the solution to gel, and forcing the gel into the fiber bat by the application of pressure.

4. That method of depositing discrete fibrous particles of the order from 100 to 3000 micron particle size within the voids between fibers of textile length constituting a bat, which comprises providing a carrier for the fibrous particles by making an aqueous dispersion of a resinous binder containing a gelling agent, distributing the fibrous particles uniformly throughout the carrier, permitting the carrier to gel, and rolling the gel into the bat.

5. A porous sheet material consisting in major proportion of unspun, unfelted relatively long fibers of textile length having within its voids relatively short fibers of paper making length, and a binder of polyvinyl alcohol having a gel structure and anchoring the short fibers to the long fibers, the polyvinyl alcohol constituting not more than 5% by weight of the material.

6. That stage product in the preparation of porous sheet material which comprises a bat of textile length cellulosic fibers having the voids initially present between the fibers filled with a gel-like composition, comprising a 1.65% water solution of polyvinyl alcohol containing a borate

and having suspended therein a substantially uniform dispersion of cellulosic fibers of paper making length.

7. That method of depositing discrete fibrous particles within the voids between fibers of textile length constituting a bat which comprises providing a carrier for the fibrous particles by making an aqueous dispersion of a resinous binder containing a gelling agent, distributing the fibrous particles uniformly throughout the carrier, permitting the carrier to gel, and forcing said gel carrier medium with its dispersed fibrous particles into the open spaced structure of the bat of textile length fibers.

8. The method according to claim 7 wherein the fibrous particles do not substantially exceed one-quarter inch in length.

9. The method according to claim 7 wherein the bat containing said gel carrier medium with its dispersed particles is thereafter dried.

10. The product obtained by the method of claim 7.

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