

UNITED STATES PATENT OFFICE

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PROCESS OF FABRICATING UNWOVEN SHEET MATERIAL AND ARTICLE THEREFOR

No Drawing.

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This invention relates to the manufacture of textiles and more particularly to an improved flat cloth. Hitherto, in the manufacture of flat cloths, such as sheetings, shirtings, dress goods, print cloths, underwear cloths, suitings, draperies, and the like, it has been necessary to weave the materials on looms at great expense both in equipment and labor. The enormous outlay required for weaving equipment militates against the economical preparation of fabrics.

In an effort to avoid the necessity of weaving operations generally, the process of felt-ing fibres into relatively thick fabrics called felts has been evolved. In such processes it has been proposed to mat or felt a bat of fibres into a compact, thick sheet, and subject the so formed sheet to the action of various binding agents for the purpose of imparting the desired degree of strength to the materials.

Such methods, however, are not suited for the preparation of a relatively thin fabric of the type designated above, suitable for use in wearing apparel of various kinds, and in various industrial processes requiring cloth fabrics as bases, as in the manufacture of oil cloth, rubberized sheeting, and the like.

It is an object of this invention to provide an improved cloth sheeting of unwoven fibres.

It is a further object of this invention to provide an unwoven water-proof flat cloth fabric.

Yet another object of this invention is the production of an unwoven flat cloth which may be readily dyed.

A further object of this invention is the production of such an unwoven flat cloth which has both wet-strength and is adapted to be dyed or to absorb some moisture.

With these and other desirable objects in view, which may be incident to the improvements, the invention consists in the parts and combinations to be hereinafter set forth and claimed, with the understanding that the several necessary elements comprising the invention may be varied in composition, proportions and arrangement, without depart-

ing from the spirit and scope of the appended claims.

In the practice of the present invention, suitable fibres, such as cotton, wool, silk or rayon wastes, jute, or other fibres, are first cleaned by the machinery commonly employed for such purposes, namely, pickers and cards, except where wood fibres are used or admixed the machinery will differ accordingly.

The resulting cleaned fibres are then arranged by such machinery in the form of a lap of any suitable thickness, according to the weight of the desired cloth, the dissociated fibres being so arranged as to assure the necessary tensile strength, after which the so-formed lap is subjected to, or treated with, a suitable binding material.

A preferred embodiment of the present invention for the preparation of an unwoven cloth having considerable wet-strength and capable of being dyed will be described.

The binding material used is a composition comprising substantially equal parts of a suitable rubber emulsion, such as latex, and a cellulosic compound. Excellent results have been obtained with cellulose xanthate, or viscose, although other cellulose compounds, such as cellulose acetate, and the like, are likewise suitable. The binding material may be compounded in any desired manner, care being taken to secure an intimate mixture or blend of the components.

The resulting solution is applied to the lap of fibres by spraying or in any other suitable manner, after which the coated or impregnated lap is passed through a plurality of compression rolls of any conventional design. Such mechanisms being well known in the art, and forming no part of the present invention, are therefore not described.

By the treatment of the lap in the rolls, the binding material is thoroughly incorporated in, and mixed with the fibres, whereby they are closely associated in a cooperative manner so as to form a relatively thin sheet of material. This sheet of material is then passed through drying or calendering rolls to recon-vert the plastic cellulose into cellulose, and vulcanize the rubber, which usually has a

vulcanizing agent incorporated in the emulsion used.

The resulting composite sheet is thus characterized by the presence of a lap of fibres which are held by a binding medium of composite rubber and pure, regenerated cellulose. This product has considerable wet-strength due to the presence of the rubber, while the cellulose constituent, imparts the desired dye-receiving ability.

In place of regenerating the cellulose by heating, the sheeted material may be passed through a suitable solution of acid or the like which is adapted to regenerate a pure cellulose by decomposing the cellulose compound. The resulting sheeting is then washed, dried, and suitably calendered, or otherwise reduced to a desired thickness. Such a product is characterized by a relatively high tensile strength and is suited for a variety of purposes.

Where a substantially waterproof fabric is desired, as in the preparation of cloths for rain-coats, bed sheets, dress shields, waterproof aprons and other like articles, the cellulose constituent of the binding material may be replaced in whole or in part by rubber, or the above described sheet material may be given a coat of rubber, as is the usual practice, or both.

If cellulose alone is used as a binding agent, viscose or any other suitable cellulose ester is incorporated into the lap of fibres, as above described, and the resulting material pressed and sheeted, the cellulose being regenerated by heat or otherwise, as above described.

The product resulting from this treatment is characterized by a relatively high tensile strength and is suited for a variety of purposes for which woven fabrics are normally used, particularly for uses where stiffness and lack of resistance to moisture are not disadvantageous, as in artificial mohair and the like.

The sheeted material or flat cloth, as it may be called, is adapted to receive any suitable dye, such dyes being applied in the well-known manner and they may also be incorporated in the binding material, thereby obviating the necessity of an added, separate dyeing step.

In applying rubber to the dissociated mass of sheeted fibres, above described, it is preferred to use an aqueous emulsion of rubber of the type known as latex, which is a naturally occurring emulsion derived from the sap of rubber bearing plants generally.

This emulsion, in suitable concentration is applied to the fibres in the manner designated above, and the resulting material subjected to the usual rolling pressure for the purpose of eliminating excess material.

The resulting fabric may then be dried, after which it is subjected to the usual vulcanizing operations to cure the rubber or the

drying may be sufficient to cure the rubber if a vulcanizing agent has been previously incorporated in the rubber.

While, as hereinbefore stated, the cellulose esters may be used as sources of cellulose, it will, of course, be understood that Schweitzer's reagent, or cuprammonium, may be applied to the lap of cotton fibres for the same purpose, or other cellulose softening reagents may be applied to gel the fibres and cause them to amalgamate. If silk, jute, wool, or other fibres are used, the softening agent will be chosen with respect to its solvent action on the particular fibre used.

If it is desired to impart increased flexibility to the cloth, there is added to or admixed with the binding material a suitable plasticizer, such as those used in the lacquer industry, viz., various oils, soluble waxes, gums and resins, which impart greater pliability to the cloth and resistance to water.

The mixture of latex and viscose, before referred to, may have plasticizers, dyes and vulcanizing agents incorporated therein, and will be found practicable in treating cotton and other fibres to obtain many common cloths.

This product is endowed with a tensile strength comparable to that of woven fabrics, and is pleasing in appearance as well as being cheap to manufacture. This process thus permits the use of a relatively unusable material; to wit, waste or short fibres of any sort, as well as permitting the use of fibres generally without the intermediacy of the customary weaving operations now uniformly in use.

A further advantage resides in the fact that by the use of this process the fibres are associated in an improved manner to form a fabric, in contradistinction to the processes hitherto available for the use of fibres which resulted solely in the formation of relatively thick felted materials. Such felted materials are obviously unsuited for use in cloth making or as flat cloths, and the processes of the present invention, while bearing a superficial resemblance to felting production generally are distinguished therefrom by the absence of the mechanical batting or felting steps and by the improved product resulting therefrom.

The cloths produced by this method can be used immediately, that is, without further treatment, as base cloths in the manufacture of oil cloth, rubberized cloths, etc., by supplementing the treatment at the time of making the cloth or thereafter with linseed oil, varnish, cellulose esters or additional rubber, etc., as may be required. In this event it may not be necessary to dry the sheet before subjecting it to further treatment.

As above noted, it will be found that by using latex as the principal binding material, a satisfactory waterproof or water

resistant sheeting can be made directly from the fibres.

To impart added strength to the cloth or cloths comprehended in this invention, threads may be distributed warp-wise, filling-wise, or in both directions as pliable reinforcements.

In making raincoating, for instance, where a base cloth is used, the present method is distinguished from waterproofing in that a lap of fibres is applied to the base cloth as in the manner previously disclosed, then impregnated with rubber to form a unitary cohesive cloth, rather than applying rubber itself to a base cloth.

This process enables the use of a cheaper base cloth and a notable saving in the amount of rubber required to waterproof the fabric.

Where the preparation of a waterproof material in considerable quantity is desired the present invention comprehends the use of ordinary paper making equipment for such purposes, and in this event fibres are treated with latex or the like in a beating engine while subjected to the action known in the paper making trade as "brushing".

This "brushing" as its name implies, is adapted to straighten out or brush the fibres without subjecting them to the disintegrating action of the knives on the bed plate of the beating engine. Such an operation is comprehended in the skill of the average paper maker and needs no further description.

The latex or other rubber emulsion is thoroughly incorporated with the fibres and, as is well known, the microscopic particles of rubber tend to deposit on the fibres. The resultant pulp is then passed on to a stuff-chest or other suitable storage, and from there flowed on to the wet end of the paper machine, the wire screen or Fourdrinier being usually employed.

These screens may be obtained in any desired mesh and are suited for imparting a desired texture to the fabric of this invention.

In place of a Fourdrinier wire, a blanket or sheet of coarse or fine fabric may be substituted and the pulp flowed directly thereon, after which it is subjected to the usual dewatering and drying operations.

This method of operation lends itself readily to the preparation of an improved base for oil cloths, linoleums and like material, the cost of the process being very low where the desired quantity of material produced is relatively large.

It will now be seen that there has been provided an improved process for the preparation of flat cloths which process is characterized by the absence of the ordinary weaving operations and the securing of a fabric which is comparable in its physical

qualities to that of the usual woven material heretofore obtainable.

Where it is desirable to impart a certain texture to the cloth fabric, the pressure rolls may be suitably configured or wire screens of a desired mesh may be used. For example, it will be found that by pressing the yet moist material against a 100-mesh wire screen or a roll having a similar face, that a cloth will be given a finish of a type commonly designated in the textile trades as "moleskin". A twilled screen or similar roll will impart a face like a "garbardine" or "drill".

Where the cloth is to be perforated this result is readily obtained by varying the number and shape of the complete perforations by means of the impressed surface to assure the desired porosity and pliability in the finished fabric.

The strength and resulting pliability of the cloth is determined to some extent by the manner in which the binder is allowed to set, i. e. whether as a continuous film, or more as a coating for the individual fibres. The structure of the cloth is further fixed by the shape or shapes impressed, and the pressure or successive pressures imparted thereto, as well as by the "breaking" actions, heatings, etc.

In manufacturing oil cloth, the bat formed of the unspun and unwoven fibres is treated with a coating comprising linseed oil, varnish and pigment.

While the foregoing description has set forth one process for the manufacture of a flat cloth, having as constituents one water proof binding medium and one water absorbent binding medium, such description is by way of example only. The same principles can be applied with other water proof and water absorbent media; such as: (water proof) resins, natural or synthetic; casein, in water proof form; cellulose acetate; glue (gelatine) made water proof as with formaldehyde; and (non-water proof) glue (gelatine); casein in non-water proof form; starches, natural or synthetic; and soluble gum.

I claim:

1. In the preparation of flat cloth the process which comprises lapping fibres, treating the lap of fibres with a binding medium comprising a mixture of cellulosic material and rubber emulsion, subjecting the resulting product to pressure whereby to produce a uniform sheet, and curing said sheet.

2. In the preparation of flat cloth, the process which comprises lapping fibres, treating the lap of fibres with a binding medium comprising a mixture of cellulosic material and rubber emulsion, together with a plasticizing agent, subjecting the resulting product to pressure whereby to produce a uniform sheet and curing said sheet.

3. In the preparation of flat cloth, the process which comprises subjecting a mass of

- loose dissociated fibres to the action of a binding medium comprising a mixture of cellulosic material and rubber emulsion, subjecting the resulting product to pressure whereby to produce a uniform sheet, and curing said sheet.
4. In the preparation of flat cloth, the process which comprises subjecting a mass of loose dissociated fibres to the action of a binding medium comprising a mixture of cellulosic material and rubber emulsion, together with a plasticizing agent, subjecting the resulting product to pressure whereby to produce a uniform sheet, and curing said sheet.
5. A flat cloth composed of dissociated fibres which have been treated with a self vulcanizing rubber emulsion and formed to a desired thickness.
6. In the preparation of a flat cloth, the process which comprises subjecting a mass of loose dissociated fibres to the action of a solvent for the fibres whereby to superficially dissolve the fibres, forming a sheet of the desired thickness, regenerating the dissolved fibrous material by suitable means, whereby to form an integral sheet of fibres in an autogenously derived binding medium.
7. In the preparation of a flat cloth, the process which comprises subjecting a mass of loose dissociated cotton fibres, to the action of cuprammonium, whereby to superficially dissolve the fibres, forming a sheet of the desired thickness, regenerating the dissolved fibrous material by suitable means, whereby to form an integral sheet of fibres in an autogenously derived binding medium.
8. As an article of manufacture, a flat cloth composed of unspun and unwoven fibres, held together by a binding material composed of a plastic cellulosic substance and a rubber emulsion, the whole being sheeted and the binding agent caused to set.
9. As an article of manufacture, a flexible sheet composed of unspun and unwoven fibres, held together by a binding material comprising a plastic cellulosic substance, a rubber emulsion and plasticizing agent, the whole being sheeted and the binding agent caused to set.
10. As an article of manufacture a flat cloth composed of dissociated fibres and binding material, the said cloth being characterized by a combined moisture receptivity and wet-strength.
11. In the preparation of flat cloth, the process which comprises lapping fibrous materials, treating the lap of fibres with a binding material, one of whose constituents absorbs moisture, and one of which resists moisture, whereby to impart a combined moisture receptivity and wet-strength to the cloth.
12. As an article of manufacture, a sheet of unspun and unwoven fibres held together by a binding medium, and coated with a water proofing material.
13. As an article of manufacture, a sheet of unspun and unwoven fibres held together by a binding medium, and coated with rubber.
14. As an article of manufacture an oil cloth formed of unspun and unwoven fibres held together by a binding medium and coated with a mixture of linseed oil, varnish and pigment.
15. As an article of manufacture a flat cloth composed of unspun and unwoven fibres held together by a binding medium, and having impressed upon it the face pattern of woven cloth.
16. As an article of manufacture a flat cloth composed of unspun and unwoven fibres held together by a binding medium, and having impressed into it a structure that will impart to the flat cloth the characteristics of woven cloth.
17. As an article of manufacture, a flat cloth composed of unspun and unwoven fibres held together by a water resistant binding medium, and having impressed into it a structure that will expose a portion of the fibres to the surface thus making the cloth water absorbent without impairing its wet strength.
18. As an article of manufacture, a flat cloth composed of unspun and unwoven fibres held together by a binding medium, and having impressed into it a pattern of structure that will impart to the cloth the mechanical characteristics of woven cloth.
19. In the preparation of a flat cloth, the process which comprises subjecting a mass of loose dissociated fibres to the action of a solvent for the fibres whereby to superficially dissolve the fibres, adding a water resistant binder as an additional binding medium, forming a sheet of the desired thickness, regenerating the dissolved fibrous material by suitable means, whereby to form an integral sheet of fibres in a partially autogeneously derived binding medium.
20. A flat cloth composed of unspun and unwoven fibrous material held together by a binding medium, one of whose constituents absorbs moisture and one of which resists moisture, whereby to impart a combined moisture receptivity and wet strength to the cloth.
21. As an article of manufacture, a flat cloth of unspun and unwoven fibres held together by a binding medium, and coated with rubber.
22. As an article of manufacture an oil cloth formed of unspun and unwoven fibres held together by a binding medium and coated with a mixture of linseed oil, lacquer and pigment.
- In testimony whereof I affix my signature.
- GODFREY BLOCH.