

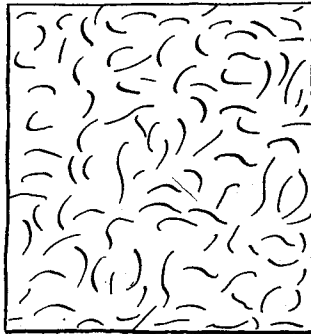
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SOFT DURABLE NONWOVEN FABRIC

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*A Soft durable
Non-Woven fabric
Impregnated with
a thermosetting crease-
proofing agent
and a soft Acrylate
binder material.*

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SOFT DURABLE NONWOVEN FABRIC

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The present invention relates to nonwoven fabrics which are particularly suitable for outer wear, more particularly to fabrics which are not only resilient and capable of resisting washing and dry-cleaning, but also are supple yet durable under the conditions to which outer wear is subjected.

The present invention contemplates a nonwoven fabric suitable for outer wear which is durable and strong, possesses a soft drape and handle, and is capable of resisting repeated washings and dry-cleanings. This fabric is abrasion resistant and capable of aging under the influence of light and heat without appreciable deterioration. It is capable of going through repeated launderings and dry-cleanings and returning to its original shape without serious wrinkling or shrinkage. It also is sufficiently porous to be worn close to the skin and possesses a sufficiently supple drape and hand for this use. This fabric has good affinity for dyes and is capable of being printed by conventional textile processes.

In the accompanying drawing, the figure is a schematic view of a soft, durable, non-woven fabric impregnated with a thermosetting, crease-proofing agent and a soft acrylate binder material.

The fabric of this invention may be formed by depositing a thermosetting resin and a soft acrylate polymer or copolymer uniformly throughout a web of overlapping, intersecting fibers in such a way that the fibers will be bound together and the web will retain a substantial degree of its original porosity. The materials may be deposited in the web as by impregnation, either in a mixture of the two, or by a two-step deposition of the thermosetting resin and the acrylate, in the order named. The thermosetting resin is cured in situ in contact with the fibers in the web by the application of heat in the presence of a catalyst. The thermosetting resin and the acrylate combine with the web in the fabric of this invention to provide the characteristics described in the preceding paragraph.

Webs suitable for conversion into fabrics of this invention may be formed by carding, garnetting, or by air deposition by techniques, such as described in U. S. Patent Nos. 2,676,363 and 2,676,364. While it is preferred that the web be isotropic, for strength purposes, the fibers it contains may be oriented predominantly in one direction as in a card web or a card web laminate. To enhance its resiliency, it is preferred that the web contain a majority of relatively crease-resistant fibers. Fibers of wool, nylon and similar synthetic materials have been found satisfactory for this purpose. The more resilient fibers may be mixed with cellulosic fibers such as cotton or viscose rayon, alone or in combination, to decrease the cost of the fabric or improve the characteristics of the web. The resulting fabric may be formed in one layer or it may be formed in an isotropic layer with a carded layer on one surface, for instance. In this case the card web may provide a surface which facilitates web processing. The size of the fibers in the web may be varied to control the

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porosity of the fabric. Generally speaking, porosity increases with the use of larger fibers. From the standpoint of durability, resilience, and strength, it is preferred that a large proportion of the fibers in the web be of relatively large diameter falling within the range of 3 to 8 denier. For instance, the web may be formed of a majority of 3 to 6 denier fibers of nylon and a minority of smaller viscose rayon fibers.

The thermosetting resin, which may comprise a material selected from the group consisting of melamine-formaldehyde, urea-formaldehyde, phenol-formaldehyde, and dicyandiamide-formaldehyde, may be applied to the base web by impregnation in a conventional manner either alone or in a mixture with the soft acrylate. The resin is applied in the form of a monomer which tends to penetrate the fibers in the web, particularly if these fibers are cellulosic. The monomer then is converted to a polymer or cured in situ by the application of heat in the presence of a conventional catalyst applied to the fabric with the thermosetting resin. Curing may be effected by heating in an oven at a temperature of at least about 300° F. for a period in the neighborhood of two minutes. Conventional acid catalysts such as diammonium phosphate have proven satisfactory for this use.

The soft acrylate polymer or copolymer may be deposited in the web in a mixture with the thermosetting resin or in the second step of a two-step process, as described hereinbefore. For example, the web containing the thermosetting resin may be impregnated with the acrylate and then subjected to a temperature of 220° to 250° F. until dry. It is preferred that the total combined thermosetting and acrylate solids weigh about 25 to 75 percent of the weight of the fabric to achieve optimum results. In order to assure that the thermosetting resin is fully effective, it is preferred that it be present in the web in an amount weighing at least about 5 percent of the weight of the dry web. The preferred upper limit for thermosetting resin content is thought to be around 40 percent by weight of the dry web. Also, it is preferred that the fabric contain a greater amount of acrylate than thermosetting resin in order that the acrylate, which is naturally soft and flexible, may offset the tendency of the resin to be brittle. It is preferred that the ratio of acrylate to resin be at least about 1.5 to 1 for this reason. This is true whether the resin and the acrylate are applied to the web in a one or a two-step operation, although it is believed that the same amount of thermosetting resin may have a somewhat greater effect in the two-step operation with the result that the same effect may be achieved with a smaller amount of resin. It also is believed that the two-step operation may result in a fabric which is slightly more bulky and porous with no decrease in strength, resilience, or durability.

Typical soft acrylates which may be employed to produce the fabric of this invention include ethyl acrylate butyl acrylate, octyl acrylate, methyl methacrylate, butyl methacrylate, the copolymers of ethyl acrylate and acrylonitrile and ethyl acrylate and polyvinyl chloride, etc.

Having now described the invention in specific detail and indicated the manner in which it may be carried into practice, it will be readily apparent to those skilled in the art that innumerable variations, applications, modifications, and extensions of the basic principles involved may be made without departing from its spirit or scope. Thus, the fabrics of the present invention may be laminated with other fabrics or employed in a host of ways that will be readily apparent to the skilled artisan. We therefore intend to be limited only in accordance with the appended patent claims.

The invention claimed is:

1. A soft, durable non-woven fabric having soft drape

and handle and resistant to serious wrinkling and shrinkage from washing and dry cleaning as well as discoloration due to light and heat comprising a web of overlapping intersecting fibers impregnated substantially uniformly with (1) at least about 5% and up to around 40% by weight of the dry web of a thermosetting crease-proofing agent selected from the group consisting of melamine-formaldehyde, urea-formaldehyde, phenol-formaldehyde, and dicyandiamide-formaldehyde, and (2) a binder material selected from the group consisting of soft acrylate polymers and soft acrylate copolymers, said acrylate being a lower alkyl ester of acrylic acid wherein said alkyl radical contains up to and including eight carbon atoms, the combined weight of said thermosetting resin and said acrylate being from about 25% to about 75% of the weight of the non-woven fabric.

2. A soft durable fabric according to claim 1, wherein the crease-proofing resin has been cured in situ in the web by the application of heat in the presence of a catalyst.

3. A soft durable fabric according to claim 1, wherein the ratio of acrylate to thermosetting resin is at least about 1.5 to 1.

4. A soft, durable non-woven fabric as defined in claim 1 wherein said fibers are oriented predominantly in one direction.

5. A soft, durable non-woven fabric as defined in claim 1 wherein said fibers are disposed at random.

6. A soft, durable non-woven fabric as defined in claim 1 wherein said binder material is a soft acrylate polymer and the lower alkyl ester is ethyl acrylate.

7. A soft, durable non-woven fabric as defined in claim 1 wherein the binder material is a soft acrylate copolymer and the lower alkyl ester is ethyl acrylate.

8. A soft, durable non-woven fabric having soft drape and handle and resistant to serious wrinkling and shrinkage from washing and dry cleaning, as well as discoloration due to light and heat, comprising a web of overlapping intersecting fibers comprising a majority of relatively crease-resistant fibers and a minority of less crease-resistant cellulosic fibers thoroughly intermingled with one another, and binder solids substantially uniformly distributed throughout the web comprising (1) a thermo-

setting crease-proofing resin selected from the group consisting of melamine-formaldehyde, urea-formaldehyde, phenol-formaldehyde, and dicyandiamide-formaldehyde, and (2) a material selected from the group consisting of soft acrylate polymers and soft acrylate copolymers, wherein said acrylate is a lower alkyl ester of acrylic acid in which the alkyl group contains up to and including eight carbon atoms, the weight of the thermosetting resin being at least about 5% and up to around 40% of the weight of the dry web and the combined weight of said thermosetting resin and said acrylate being from about 25% to about 75% of the weight of the non-woven fabric.

9. A soft durable fabric according to claim 8, wherein the crease-resistant fibers are of nylon and the less crease-resistant fibers comprise viscose rayon.

10. A soft durable fabric according to claim 8, wherein a majority of the fibers in the web are of 3 to 6 denier.

11. A soft, durable non-woven fabric as defined in claim 8 wherein said fibers are oriented predominantly in one direction.

12. A soft, durable non-woven fabric as defined in claim 8 wherein said fibers are disposed at random.

13. A soft, durable non-woven fabric as defined in claim 8 wherein the relatively crease-resistant fibers comprise nylon.

14. A soft, durable non-woven fabric as defined in claim 8 wherein the less crease-resistant cellulosic fibers comprise viscose rayon.

15. A soft, durable non-woven fabric as defined in claim 8 wherein said binder material is a soft acrylate polymer and the lower alkyl ester is ethyl acrylate.

16. A soft, durable non-woven fabric as defined in claim 8 wherein the binder material is a soft acrylate copolymer and the lower alkyl ester is ethyl acrylate.

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