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GLASS FABRIC WITH PARTICULATE MATERIAL AND PILE YARNS PENETRATING THE SAME

Filed April 17, 1964

FIG. 1

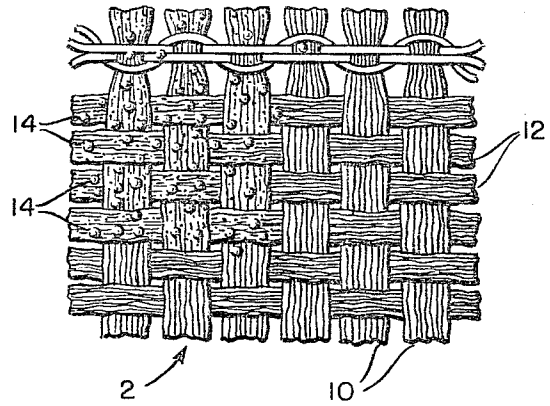


FIG. 2

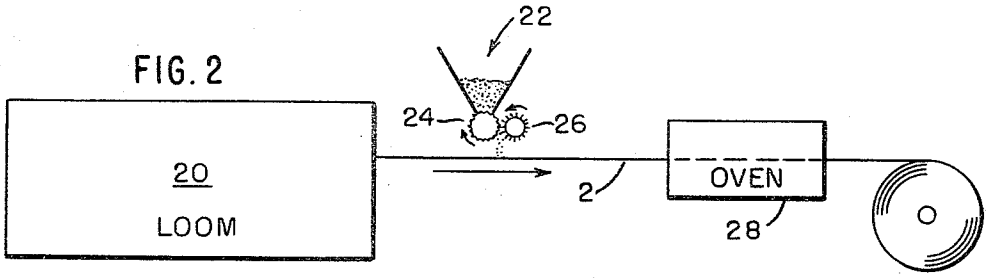
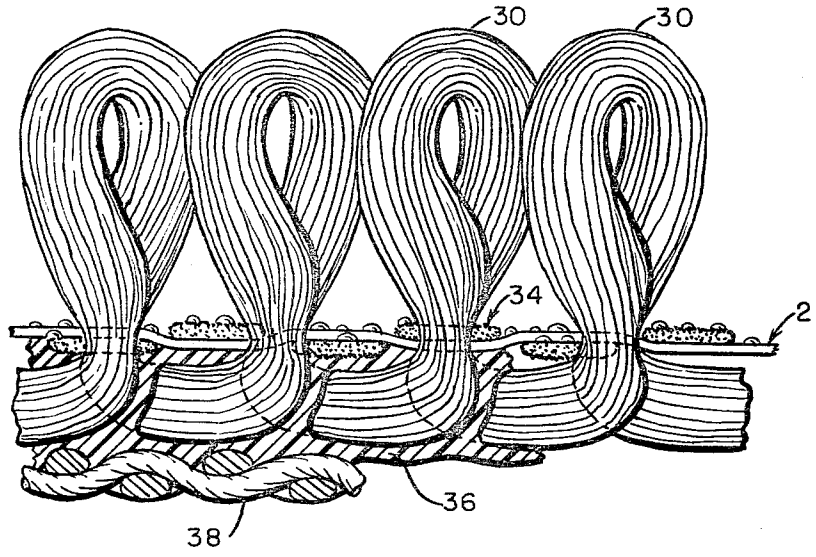


FIG. 3



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GLASS FABRIC WITH PARTICULATE MATERIAL AND PILE YARNS PENETRATING THE SAME

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This invention relates to open mesh fabrics of continuous filament roving, and in particular to fabrics formed of strands of roving of synthetic fibers such as glass, which have not been twisted.

Fabrics are commonly formed by weaving together yarns, each of which is generally composed of many filaments or fibers twisted together. The twist serves to hold the individual yarns in a compact bundle, and in the woven fabric the surface irregularities imparted by the twist also serve to hold the intersecting yarns in a stable arrangement by reducing their freedom to slip relative to each other. Fabrics formed of glass fibers are presently used to a large extent in reinforced plastics, where it is important that high glass content and maximum strength be realized. Fabrics of glass currently available are made up of woven twisted yarns which resemble conventional woven fabrics, and woven roving which may be twisted or not twisted. As maximum strength is developed when the strands are not twisted, it is particularly advantageous to use woven roving fabrics in reinforced plastics and other applications when high strength is important. However, open mesh glass fabrics of this type suffer from a lack of stability, since in its nature roving forms a loose weave and the lack of twist results in a flimsy unstable condition since the intersecting fibers are free to shift relative to one another. Generally a selvage is required to keep the roving from separating at the edges of the fabric. The woven roving product is, however, 20–30 percent stronger than its counterpart formed from twisted yarns and is cheaper to form, since the twisting step may be eliminated.

Woven roving has been impregnated with a resin to unify the strands and cause them to adhere together. This product, however, lacks the flexibility and ease of handling of the impregnated product and its usefulness as a reinforcement in a plastic structure is greatly impaired.

The present invention is aimed at providing a woven roving fabric in which the individuality of the filaments making up the strands of roving is essentially preserved. and the flexibility, ease of handling, and textile characteristics of the woven product are retained, but in which the instability characteristic of such products as formed on a loom is greatly reduced.

This invention is based on the discovery that a woven roving fabric may be stabilized by depositing small particles of adherent material on the exposed surfaces of the strands of roving on one or both sides of the fabric. These particles need be only sparsely distributed in the exposed, overpassing stretches of each strand and serve largely to hinder or prevent side way slippage of the transverse strands where they cross over. The particles in a sense define on each strand of roving a roughened portion in the overpassing areas where the strand is exposed and a smooth area where the strand passes under a transverse strand, so that slippage of a transverse strand from the smooth area to the roughened areas is hindered. In addition, adhesive particles will also join some of the filaments together and thereby lessen their freedom to move relatively to each other within each strand of roving, and, where intersecting filaments are joined, the strands of roving containing them will also be correspondingly joined. The joining of intersecting strands is an incidental effect,

which contributes to stability; however, it leaves each strand of roving essentially unbonded to and free of the intersecting strand. Fabrics formed in accordance with this invention are ideally suited for use as reinforcements in reinforced plastic products and are also useful in other applications that require strong loosely woven textile materials, such as in the manufacture of tufted carpeting.

As a backing for tufted carpeting glass fabrics are ideal because of their strength and durability, but the lack of stability of woven roving has rendered this material impractical. Attempts at stabilizing it by impregnating the fabric with resins have met with limited success, but have led to the disadvantage of the strands being readily broken entirely if struck by the tufting needle. In fabrics made in accordance with this invention, the strands of roving are essentially a bundle of individual filaments. These do not rupture when struck, rather the individual filaments part when hit by the needle. If some break the rest of them in the strand remain intact, even though they may have been spread apart by the insertion of a tuft.

The fabrics of this invention are made with conventional weaving apparatus in which warp strands of roving are interwoven with weft strands of roving. As the fabric leaves the machine it is dusted with particles of dry resin, on one or both sides, and is then heated to cause the resin to fuse sufficiently to adhere to the exposed surfaces of the strands of roving. As the effect of the resin particles is entirely mechanical, any resin which may be caused to adhere to the strands of roving may be employed. Where the fabric is intended for use as a plastic reinforcement, it is obviously desirable that the resin be one that is compatible with the plastic to be used. Most preferably the resin will be the same as the plastic with which the fabric will be used.

In many cases where the fabric is used in reinforced plastic constructions, the application of the plastic, which is generally a liquid, to the fabric will cause the resin to dissolve so that its stabilizing effect is impaired. This can be prevented by using curable resins which can be cured to any desirable degree sufficient to avoid possible loss of stabilization. In typical applications the material will be used with a polyester resin, in which case the resin particles are most desirably also of the same polyester. In certain types of molding applications, for instance where matched dies are employed, the flow of resin occasioned by the positioning of the dies tends to cause the strands of roving to become displaced. If the stabilizing resin particles are completely uncured and dissolve in the molding resin, the fabric will become disrupted by this action. If, however, the stabilizing resin particles are cured or partially cured they will remain effective throughout the molding operation and prevent such disruption.

The appended drawings are presented to illustrate in a schematic way the nature of the products of this invention and the method of making them:

FIG. 1 is a plan view of a woven unspun roving fabric embodying this invention;

FIG. 2 is a schematic diagram illustrating the method of manufacturing the product of this invention; and

FIG. 3 is a cross section schematic diagram illustrating a tufted pile fabric formed from the product of this invention.

As shown in FIG. 1 the fabric 2 of this invention consists of generally parallel weft strands of roving 10 interwoven with generally parallel warp strands of roving 12, each having on their exposed upper surfaces adherent small particles of resin 14. It will be noted that the resin particles are quite sparsely distributed, covering only a minor fraction of the exposed surface area of the strands of roving. They do not in any way coat the strands or impart any significant adhesive bonding of one strand of

roving to another, nor do they significantly combine the individual filaments together into a unitary bundle, except to the extent that each particle is in contact with several filaments in a single strand or in intersecting strands. The particles 14 may be said to be adherent to the surfaces of the strands of roving on their exposed portions, and to be discretely distributed, without continuity or coalescense, over only a minor portion of the exposed portions without imparting substantial adhesive bonding of one strand of roving to another.

In manufacturing this product the woven roving 2 is initially formed on a conventional loom 20 following which it is dusted with the resin particles 14. Conveniently the resin is contained in a hopper 22 over the traveling web of fabric and a knurled roller 24 rotating across the open bottom of the hopper serves to meter out the resin in the desired quantity. A rotating brush 26 adjacent to the roller 24 serves to dust the resin metered out by the roller onto the fabric. Following the application of the resin the fabric is fed through an oven 28 which is maintained at a temperature sufficient to cause the resin particles to fuse sufficiently to adhere to the fabric. Following its emergence from the oven the fabric is ready for use.

A particular advantage of manufacturing fabrics in accordance with this invention is the ability to make use of extremely wide looms, since the stabilizing effect of the resin particles makes it possible to slit the woven fabric without the need of a false selvage. There is little tendency for the fabric to ravel.

In FIG. 3 is illustrated a tufted carpet formed by drawing tufts 30 of pile material, for instance nylon yarn, between the openings of an open weave fabric 2. The carpet is made in the conventional manner, differing essentially only in that the backing is the woven unspun roving of this invention. As shown in FIG. 3, the tufts 30 will penetrate through not only the regular mesh openings that lie between the woven strands, but also through the strands themselves, as illustrated at 34.

In the preferred product, the backing and base portions of the tuft material are impregnated with a plastic 36, e.g. a latex of polyvinyl acetate, or polybutadiene-styrene to firmly bond the carpet together and prevent tufts from pulling out. Additionally, a backing of a conventional fabric, e.g. burlap, or of the same woven roving, is applied to absorb wear and further protect the final carpet assembly.

In typical embodiments of this invention, the mesh sizes have ranged from as small as 18 per inch to as large as 1 per inch, and the strands of roving have been anywhere as little as 200 filaments per strand to as many as 1,200 filaments per strand, of either G or K filament size.

A product suitable for use in reinforced plastics had a warp of 14 strands per inch, each having 600 K filaments, and a fill of 7 strands per inch, each having 1,200 K filaments.

A fabric suitable as a backing for tufted carpeting had a warp of 18 strands per inch, each having 400 K filaments and a fill of 9 strands per inch each having 800 K filaments.

Resin particles suitable for stabilizing woven roving, may vary in size quite considerably, as long as they are small enough to be applied to the exposed portions of the strands of roving, but not so small as to impart negligible roughness. In preferred embodiments 40 mesh particles have been employed, but coarser particles, up to about 10 mesh would be suitable particularly for heavier fabrics, while finer sizes, down to about 200 mesh, would also be suitable. Generally the amount of resin will be less than 10 percent of the weight of the fabric, and, less than 25 percent of the area, but at least sufficient to provide particles at substantially all of the over passing portions of roving.

The resin particles may be of any suitable material which can be caused to adhere by heating the fabric, such as the thermoplastic synthetic and natural resins known to the industry e.g. polystyrene or rosin, or as pointed out, thermosetting materials in the uncured state, e.g. any of the conventional commercially available solid polyester type resins. (See Modern Plastics Encyclopedia for 1964, vol. 41, No. 1A, p. 270.) These of the latter class, the solid polyester alkyd resin sold under the trade name ATLAC 363, containing 3 percent by weight of benzoyl peroxide and 2 percent by weight of zinc stearate, is very satisfactory.

These will, of course, be selected on the basis of the particular properties required, such as hardness, melting point, and compatibility with the material with which it will be used. Tabulations of plastics' properties are readily available and reference to any of them can be made for the designation of particular materials in addition to those specifically mentioned here.

The invention is most advantageously utilized in the glass fabrics, but other synthetic materials, such as nylon, dacron, rayon and other synthetic fibers available as continuous smooth filaments may also be employed.

The references in this disclosure to roving that has not been twisted should be taken as meaning roving having not only no twist, but also insufficient twist to impart stability to the strand and weave.

The foregoing are presented as representative of the products of this invention and should not be taken as designating limitations not otherwise established, as it is expected that fabrics heaveir or lighter or coarser or finer than those described may also be made, utilizing an application of discrete resin particles to stabilize the weave.

It is accordingly contemplated that modifications in the materials and construction will readily occur to those skilled in the art and familiar with the principles herein set forth, and that such modifications may be made without departing from the scope of this invention.

Having thus disclosed our invention, we claim:

1. A fabric comprising interwoven strands of smooth substantially twistless roving of continuous glass filaments having discrete solid resinous particles of a size between about 10 and about 200 mesh attached to exposed surface portions of said strands on at least one side of said fabric to impart a roughened surface to said fabric, said particles occupying less than the entire area of said surfaces and serving to hinder sideways slippage of one strand relative to a transverse strand and to bond individual filaments together.

2. A pile textile comprising a fabric base as defined in claim 1 together with tufts of yarn projecting through said fabric base forming thereon a pile, some of said tufts projecting between said strands and some of said tufts projecting through said strands.

References Cited by the Examiner

UNITED STATES PATENTS

2,521,055	9/1950	Foster	139—420
2,603,575	7/1952	Schramm	117—16
3,110,905	11/1963	Rhodes	161—65 X

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