

[54] **METHOD OF MAKING A COMPOSITE YARN**

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Related U.S. Application Data

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[52] **U.S. Cl.**..... **57/157 AS; 28/76 T; 57/140 BY**

[51] **Int. Cl.**..... **D02g 3/12; D02g 3/04**

[58] **Field of Search** **57/140 BY, 157 AS; 28/76 T**

References Cited

UNITED STATES PATENTS

2,890,567 6/1959 Taylor et al. 57/140 BY

OTHER PUBLICATIONS

Webber, "Metal Fibers," Modern Textiles Magazine, Vol. 47, May 1966, pages 72-75.

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[57]

ABSTRACT

A composite textile yarn having anti-static characteristics formed of non-metallic yarn and a blended yarn plied with the non-metallic yarn, the blended yarn being formed of metallic and non-metallic staple fibers with the metallic fibers being distributed in the blended yarn so as to be capable of dissipating static electricity while being incapable of maintaining an electric current flow continuously therethrough.

2 Claims, 5 Drawing Figures

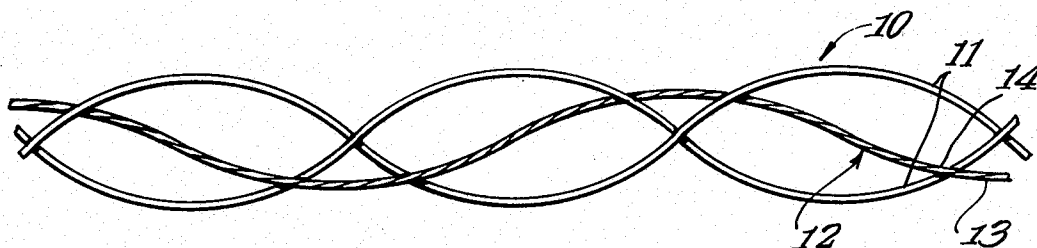


Fig. 1

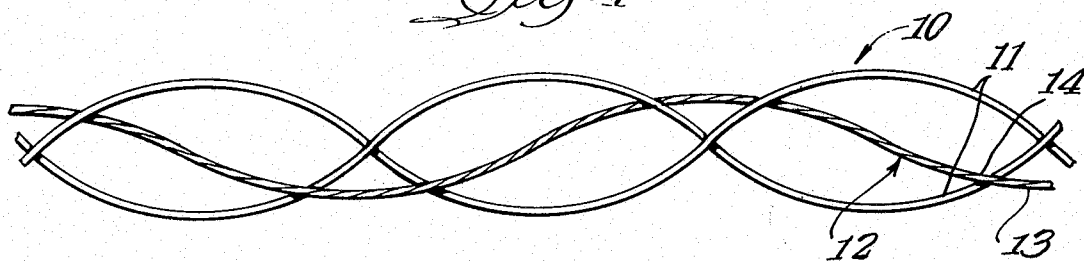


Fig. 2

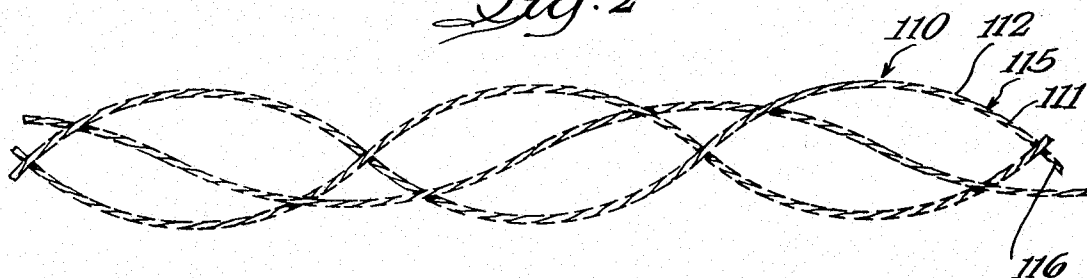


Fig. 3

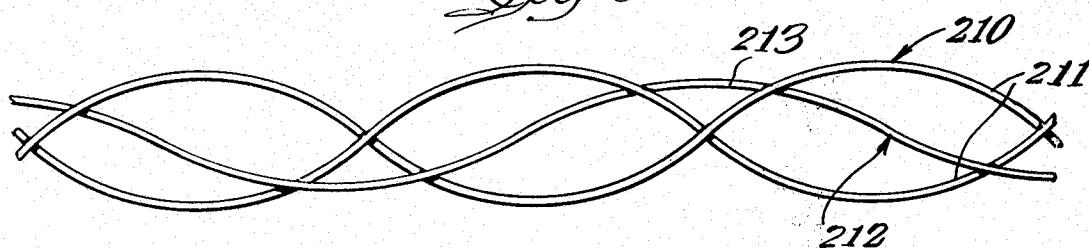


Fig. 4

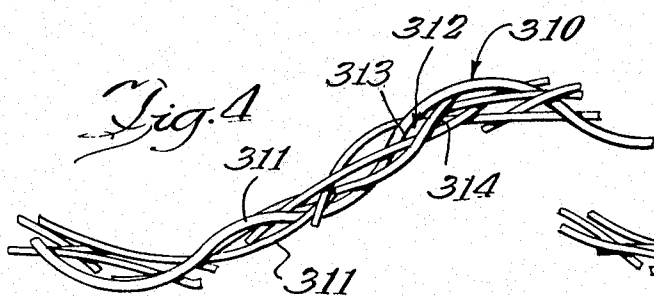
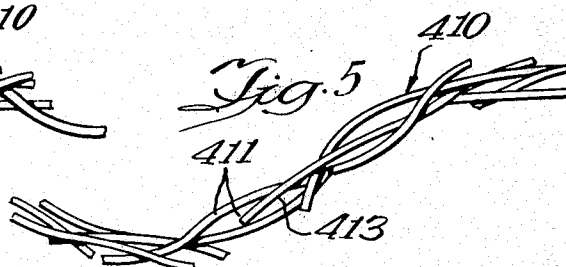


Fig. 5



METHOD OF MAKING A COMPOSITE YARN

CROSS REFERENCE TO RELATED APPLICATION

This application is a divisional application of co-pending application Ser. No. 19,442, filed Mar. 13, 1970.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to textile materials and in particular to anti-static textile materials.

2. Description of the Prior Art

A problem arises in the uses of conventional textile materials in the forming of static electric charges thereon. Thus, in carpeting the movement of a person's shoes against the carpet nap generates a static charge which is highly annoying and/or painful, such as when the charge is dissipated by the person touching a grounded object. Numerous attempts have been made to solve this vexatious problem including providing carbon backing on the carpeting, weaving wires through the backing of the carpeting, etc. Another problem in connection with the use of conventional textile materials is the tendency for such materials to accumulate soil and other material as a result of the electrostatic attraction thereof by such charges on the material. One attempted solution to this problem has been to coat the fabric with soil repellent materials. Such materials, however, have the disadvantages of changing the characteristics of the fabric and requiring reapplication from time to time, particularly where the fabric is laundered.

SUMMARY OF THE INVENTION

The present invention comprehends an improved textile material eliminating the disadvantages of the above discussed conventional textile materials in a novel simple manner.

More specifically, the invention comprehends a composite textile yarn including a non-metallic yarn portion and a blended yarn portion plied with the non-metallic yarn portion. The blended yarn portion is formed of metallic and non-metallic staple fibers with the metallic fibers being distributed suitably to be incapable of maintaining an electric current flow there-through.

The metallic yarn includes metallic fibers having a rough non-machined unburnished outer surface to provide improved association between the metallic and non-metallic portions of the yarn. Thus, in broad aspect, the invention comprises a composite textile yarn including a non-metallic yarn and a metallic yarn plied with the non-metallic yarn having such rough non-machined unburnished metallic fibers.

The non-metallic yarn may comprise a continuous monofilament, a spun yarn of staple fibers, etc. The composite yarn may include a plurality of either or both of the non-metallic or the blended yarn. The metal fibers in the blended yarn preferably are present in a weight ratio of less than 20 percent.

The composite yarn may be formed to be relatively loose as by removing sacrificial portions of the yarn upon completion of the plying thereof. Illustratively, the entire non-metallic portion of the blended yarn may comprise a sacrificial material so that the final composite may comprise solely a non-metallic yarn and metal-

lic fibers. The blended yarn may have a tensile strength substantially that of the non-metallic yarn.

BRIEF DESCRIPTION OF THE DRAWING

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing wherein:

FIG. 1 is a schematic illustration of a composite textile yarn embodying the invention;

FIG. 2 is a schematic illustration of a modified form of a composite textile yarn embodying the invention;

FIG. 3 is a schematic illustration of another modified form of a composite textile yarn embodying the invention;

FIG. 4 is a schematic illustration of still another modified form of a composite textile yarn embodying the invention; and

FIG. 5 is a schematic illustration of yet another modified form of a composite textile yarn embodying the invention formed by removing portions of the yarn of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the exemplary embodiments of the invention as disclosed in the drawing, a composite textile yarn generally designated 10 is shown to comprise a plurality of continuous filaments 11 and a blended yarn 12 plied with filaments 11 to define the composite textile yarn. Blended yarn 12 is formed of metallic fibers 13 and non-metallic fibers 14. The fibers comprise staple length fibers which conventionally have a length of less than approximately 8 inches depending on the type of fiber. The amount of metallic fibers 13 in blended yarn 12 is preferably maintained sufficiently low as to preclude the capability of the yarn to pass a direct electrical current continuously therethrough while yet the fibers are present in sufficient quantities to permit dissipation of electrostatic charges rendering the composite yarn effectively an anti-static material. Illustratively, the metallic fibers may be present in the blended yarn in a weight ratio of less than approximately 20 percent.

The continuous filament yarns 11 may be formed of any suitable non-metallic material. Illustratively, they may comprise cellulosic yarns such as acetate, rayon, triacetate, etc. yarns. The continuous filament yarns may be non-cellulosic such as fluorocarbon (Teflon), nylon, etc. yarns. The continuous filament yarns may be formed of olefins such as polypropylenes. They may comprise polyester yarns such as dacron yarns. They may be formed of saran plastic material. It will be obvious to those skilled in the art that any suitable continuous filament non-metallic yarn material may be used, the above examples being illustrative only.

The blended yarn 12 may be formed of any suitable nonmetallic staple fiber formed of materials such as that of the above discussed non-metallic fibers for use as the continuous filament yarns. The blended yarn is preferably spun and twisted into the plied configuration. While the amount of twisting may be varied as desired, it has been found that where metal fibers comprising fibers having a diameter of under approximately 1 mil are employed, a standard producer's twist may be utilized. In one example the continuous filament yarns were comprised of nylon having a 1200 denier size and a blended yarn of stainless steel metallic fibers and nylon non-metallic fibers having a spun size of 1200 de-

nier, with the metal fibers being present in a ratio of approximately ½ percent. While the percentage of metal fibers may vary as desired, it has been found that a ratio of below 3 percent is sufficient for most purposes in providing an anti-static characteristic in the textile yarn 10.

While yarn 10 is shown to include a plurality of continuous filament yarns, as will be obvious to those skilled in the art, a composite yarn may be formed with one or more such non-metallic yarns plied with the blended yarn and, while yarn 10 is shown with a single blended yarn, as will be obvious to those skilled in the art, any number of blended yarns may be plied with the non-metallic yarns within the scope of the invention.

Turning to FIG. 2, a modified form of composite textile yarn embodying the invention generally designated 110 is shown to comprise a yarn generally similar to yarn 10 but having a modified arrangement of the conductive fibers. Thus, in yarn 110 the yarn comprises a plurality of composite blended yarns 115, which may be of a blended yarn 112 similar to blended yarn 12 of yarn 10, a non-metallic yarn 111 similar to the non-metallic yarns 11 of yarn 10, and a metallic yarn 116. Thus, each of the composite blended yarns 115 comprises a composite which may be plied with other similar composites to form the final textile yarn 110. The metallic portions of blended yarn 112 and metallic yarn 116 may comprise staple fibers distributed in the textile yarn 110, as discussed above, relative to yarn 10 whereby the metal fibers are incapable of sustaining an electrical current continuously therethrough while yet providing the desired anti-static characteristics.

In FIG. 3 a further modified form of composite textile yarn generally designated 210 is shown to comprise a yarn similar to yarn 10 wherein the conductive yarn portion 212 comprises a 100 percent spun metal fiber yarn or alternatively a 100 percent continuous filament yarn. Thus, in composite yarn 210 an electric current may be continuously carried by the electrically conductive portion 212. The metal fibers or filaments 213, of which portion 212 is formed are preferably formed by a process such as disclosed in Webber et al U.S. Pat. No. 3,277,564 whereby the fibers and/or filaments have a rough, non-machined, unburnished outer surface. Such metallic fibers provide an improved coaction with the non-metallic yarns 211 of the composite yarn 210 in providing improved positive association with the non-conductive yarns as well as providing an improved integrity in the electrically conductive yarn 212. While reference may be had to said Webber et al patent for a more complete disclosure of a method of forming such rough, non-machined, unburnished outer

surface fibers, for the purposes of the present invention the method comprises the multiple end drawing of the fibers in a suitable matrix whereby the outer surface of the resultant filaments is maintained unburnished in the drawing operation.

In FIGS. 4 and 5 further modified arrangements of the composite textile yarns are illustrated. Thus, in FIG. 4 the composite textile yarn 310 is shown to comprise a plied arrangement of non-metallic yarns 311 and a spun yarn 312 formed of metal fibers 313 and non-metal fibers 314. The non-metal fibers 314 in yarn 310 are formed of a sacrificial material permitting them to be removed if desired and thereby form a composite textile yarn such as yarn 410 shown in FIG. 5. Illustratively, the sacrificial yarn 314 may comprise a water or chemically soluble yarn such as polyvinyl alcohol, chemically soluble rayon, etc. In yarn 410 the metal fibers 413 which may comprise staple fibers are mechanically trapped in the plied textile yarn 410 notwithstanding the removal of the non-conductive fibers of the blend, such as blend 312 of yarn 310. Thus, the non-conductive portion of the blend may merely comprise a carrier for the metallic fibers for facilitated plying thereof in forming the composite textile yarn 410.

The plying of the components of the composite textile yarn may be arranged so that the spun yarn effectively contributes substantially nothing to the integrity of the yarn, but merely provides the desired electrostatic dissipation characteristics. However, the twist in the yarns and crimp in the fibers, both organic and metallic, provide a mechanism for maintaining the structural yarn form. Alternatively, the blended yarn may comprise a component of the composite yarn providing a strength to the yarn as well as the antistatic characteristics.

The foregoing disclosure of specific embodiments is illustrative of the broad inventive concepts comprehended by the invention.

I claim:

1. A method of making a composite textile yarn comprising the steps of:

- a. spinning a blended yarn of metallic and non-metallic staple fibers
- b. combining a non-metallic continuous filament yarn with the blended yarn: to form a composite yarn; and
- c. removing said non-metallic staple fibers while leaving said metallic staple fibers trapped in said composite.

2. The method of claim 1 wherein said non-metallic staple fibers are removed by dissolving.

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