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W. H. HILLS ET AL
YARN TEXTURING PROCESS

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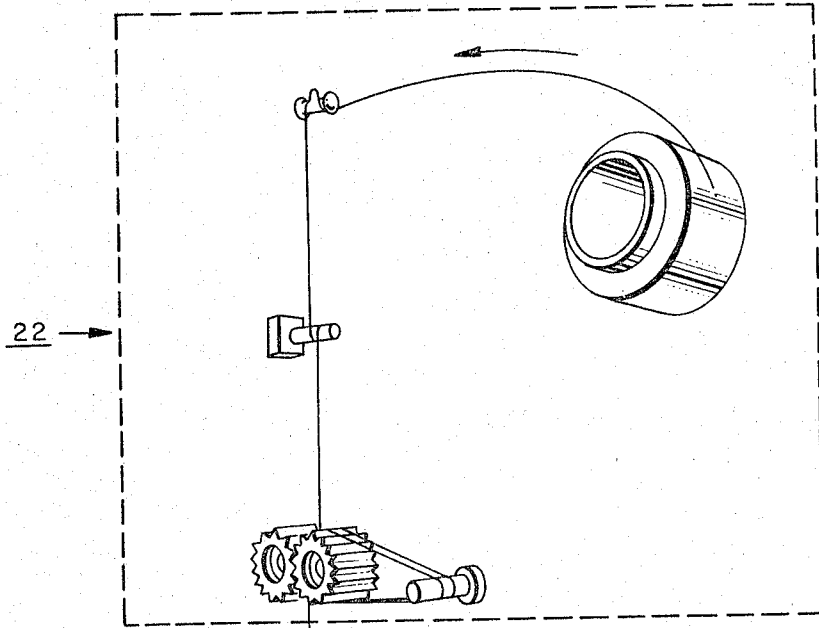


FIG. 1.

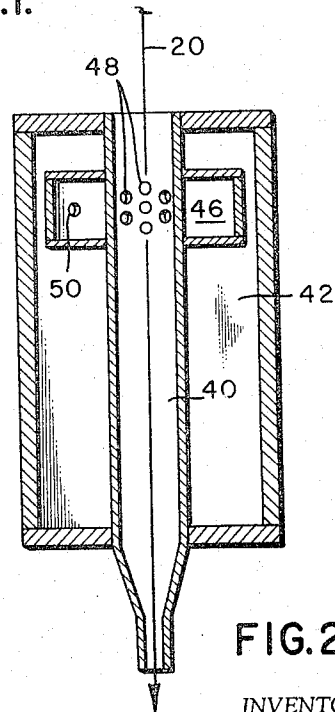
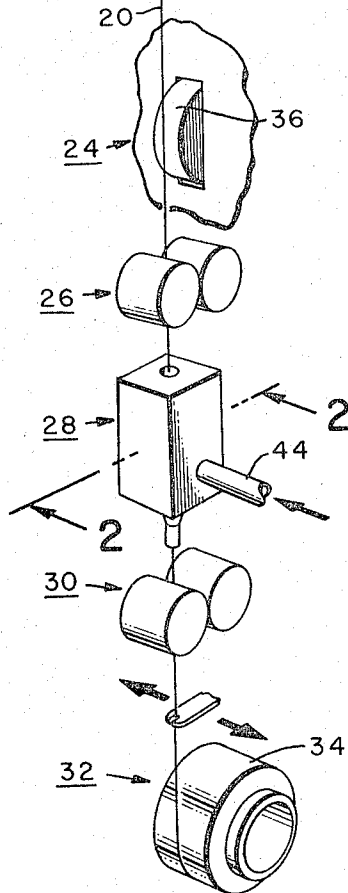


FIG. 2.

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2 Claims. (Cl. 28—75)

The present invention relates to a textured yarn having superior tufting, knitting and weaving performance, and more particularly to such a yarn which is pre-bulked and coated with a particular composition for improving its performance.

For the past several years, there have been commercially available continuous filament thermoplastic yarns which possess latent bulking. The yarn was used in this form to make textile products, and the bulk developed after the end product had been partially or completely manufactured. For example, a carpet would be tufted using such yarns and the bulk would be developed when the carpet was dyed. Carpets made of yarn having undeveloped bulk typically had a high incidence of flaws and pulled loops, which had to be repaired by hand, thus increasing the cost of producing satisfactory carpeting. Such unbulk yarn gave certain other difficulties in handling and in subsequent manufacturing operations.

According to the present invention, such yarn is coated with a particular composition and pre-bulked to markedly improve its performance in subsequent manufacturing operations.

Accordingly, a primary object of the invention is to provide a continuous filament textured yarn which may be more readily incorporated into manufactured products.

A further object is to provide such yarn which produces greatly improved tufting performance.

A further object is to provide yarn of the above character which is pre-bulked and which has thereon a coating to further improve performance in subsequent manufacturing operations.

A further object is to provide a method for producing yarn of the above character.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the several steps and the relation of one or more of such steps with respect to each of the others, and the article possessing the features, properties, and the relation of elements, which are exemplified in the following detailed disclosure, and the scope of the invention will be indicated in the claims.

For a more complete understanding of the nature and objects of the invention, reference should be made to the following detailed description taken in connection with the accompanying drawing, in which:

FIGURE 1 is a schematic perspective view of an exemplary form of apparatus for practicing the method according to the present invention; and

FIGURE 2 is a cross-sectional view taken along line 2—2 of FIGURE 1.

Referring now generally to FIGURE 1, yarn 20 having latent bulking is supplied from a source 22. As schematically illustrated, source 22 may be the apparatus disclosed in U.S. Patent 3,024,516 to J. E. Bromley et al., or may be any other equivalent source, such as a different apparatus or a bobbin of latent-crimped yarn. An applicator 24 applies silica dispersed in a liquid carrier to the yarn, as will be more fully explained. The wetted yarn 20 is fed by a pair of nip rolls 26 to a treating chamber 28 wherein it is exposed to sufficient heat to simultaneously bulk the yarn and evaporate the liquid component applied by applicator 24. Yarn 20 is then fed by a second pair of nip rolls 30 to a suitable take-up

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mechanism 32 which takes up the yarn in the form of a package 34.

Referring now more specifically to FIGURE 1, the applicator 24 is illustrated in the form of a slowly rotating wheel 36, against the periphery of which yarn 20 runs. The lower surface of wheel 36 may be immersed in a container of the dispersion. As will be understood, the amount of dispersion thus applied to yarn 20 by wheel 36 may be readily controlled by controlling the rate of revolution of wheel 36. Sufficient dispersion should be applied by wheel 36 so that the silica deposited on the yarn is between 0.1 and 5.0 percent of the yarn weight. Water is a convenient carrier. Preferably, the silica is in the form of a colloidal dispersion, with particle sizes of a few hundred angstroms. For example, the particle size may be in the range of from 350 to 400 angstroms in diameter. Advantageously, such a colloidal dispersion may be slightly basic to prevent precipitation of the silica. A pH of between 7.0 and 10.0 is satisfactory.

Yarn 20 is next fed by nip rolls 26 into a heating region illustrated as the treating chamber 28. Referring now to FIGURE 2, chamber 28 comprises an elongated central tube 40 passing vertically through a surrounding steam chamber 42. Chamber 42 is welded or otherwise sealed to the outside of tube 40 near its ends. As shown in FIGURE 1, high pressure steam may be admitted to chamber 42 by a steam supply pipe 44, whereby the walls of tube 40 are heated. Referring again to FIGURE 2, an annular interior chamber 46 is formed about tube 40 near its upper end, and is sealed thereto. Several relatively large apertures 48 provide communications between the interior of the chamber 46 and tube 40. A restricted orifice 50 is provided in the walls dividing chamber 46 from chamber 42, to permit a small amount of the high pressure steam in chamber 42 to bleed into chamber 46. The steam thus admitted into chamber 46 dissipates at low velocity through apertures 48 into the central tube 40, so as not to agitate the yarn. The following values are given solely by way of example to illustrate the mode of operation contemplated. The steam admitted through pipe 44 was at 90 pounds per square inch gauge and 350° F. The single orifice 50 was 0.020 inch in diameter, while each of the apertures 48 were of approximately 3/32 inch diameter. Tube 40 was 11 inches long, and was surrounded by chamber 42 over 9 inches of its length.

As a result, the walls of tube 40 are maintained at approximately 350° F. and the interior of the tube has applied thereto a small amount of a steam at atmospheric pressure and 350° F. through orifice 50 and apertures 48. The wetted yarn fed through tube 40 is thus subjected to a temperature sufficiently high to evaporate the carrier (water) and to simultaneously develop the latent bulk possessed by the yarn. It will be understood that the length of tube 40 and chamber 42 may be increased or decreased depending upon the speed of the yarn 20 through treating chamber 28, the exemplary values given being suitable for a yarn speed of 175 y.p.m.

The relative speeds of nip rolls 26 and nip rolls 30 should be adjusted so that there is substantially no tension applied to yarn 20 while in treating chamber 28, in order to avoid destroying the developed bulk. In one successful embodiment of the invention, nip rolls 26 had a 10 percent greater peripheral velocity than nip rolls 30, to permit a 10 percent reduction in length of the yarn as the bulk is developed. The yarn is taken up in package form at a speed at least 5 percent less than the speed at which it is fed into tube 40 by rolls 26. Advantageously, the yarn is wound on a bobbin or support member at a tension less than 0.2 gram per denier.

To illustrate the efficiency of the present invention, the

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following data was obtained by tufting carpets with nylon yarns of 136 filaments and a total of 2460 denier. Carpet made with the control yarn, which was not treated with silica and which had not had its bulk developed, had an average of 3.24 flaws requiring mending in a given area. When the yarn was pre-bulked but not silica-coated, the same given area had 2.58 flaws, an improvement in tufting performance by a factor of 1.25. When the yarn was silica-coated but not pre-bulked, the same given area had 0.83 flaws, an improvement by a factor of 3.90. Carpet made with silica-coated and pre-bulked yarn according to the present invention, at a treating level of 0.35 percent silica on the yarn, had an average of only 0.023 flaws in the same given area. This shows improved tufting performance by reduction of carpet flaws by a factor of about 140, which improvement is far greater than would be expected by the cumulative effects of the individual steps. In addition, superior yarn cover is provided as compared to control.

From the above description and the accompanying drawing it may be seen that the present invention provides a substantially improved yarn, which may more readily be incorporated into manufactured products. The combination of pre-bulking with the silica coating radically improves the tufting performance of yarns according to the invention. The manufacturing steps are simple and economical, and may readily be incorporated into existing equipment.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in carrying out the above process and in the article set forth without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific fea-

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tures of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A process for improving tufting performance of a latent-crimped yarn, comprising in combination:

(a) applying colloidal silica dispersed in a liquid carrier to a yarn having latent crimps, at an application rate to deposit between 0.1 and 5.0 percent silica based on the weight of said yarn,

(b) feeding said yarn under substantially no tension through a heating region wherein said yarn is heated sufficiently to evaporate said carrier and to develop the bulk in said yarn,

(c) and taking up said yarn in orderly fashion.

2. The process of claim 1, wherein said silica has an average particle diameter of the order of a few hundred Angstroms.

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