

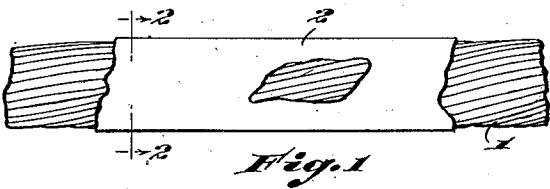
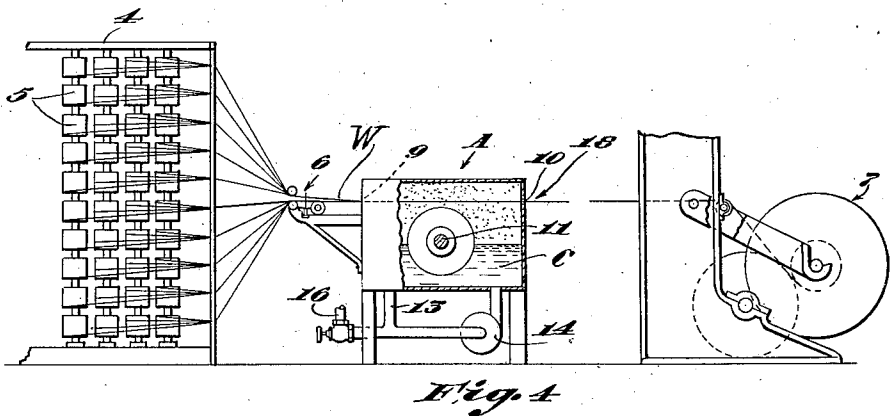
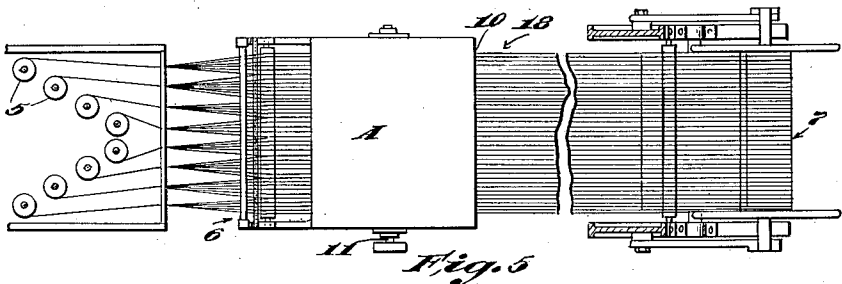
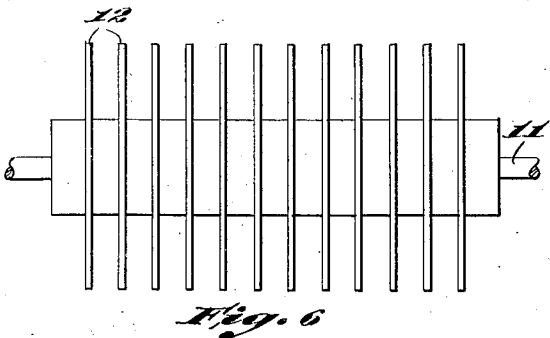
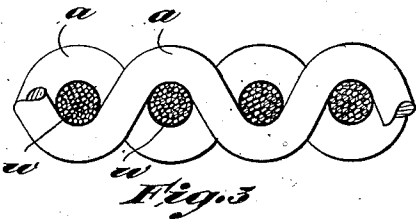
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F. RINDGE

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TEXTILE

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UNITED STATES PATENT OFFICE

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TEXTILE

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This invention pertains to textile manufacture and more particularly to a process of treating yarns preparatory to weaving, knitting or the like, to a yarn so prepared, and to a fabric made from such yarn. In the most important processes of converting yarn into cloth, to wit, weaving and knitting, the individual yarns are subject to heavy tension and to the abrasive action of the mechanical parts with which they contact. Thus, for example, in weaving, each warp yarn must reeve back and forth through the heddle eye many times before it becomes a part of the woven fabric, and the heavy tension, coupled with the rubbing of the yarn against the heddle and other guiding and positioning elements, tends to cause frequent breakage. Moreover, in dealing with soft or fibrous yarns, especially those whose fibers tend to kink, curl, or intertwine, for instance woolen yarns, great difficulty is experienced through the entanglement of the fibers of one yarn with those of adjacent yarns, which causes slubs, knots, and breakage during the weaving and preliminary processes and results in floats in the woven fabric. To avoid these difficulties, the yarn is commonly drawn through a bath of starch or glue size and dried before weaving, and in thus treating the yarn, every effort is made to cause the size to penetrate the yarn completely, so as to stick the individual fibers of the yarn together. While the size commonly employed does not greatly increase the tensile strength of the yarn, it unites the fibers so that the yarn is not so readily roughened or abraided by heddles and guides. While this mode of treating the yarn has been known and practiced for many years it has certain practical disadvantages among which in particular may be mentioned the great loss of time in drying the sized yarn; the initial cost and operating expense of usual drying apparatus, in which a large amount of heat is consumed; and the danger from mildew when yarn, so sized, is stored for any considerable time.

protects the inner fibers and minimizes abrasion during weaving, but reach this result without employing heat for drying the yarn and by a treatment which takes but a small fraction of the time required for the usual sizing operation. Moreover, the yarn so treated has greatly increased tensile strength as compared with yarn sized by usual methods but without unduly impairing its normal flexibility; its surface fibers are so united and protected that they do not snarl, bunch, or tangle readily; it will not mildew; and it preserves its internal moisture, oil, or grease indefinitely.

To this end I employ as the treating medium a substance which possesses strengthening and gloss imparting qualities; which dries almost instantaneously at usual room temperatures; and which forms a thin, tough and flexible protective outer sheath about the inner fibers. For best results I apply this material in the form of a fine mist-like spray through which the yarn passes, and which is deposited upon the outer fibers, after substantial penetration into the interior of the yarn, and which coats and binds in the outer fibers to form a more or less continuous but extremely thin layer or sheath from which the solvent evaporates immediately upon exposure to the air. Preferably I employ one of the quick drying cellulose lacquers (of which pyroxyline may be cited on a specific example) and which usually comprise a cellulose ester of nitric or acetic acid, extended in a highly volatile solvent, for example acetone or amyl acetate. This lacquer (for this purpose ordinarily uncolored) may be thinned down to a constituency suitable for atomization by the particular means employed for this purpose, and after evaporation of the solvent leaves the yarn with an extremely thin but dry and non-sticky, tough and flexible sheath in which the outer fibers are firmly bound together. The preferred method of producing the spray or mist of coating material does not involve the use of air or other gaseous medium at high pressure, and thus penetration of the interior of the yarn by the coating material is substantially prevented and incidentally the troubles inci-

In accordance with the present invention I provide for temporarily but firmly binding together the outer constituent fibers of the yarn, thereby in effect to form a sheath which

dent to leakage of the coating solution or its solvent into the surrounding area are avoided and substantial economy in the amount of coating material required results. This coating material, unlike the usual starch size, does not penetrate the yarn to any substantial depth, but by reason of its toughness greatly strengthens the yarn, provides a glossy surface protecting the yarn against abrasion, from snarling, mildew, and breakage, and tends to minimize the formation of floats in weaving. Since this coating is of vegetable origin, it is completely removed from woolen (including worsted) or silk fabrics in the process of carbonizing, and is readily removable from cotton by proper solvents without substantial detriment to the yarn itself, and since the coating is very thin, ordinary laundering is usually sufficient to remove it:—thus the practice of this process need not substantially affect the appearance or feel of the finished fabric.

In the accompanying drawings I have diagrammatically illustrated certain apparatus useful in the practice of my process of yarn treatment, together with diagrammatic large scale illustrations of the yarn, and a fabric made therefrom, but it is to be understood that the drawings are merely illustrative and not intended to limit the invention.

In the drawings:

Fig. 1 is a fragmentary diagrammatic side elevation, to greatly enlarged scale, of an idealistic spun yarn after treatment in accordance with the present invention;

Fig. 2 is a sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a diagrammatic cross section to large scale of a woven fabric having its warp yarns prepared in accordance with the present invention;

Fig. 4 is a diagrammatic side elevation, partly in section, of apparatus suitable for use in the practice of this process;

Fig. 5 is a diagrammatic plan view of the apparatus of Fig. 4; and

Fig. 6 is a side elevation, to larger scale, of the atomizing element of the device shown in Fig. 7.

Referring to the drawings, the numeral 1 designates a spun yarn comprising a plurality of textile fibers twisted together in the usual manner to form a more or less cylindrical strand. For convenience in illustration the yarn of Fig. 1 is shown as of idealistic perfection, having all of its constituent fibers laid smooth, close, and substantially parallel, and being without slubs, loose ends or other common defects. As shown in Fig. 1 this yarn has received a coating 2 consisting of lacquer which unites with the outer fibers to form a thin, dry and normally non-sticky, and elastic sheath. Since the actual yarn is not truly cylindrical and since its constituent fibers are not all parallel but sometimes cross, kink or

snarl, and since in some yarns, especially woolen and worsted, there are more or less short projecting ends, etc., the coated yarn does not in practice, when viewed under the microscope, present the smooth external appearance of Fig. 1 but is more or less rough and uneven, being somewhat suggestive in appearance of a twig which has been exposed to a freezing fog or mist, the original irregularities of the uncoated yarn appearing as smooth, glossy lumps or rounded protuberances and the ends of the fibers being agglutinated and encased so that they appear as relatively short, stiff stubs not readily entangled with those of adjacent yarns. While this outer sheath or coating is substantially continuous, it may have small fissures or openings at irregular intervals, due to the failure of the coating material completely to coalesce at all points. Such a coating, consisting of a dried cellulose lacquer, for example pyroxyline, deposited from a mist or spray of the fluid lacquer, while sufficient to bind the fibers of the yarn together; to impart great additional strength to the yarn; and to resist separation of the fibers by abrasion in the weaving operation, nevertheless substantially disappears when the woven fabric is suitably treated.

In applying the coating to the yarn I may employ apparatus such as shown in Figs. 4, 5 and 6. This apparatus comprises a creel 4 adapted to support a great number of cheeses, spools, cops or the like, indicated at 5, providing masses of spun yarn from which the yarns are drawn off through a reed 6 and thence to a beam 7 upon which they are wound, the yarns intermediate the reed 6 and the beam 7 forming a substantially horizontal sheet W. This sheet of yarns passes through the coating apparatus A which preferably consists of a closed tank or casing having openings 9 and 10 in its opposite side walls for the passage of the sheet of yarns and containing a shaft 11 driven at high speed by suitable means (not shown) and provided with a series of disks 12 adapted to dip into a body of the fluid lacquer C in the receptacle and by centrifugal action to atomize this material in the form of a fine mist or spray in the upper part of the casing. This type of atomizing apparatus is highly desirable since it does not create a pressure in the tank which would force the coating material into the interior of the yarn while, furthermore, it avoids leakage of the solvent vapor into the surrounding air, such as results when pressure spraying or the like is employed. Preferably the casing is provided with a drain pipe 13 which delivers to the intake of a circulating pump 14 which returns the fluid lacquer to the casing. Suitable supply connections 16 are provided for delivering a fresh supply of coating material to the tank when needed.

As the sheet W of yarns passes through the

upper part of the tank or casing, the mist-like particles of the lacquer deposit upon the exposed exterior fibers of the yarn, the particles or droplets which deposit upon adjacent fibers coalesce so as to form a film of sufficient continuity to bind in these outer fibers and thus protect the inner fibers, although, as above stated, the incomplete coalescence may leave small fissures or openings in the coating or sheath at irregular intervals. The yarn now passes out through the opening 10, but without contact with guides or other elements disturb the sheath of fluid coating material, and upon exposure to the air at the point 18, the highly volatile solvent employed evaporates almost instantly leaving the yarn with a dry, non-sticky, tough coating as above described. The treated yarn is wound upon the beam 7 or other suitable support, and may now be employed for any desired purpose, for example, as a weaving warp, being used with weft yarns similarly prepared or with ordinary wefts as desired. It is to be noted that the yarn after receiving its coating, does not engage guide or squeeze rollers before the coating is substantially dry, and thus its normal substantially cylindrical shape, resulting from the spinning operation, is substantially preserved. In Fig. 3 I have illustrated a fabric woven by the use of treated warp yarns *w* and ordinary wefts *a*.

After weaving, this fabric may be subjected to appropriate finishing operations, such, for example, as carbonization, washing with soap or weak alkaline solutions, etc. upon the completion of which it is found that the coating has substantially disappeared, although during the weaving the coating strengthens and protects the yarn so that but little, if any, warp breakage occurs.

Preferably the yarns are treated by the present method as soon as possible after spinning, thus retaining the original moisture or oil taken up by the fiber during the preliminary steps in the textile process, thus preserving the flexibility of the fiber and preventing it from becoming harsh or brittle, while the sheathing prevents abrasion of the formation of fly and slubs throughout all subsequent stages of manufacture.

While I have herein disclosed one desirable type of apparatus suitable for use in atomizing the adhesive and for presenting the yarn for contact with the mist or spray produced by the atomizing means, I wish it to be understood that the invention is not necessarily limited to the employment of the apparatus herein described and illustrated but that any suitable means may be used for the purpose. Moreover, while the method of applying the coating material to the yarns as herein disclosed is well suited for use with cellulose lacquers as described, it is contemplated that this method of applying of the coating material by atomization may also be found use-

ful in applying adhesives of other types to the yarn, since by these means a very thin uniform coating is obtained. In this connection it may be noted that by applying the coating in the form of a mist or spray, there is a less penetration of the yarn by the coating material than in under usual practice so that while the surface of the yarn is protected and its constituent fibers are sheathed and confined so as to impart a maximum strength to the yarn the yarn still remains flexible, and great economy in the use of the material is effected.

I claim:

1. That method of treating textile yarn preparatory to its manufacture into cloth which comprises as steps depositing upon the surface of the yarn a thin coating of a fluid adhesive comprising a cellulose ester of nitric acid extended in a highly volatile solvent and substantially free from oily substances, and subsequently exposing the yarn to air at normal temperature to permit the solvent to evaporate whereby to provide the yarn with a temporary mildew resistant binder for its outer fibers.

2. That method of treating textile yarn preparatory to weaving which comprises as steps exposing the yarn to a fine spray of a cellulose lacquer comprising a highly volatile solvent whereby to cover the outer surface of the yarn with minute droplets of the lacquer, and subsequently exposing the yarn to the air to permit evaporation to the solvent whereby to leave a thin, dry, tough and readily removable lacquer coating on the surface of the yarn.

3. That method of treating textile yarn which comprises as steps providing an extension of a cellulose derivative in a highly volatile solvent, atomizing said extension to produce a mist, passing the yarn through such mist whereby to secure a thin deposit of the fluid extension upon the outer surface only of the yarn, and exposing the yarn to the air to permit the solvent to evaporate.

4. That method of treating textile yarn which comprises providing a coating fluid, reducing such fluid to the form of a mist, passing the yarn through said mist within a substantially closed chamber wherein the pressure does not substantially exceed that of the atmosphere whereby to deposit a thin coating of the fluid upon the surface of yarn, and drying the yarn.

5. That method of making textile fabric which comprises as steps applying a cellulose lacquer to woolen yarn so as to form a thin, dry, elastic coating binding together the constituent fibers of the yarn, combining yarns so treated to form a fabric, and carbonizing the fabric to remove the coating from its constituent yarns.

6. A textile spun yarn suitable for cloth manufacture having its surface fibers bound

together by means of a thin exterior coat of dry elastic cellulose lacquer readily capable of removal in cloth finishing so as to leave the yarn of substantially the same diameter and degree of flexibility as when spun.

5 7. A textile yarn suitable for use in weaving having a temporary outer sheathing comprising a thin, tough elastic and readily removable deposit of cellulose lacquer, the inner portion of the yarn being substantially free from lacquer.

10 8. A textile yarn temporarily reinforced for weaving by a thin, tough, glossy temporary coating of an adhesive cellulose derivative adapted to strengthen the yarn and to protect it from abrasion during weaving, said coating being readily removable from the yarn upon exposure of the latter to subsequent cloth finishing operations.

20 9. A textile fabric composed of yarns some at least of which are individually coated with a thin, dry surface deposit of cellulose lacquer, the deposits upon adjacent yarns being free from each other and being readily removable from the yarn upon subjection of the fabric to subsequent cloth finishing operations.

30 10. A woolen warp yarn having the requisite flexibility for use in weaving, and having its outer surface fibers bound in by a thin mildew resistant outer sheath of a cellulose lacquer, readily removable from the yarn in a carbonizing process.

35 11. A warp yarn suitable for use in weaving having its outer fibers bound in to prevent abrasion during weaving by means of a thin mildew repellent surface sheathing of cellulose lacquer, the interior of the yarn being substantially free from such lacquer and preserving its normal flexibility.

40 Signed by me at Boston, Massachusetts this 8th day of April, 1929.

FULTON RINDGE.

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