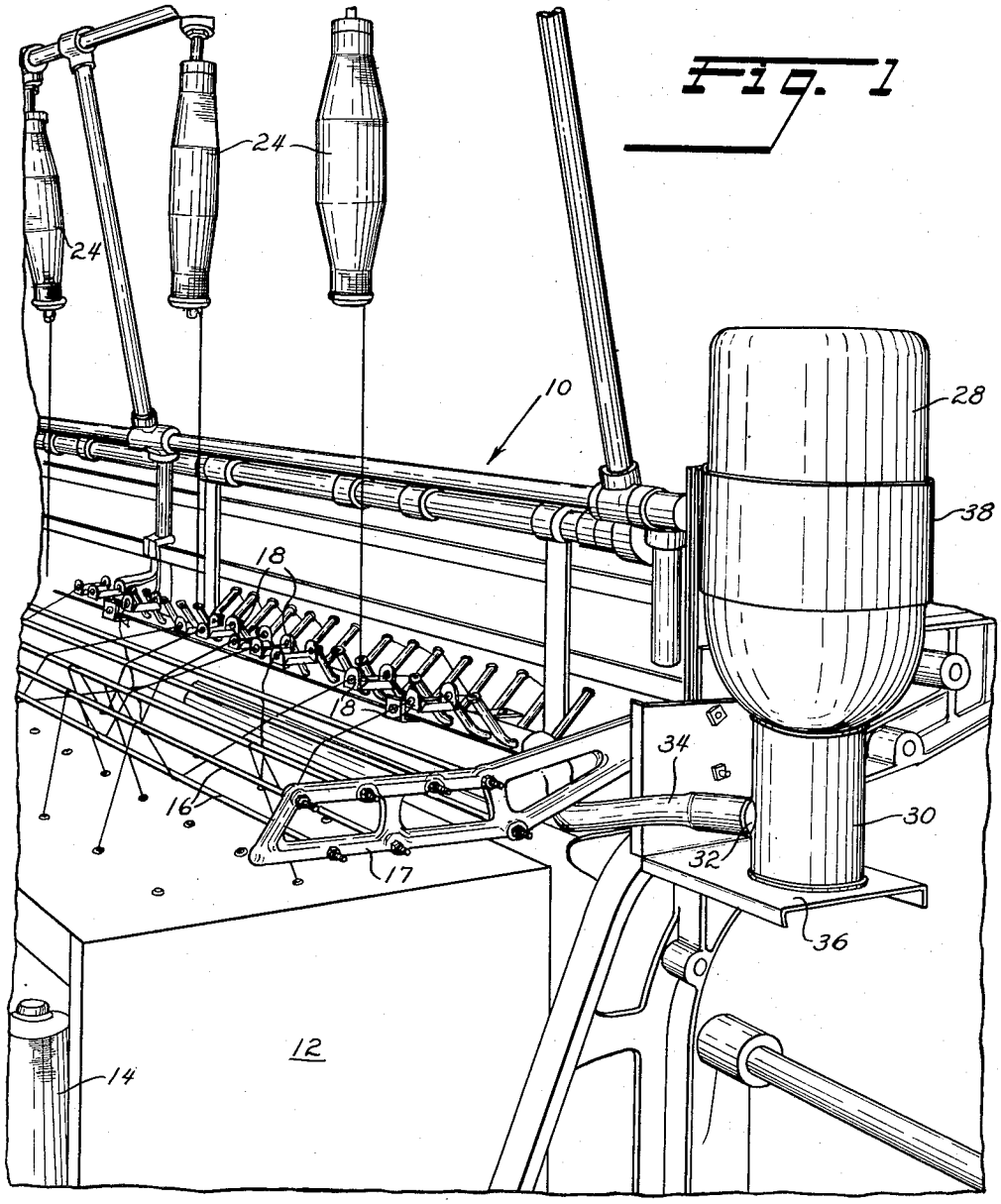
Nov. 2, 1954 J. H. QUINN 2,693,096

YARN TREATING APPARATUS

Filed June 27, 1951 2 Sheets-Sheet 1

Fig. 1



INVENTOR

JAY H. QUINN

BY Strauch, Nolan & Diggins

ATTORNEYS

Nov. 2, 1954 J. H. QUINN 2,693,096

YARN TREATING APPARATUS

Filed June 27, 1951 2 Sheets-Sheet 2

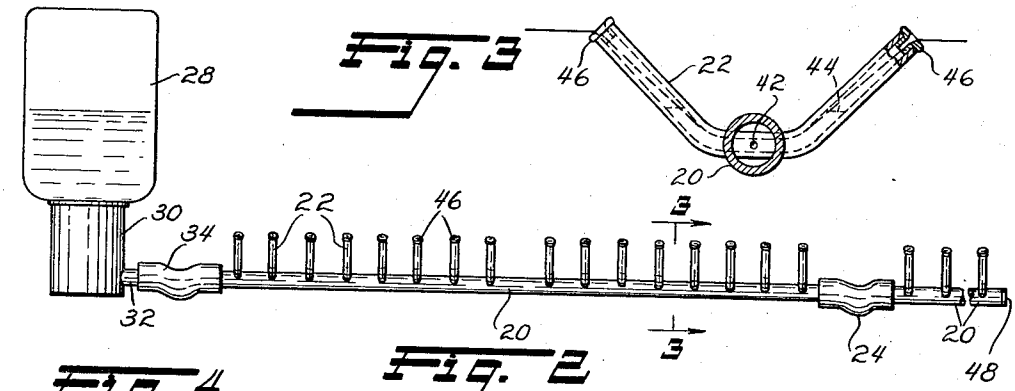


Fig. 2

Fig. 3

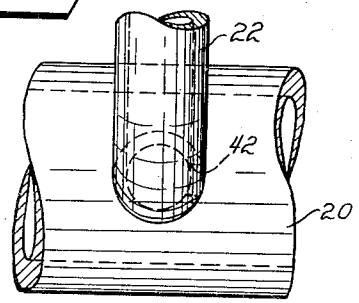


Fig. 4

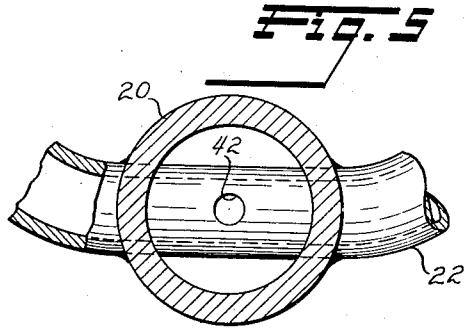


Fig. 5

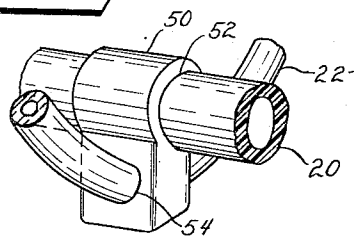


Fig. 6

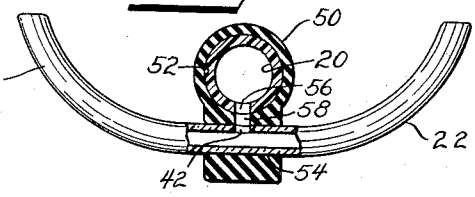


Fig. 7

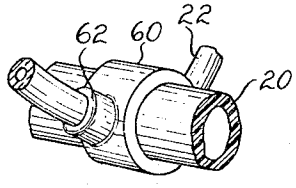


Fig. 8

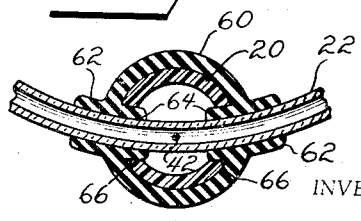


Fig. 9

INVENTOR

JAY H. QUINN

BY Strauch, Nolan + Diggins

ATTORNEYS

United States Patent Office 2,693,096 Patented Nov. 2, 1954

2,693,096

YARN TREATING APPARATUS

Jay H. Quinn, Reading, Pa.

Application June 27, 1951, Serial No. 233,905

2 Claims. (Cl. 66—125)

This invention relates to the treatment of yarns such as nylon, silk, cotton and others in knitting operations. More particularly my invention relates to improved yarn lubricating and wetting apparatus and solutions therefor to condition yarns for passage from the cones through the intermediate parts to the needles of knitting machines in the production of improved quality of knitted goods.

In the knitting of nylon stockings and the like single or mono-filament and multiple filament nylon yarns are in general used to form the various parts of the knitted article, such for example as the main body and the toes, heels and tops full fashioned nylon stockings.

The single or mono-filament yarn is unsized, and since it is abrasive and tends to rapidly wear and cut machine parts such as carrier tubes, eyelets, guide rods, and the like with which it contacts in passing to the needles it has been the practice to lubricate such mono-filaments strands by passing them from the cones over wick oilers of well known design prior to contact with knitting machine parts. Such oilers are handled and adjusted manually and are subject to accidental disarrangement with resultant unavoidable variations in yarn tension. This results in undesirable differences in stocking lengths from head to head on the same machine, and lowers the quality of the goods produced.

The multiple filament yarns are twisted together and generally sized with a polyvinol alcohol to hold them together in their passage from the cones through the knitting machine. When used with wick oilers for the mono-filament yarns, such sized yarns are passed through separate large open topped troughs which in such operations contain a water solution of wetting agents to soften the sizing and to provide necessary lubricity, and stitch lock for the knitting operation.

To avoid the variations in length due to the use of wick oilers for the mono-filament yarn, some mills run both the mono and multiple filament yarns through the large open troughs, with some oil added to the solution to provide the necessary lubricity for the mono-filament yarn. The added oil tends to prevent proper locking of the stitches normally provided by the wetted sizing which results in sleazy second grade products, and in imperfections such as fisheyes or relatively enlarged holes in the fabric.

Such troughs for both of the foregoing types of operation are provided for each section of the knitting machine and contain considerably more solution than is necessary to treat the few strands of yarn passing through them. Dirt from the atmosphere deposits in them and contaminates the solution, and as the sizing is water soluble some of it accumulates in the troughs in operation, further contaminating the solution which becomes gummy and dirty with sludge formation due to evaporation. Also because of external contamination and oxidation, undesirable unsanitary mildew, bacterial growths, and fungus forms in the troughs. In addition, as the yarns pass through the open troughs, the solution tends to spray over the adjacent machine parts, resulting in undue corrosion and requiring more or less frequent cleaning and servicing of the machines, with lowered production, lowered quality of goods, and increased production costs.

Because of the foregoing disadvantages of the prior yarn treating arrangements and methods, various yarns treating expedients have been proposed including passage of the yarns through individual tubes, as for example shown in U. S. Patent to Heuer No. 1,269,604 in

which solution is fed into individual strand wetting tubes through a multiplicity of feed holes. The passage of the yarn through the tubes in such devices causes circulation of solution between the tubes and the container in which they are immersed with excessive treatment of the yarn, stripping of the sizing in the tubes and contamination of the solution. As a result, such devices have not been successful in replacing either the prior open troughs or wick oilers.

By my present invention I eliminate the foregoing disadvantages of the present yarn wetting and lubricating apparatus and procedures through the use of a combination of novel tubular wetting and lubricating arrangement with a novel solution which properly wets and lubricates sized multiple filament and unsized mono-filament nylon yarns, providing the necessary wetting and lubricity for both types of yarns. Substantially uniform yarn tension is provided resulting in substantially equal lengths of knitted goods throughout the various machine sections or heads, with substantial elimination of sleazy goods due to unlocked stitches, and of fisheyes and the like in the finished products.

It is accordingly a primary object of my invention to provide novel improved yarn treating apparatus which may be built initially into knitting machines, or incorporated as attachments in existing machines to replace the present constructions and techniques for treating yarn of all deniers and sizes prior to knitting. This I accomplish by means of a closed system for the treating solution which substantially prevents evaporation, maintains a substantially constant solution concentration, provides desirable wetting and lubricity, and precludes formation of sludges, fungus and the like, with resultant economy of use of solution.

A further object of my invention is to provide an enclosed self cleaning yarn treating system in which no residues are formed by evaporation, thus eliminating the need for the frequent cleaning of the apparatus as required with present yarn treating devices to remove accumulated dissolved size and sludges formed by evaporation.

Another object of my invention is to eliminate the prior open troughs, and the prior trough solutions for wetting thread in knitting machines with their attendant, evaporation, subsequent sludge formations, external contamination and bacterial growth.

With the prior troughs it is necessary to pass each strand of yarn thru several eyelets which wear rapidly and must be frequently replaced increasing the costs of operation and maintenance and limiting the machine production. It is a further object of my invention to provide simplified apparatus in which the prior eyelets are eliminated and threading of the yarn is simplified by passage the yarn strands through individual U-tubes in one operation.

A further object of my invention is the provision of novel apparatus for the controlled uniform treatment of yarn in which all of the solution is used for the treatment of yarn with no substantial loss by evaporation or spraying over the machine parts. This I accomplish by utilizing separate U-tubes for the wetting and lubrication of each strand of yarn, with each U-tube constantly fed through a single opening from a solution supply tube maintaining a flow in one direction only. The supply tube is continuously filled from an inverted vertical container of solution which maintains a constant solution level in the tubes, thus assuring proper uniform treatment for each strand of yarn.

Still another object of my invention is to eliminate wicks and wick oils for lubrication of yarns in knitting machines with their attendant manual handling which makes uniform tension of the yarn from head to head of the prior knitting machines practically impossible. This I accomplish by providing treating apparatus in which the various types of yarn are automatically pulled through a single solution with no outside manipulation necessary so that the tension is constant.

Excessive wetting of the sized yarn will loosen the size in the yarn with the result that it is stripped from the yarn by the physical friction of the knitting process. This removal of size by stripping is detrimental both to the machine in which the loosened size lodges, and to the per-

fection of the knitted stitch. A still further object of my invention, accordingly, is to provide a novel solution to wet and lubricate both sized and unsized yarn, the formula of which is adjusted to prevent excessive penetration of the wetting action into the sizing, and which contains a lubricant to minimize wear on the knitting machine parts as the yarn passes through. Since my single improved solution performs both lubrication and wetting, I eliminate the prior troughs and wick oilers with the prior separate trough solution and wick oils.

Still another object of the invention is to provide a novel combination of wetting apparatus with a novel solution for treating yarn which results in a firm stitch formation with resultant production of superior quality knit goods with control of fabric length, and regularity of the courses in the fabric.

Further objects of the invention will appear from the following detailed description of preferred embodiments thereof, and from the scope of the appended claims:

As shown in the drawings:

Figure 1 is a perspective view of a portion of a nylon hose knitting machine provided with a preferred embodiment of my improved wetting apparatus.

Figure 2 is a side elevation showing a plurality of my improved wetting devices illustrated in Figure 1 connected to the treating liquid supply.

Figure 3 is a sectional view taken along line **3—3** of Figure 2.

Figures 4 and 5 are enlarged details of a portion of the device of Figures 1–3.

Figure 6 is a perspective view of a portion of a modified form of wetting device.

Figure 7 is an end view of the modified form of Figure 6 with a portion thereof in section.

Figure 8 is a perspective view of a portion of another modified form of my improved device.

Figure 9 is a transverse sectional view of the modified wetting device of Figure 8.

Referring to the drawings wherein like reference numbers indicate like parts, **10** (Figure 1) indicates the frame of a nylon hose knitting machine, only a portion of which has been shown. The knitting machine is provided with a conditioning box **12** which houses cones of multiple filament nylon yarn **14**. The yarn strands are lead over tension rods **16** mounted in frames **17** supported from the main frame of the knitting machine **10** over the top of conditioning box **12**. From tension rods **16**, yarn **14** passes through guide members **18** into my improved treating device embodying the main liquid supply and support pipe **20** of brass or other suitable material for substantially U-shaped tubes **22**. In this embodiment, pipe **20** forms a solution reservoir structure through which tubes **22** extend and by which they are supported. The mono-filament yarn from suspended cones **24** is fed directly into U-shaped tubes **22**.

In Figure 2 of the drawings a plurality of my improved treating units are shown connected together by tubing **24**. The same arrangement and numbers of U-tubes is repeated for each section of the machine, assuring uniform style of knitting in each section. The treating liquid is fed by gravity from a liquid supply consisting of a bottle **28**, inverted and having its open end positioned within a cup shaped container **30**. Bottle **28** may be arranged as shown at the end of a series of treating units or between adjacent units as desired (not shown). A short section of tubing **32** is welded or otherwise secured to the lower outside portion of container **30**. A section of flexible tubing **34** having one end fitted upon tube **32** and the other end fitted upon one end of the end treating unit as illustrated, allows the liquid in container **28** to continuously fill the treating units to the desired level in operation. This level is maintained by any constant level device of well known construction positioned within cup **30** such as is used in feeding solution to the present troughs (not shown). Bottle **28** and cup **30** are supported upon a shelf **36** (Fig. 1) which is connected in any suitable manner upon the frame of knitting machine **10**. Bottle **28** is secured further by an encircling band **38** which is also fastened to knitting machine **10**.

Tubes **22** pass through and are secured in pipes **20** by welding (Figure 5) or in any other suitable manner. Each tube **22** has a metering opening **42** of predetermined size (Figs. 3–5) through which liquid from pipe **20** flows to fill tubes **22** to the desired level **44** above the opening as the fluid is withdrawn by the yarn strands feeding into the knitting mechanism. The outer ends of tubes **22** have replaceable stainless steel or porcelain eyelets **46** mounted therein which can be removed and replaced to facilitate threading of the yarn through the tubes. The openings through eyelets **46** are restricted in size to prevent loss of liquid by spraying as the yarn passes through the level of treating liquid in the tubes in the knitting operation.

The rounded edges of eyelets **46** present smooth long wearing replaceable surface over which the yarn may pass without injury to it or to the edges of tubes **22**.

The outer end of the outermost wetting pipe **20** is sealed closed as at **48**.

In operation the yarn strands passing through tubes **22** are completely submerged in the constant level of solution in the lower section of tubes **22** which is maintained by flow of liquid into the tubes through openings **42** which are of a size to meter the solution and maintain the level of the solution in the tubes constant as the yarn passes through the tubes to the knitting area in operation of the machine without return of the fluid with the main body of fluid in pipe **20**. The level of the liquid within tubes **22** is sufficient to wet the yarn to the desired extent and to properly soften the sizing on the multiple-filament strands. Since the flow of fluid through openings **42** is into tubes **22** only, comparatively no contamination of the main body of solution in pipe **20** occurs, and since the system is substantially closed substantially no evaporation occurs in operation of the device. Furthermore the solution flow into the tubes is metered so as to provide proper treatment without the drawing or spraying of solution from the tube ends over the adjacent machine parts, and the internal diameter of tubes **22** is such that the movement of yarn through the tubes keeps the tubes clean.

While my improved apparatus has been disclosed in separate connected units of a length to service each machine head, if desired it may be built into a single unit for a complete machine by extending pipe **20** throughout the length of the machine. Also for large machines the container **28** may be centrally disposed between tube units.

The solution in the feeder bottle **28**, being supplied to both sized and unsized nylon yarns through pipe **20** and U tubes **22** is compounded to provide adequate lubrication of the mono-filament yarn and wetting of the sized multi-filament yarn, with proper rust inhibiting protection. A typical composition which I have successfully used in combination in my improved treating apparatus, with the production of improved firmly locked stitches in the production of nylon hose, consists of 1% water soluble lubricant of the Ucons of the 50–HB series such as 50HB–260 or 50HB–600; 0.25% size wetting agent such as Sterox; and .04% rust inhibitor of the amine or sulphur compound type, and the remainder water. Ucons are polyalkylene glycols formed by reacting ethylene oxide with glycols to produce different chain lengths depending on the amount of ethylene oxide allowed to react. The numbers of the ucons represent different viscosities obtained from the different chain lengths of the compounds. Sterox is a polyoxyethylene ester formed by reacting ethylene oxide with a fatty acid ester. The composition of the solution will vary somewhat depending upon the constituents of the local water available, but may be readily adjusted in a manner that will be apparent to those skilled in the art to meet local water conditions.

In test operation of my invention in the manufacture of ladies' nylon hose, variations from head to head of a machine are not more than ¼" either way from average stocking length, the fabric on all hosiery examined was clear of "fish eyes" sleaziness, the stitch formation was above normal, and elasticity was below average due to firmer stitch formation. The spray present before my invention was applied and the resultant corrosion and gumming of parts was eliminated, and the need for frequent cleaning shut downs of the machine was eliminated.

To replace the strategic material, such as brass and stainless steel, used in form of Figures 1–5, the modifications shown in Figures 6 through 9 inclusive have been developed utilizing pipes **20** of laminated plastic tubing or of a molded or extruded plastic material and tubes **22** of glass.

The modification if Figures 6 and 7 disclose a treating device in which plastic pipe **20** and the glass tubes **22** are secured together by rubber grommets **50** substantially the shape of a keyhole in cross section. Grommet **50** has a

longitudinal opening **52** through which pipe **20** is forced and held in liquid tight relation by the grip of the rubber. A transverse opening **54** is provided in the lower portion of grommet **50** to support tube **22**. Opening **42** in this form of the invention is located in the upper surface of glass tube **22** and is positioned in alignment with openings **56** of pipe **20** and **58** of grommet **50** to allow proper flow of the treating liquid into tubes **22**.

The modified form of wetting device shown in Figures 8 and 9 employ a grommet **60** which has aligned tubular sleeves **62** integral therewith. The inner ends **64** of sleeves **62** fit into openings **66** of pipe **20** and tubes **22** are positioned within sleeves **62** forming a liquid tight connection and permitting free flow of the wetting solution from pipes **20** through opening **42** and into tubes **22**.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In combination with a knitting machine having a knitting mechanism and a plurality of yarn supply devices therefor, apparatus interposed between said supply devices and said knitting mechanism for simultaneously wetting and softening sized multiple filament yarn comprising a solution reservoir structure; a plurality of spaced curved wear resistant yarn treatment tubes extending through

and supported by said structure, each of said tubes being of a size to receive and guide a single strand of yarn from one of said yarn supply devices to said knitting mechanism; each of said tubes being provided with a single metering opening of such size as to permit passage of a predetermined amount of treatment solution from said solution reservoir structure into each of said tubes without permitting substantial circulation of the solution between said solution reservoir structure and said tubes, and means for supplying solution to said structure whereby solution may pass through said structure and the openings of said tubes into said tubes.

2. In combination with a knitting machine, apparatus for simultaneously wetting and softening sized yarn comprising a solution supply structure; a plurality of curved yarn treatment tubes each of a size to receive and guide a single strand of yarn through a predetermined quantity of treatment solution; means for securing said tubes to said structure in spaced relationship; means forming a metering passage permitting fluid communication between each of said tubes and said supply structure for directing the passage of treatment solution from said structure into each of said tubes without permitting substantial circulation of solution between said tubes and said supply structures.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,269,604	Heuer	June 18, 1918
1,776,529	Weinerth	Sept. 23, 1930
2,539,953	Hoffecker	Jan. 30, 1951