Aug. 13, 1929. W. N. GERE 1,724,015

METHOD OF SPOTTING YARN

Filed Nov. 3, 1925

Fig. 1.

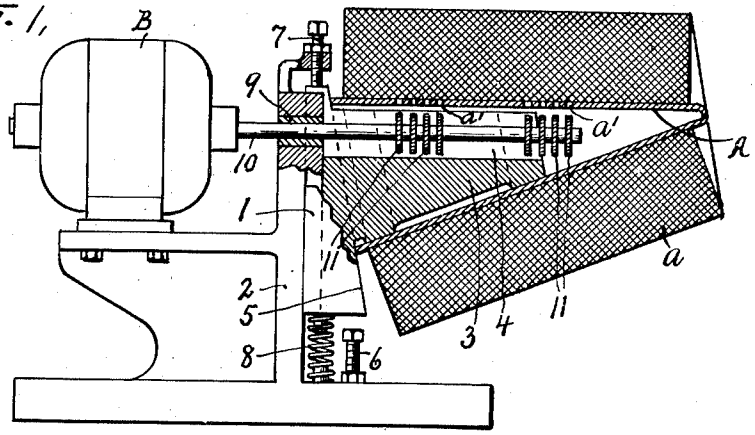


Fig. 2.

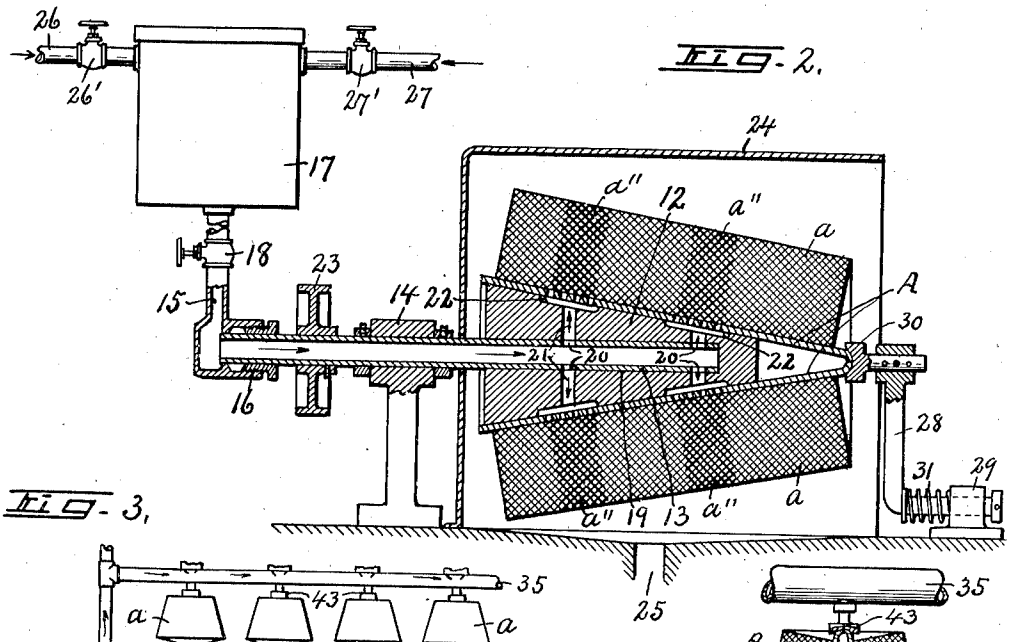


Fig. 3.

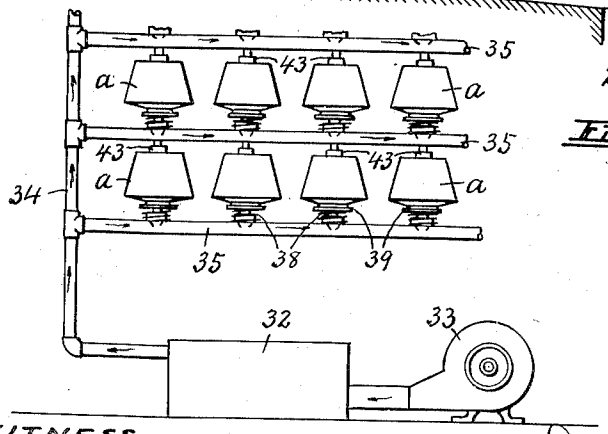
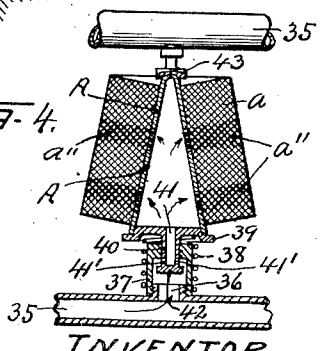


Fig. 4.



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UNITED STATES PATENT OFFICE.

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METHOD OF SPOTTING YARN.

Application filed November 3, 1925. Serial No. 66,533.

This invention relates to a method of coloring yarn in spots on the bobbin or cone so that when the yarn is knit into a garment the colored portions thereof will be more or less irregularly interspersed throughout the fabric for imparting thereto a mottled appearance somewhat similar to the best grades of woolen knit goods.

The cotton thread or other yarn is usually supplied to the knit goods manufacturers in the form of cones wound upon hollow conical cores or spools of relatively stiff cardboard or equivalent comparatively inexpensive material and the main object of the present invention is to provide a simple, expeditious, economical and highly efficient method of and apparatus for uniformly coloring the yarn in spots in the cone without removing any part thereof from the core or spool.

These paper cores upon which the yarn is wound are usually imperforate and open at their larger ends while the smaller ends closed primping the adjacent portions of the material across the intervening space and in carrying out the objects above stated it is necessary to first perforate the peripheral walls of the core at suitable spaced intervals within the length of the yarn cone after which a suitable coloring liquid is caused to pass through the perforations and registering portions of the yarn for coloring said portions, the colored yarn being then subjected to a color sizing and drying agent such as heated air in such manner as to retard the progress of the previous operations.

One of the objects is to rotate the perforated core with the yarn cone thereon at a speed sufficient to cause the coloring liquid which may be introduced into the interior of the cone to be thrown outwardly through the perforations and registering portions of the yarn by centrifugal force and thereby to obtain an efficient color spotting of the yarn under a comparatively lower pressure of the liquid entering the core.

A further object is to provide means whereby the colored cones may be dried and the color fixed immediately following the coloring operation.

Other objects and advantages of the method will be brought out in the following description.

In the drawings:

Figure 1 is a longitudinal sectional view of a device for perforating the core which together with the yarn cone is shown in operative position upon the perforating device showing also an electric motor for operating the perforating device.

Figure 2 is a sectional view of the device for coloring the yarn cone on the core.

Figure 3 is an elevation of a portion of a color fixing and drying device for the colored cones.

Figure 4 is an enlarged sectional view of one of the color fixing and cone drying devices shown in Figure 3.

The process or method for coloring the yarn in the cone comprises:—

First, perforating the peripheral walls of the core from the inside outwardly in such manner as to prevent the formation of burrs on the periphery and also to prevent the mutilation of the inner layers of yarn.

Second, projecting a coloring liquid from the interior through the perforated walls of the core and thence through the registering portions of the yarn on the core and simultaneously rotating the core with the yarn thereon to assist the passage of the coloring liquid through the perforated portions of the core and registering portions of the yarn by centrifugal force.

Third, placing the core with the previously colored yarn thereon upon a suitable drying nozzle and projecting an agent such as heated air from the interior through the perforated walls of the core and thence through the colored portions for quickly drying the same and fixing the color in the yarn.

The apparatus shown for carrying out this process comprises a bracket —1— slidable vertically upon a suitable support —2— and provided with a horizontally projecting tapered mandrel —3— having a longitudinally extending recess —4— in its upper side and open at the top.

The base portion of the bracket —1— extends some distance beyond the adjacent portion of the tapered mandrel —3— and is provided with an inclined face —5— disposed in a plane at right angles to the axis of the mandrel to form an abutment for the larger end of the hollow core —A— carrying the yarn cone —*a*—.

The base of the bracket —1— is slidable

vertically upon the adjacent portion of the support —2— between lower and upper adjustable limiting stops —6— and —7— on the support —2— and is yieldingly held against the upper stop —7— by a coiled spring —8—, Figure 1.

The recess —4— in the upper side of the mandrel —3— extends from end to end thereof in alignment with a bearing —9— on the support —2—.

A rotary shaft —10— is journaled in the bearing —9— and has one end extended into and through the recess —4— and provided with separate sets of axially spaced rotary cutters —11— of slightly less diameter than the transverse width of the slot or recess —4—, the outer end of said shaft being connected directly to the armature shaft of a motor —B— which is also mounted upon the support —3—.

The core —A— with the yarn cone —*a*— is placed by hand or otherwise around and upon the tapered mandrel —3— with its larger end face against the inclined abutment —5—, the periphery of the mandrel being made to correspond approximately to the interior diameter and taper of the portion of the core —A— which it is adapted to receive so that when the core with the yarn cone thereon is pressed upon the mandrel the upper portion of the core will normally lie directly over the adjacent open side of the recess —4— and will extend across and axially some distance beyond the upper edges of the separate sets of cutters —11—.

When the core with the yarn cone thereon is properly adjusted upon the mandrel —3—, the yarn cone and bracket —1— carrying the mandrel —3— are pressed downwardly against the action of the spring —8— to cause the upper edges of the cutters to cut through the overlying portions of the core to form the necessary perforations or slots therein until restrained by the engagement of the lower end of the bracket —1— with the lower stop —6— which is adjusted to limit the downward movement of the mandrel and cone thereon to just sufficient distance to cause the cutters to cut through the upper side of the core the thickness thereof by which operation the material cut away is carried into the recess —4— thereby avoiding the formation of burrs on the periphery of the core adjacent the openings and also preventing the mutilation of the inner layer of yarn adjacent the core.

Immediately following this operation the pressure upon the cone is relieved to allow the spring to return the mandrel with the cone thereon upwardly until limited by the stop —7— which is adjusted so as to prevent contact of the lower wall of the recess —4— with the cutters —11—.

The core with the yarn cone thereon may then be turned by hand about the axis of the mandrel —3— to present another imperforate portion of the core in the open upper side of the recess —4— following which the cone and mandrel may again be depressed against the action of the spring —8— to form other sets of openings in the core, these operations being usually repeated until several sets of openings have been formed in different portions of the core but, in some instances one row of apertures may be sufficient in which case a single operation only will be necessary.

As soon as the proper number of lines of perforations have been formed in the core —A—, said core with the yarn cone thereon will be removed and placed upon another mandrel —12—, Figure 2, forming a part of the color applying device.

This mandrel —12— is secured to one end of a horizontal tubular shaft —13— which is journaled intermediate its ends in a suitable bearing —14— and has its other end connected to a color supply pipe —15— through the medium of a gland —16— in which the adjacent end of the shaft is journaled.

The pipe —15— is connected to a superposed tank —17— containing the coloring liquid and from which said liquid is adapted to flow by gravity through the pipe —15— and thence into the tubular shaft —13—, the supply of coloring liquid being controlled by a valve —18— in the pipe —15—.

The pipe —13— extends axially into a central lengthwise socket —19— in the mandrel —12—, the greater length thereof and secured to the walls of said socket and is provided with radial openings —20— registering with similar radial passages —21— in the mandrel, said passages —20— and —21— being arranged in axially spaced relation to and some distance from the ends of the mandrel and communicate with axially elongated annular recesses —22— in the periphery of said mandrel.

The smaller end of the mandrel is closed to form a closure for the adjacent end of the tubular shaft —13— and thereby to prevent the passage of the coloring fluid therethrough and at the same time causing it to be deflected laterally and radially through the passages —20— and —21— into the recesses —22—.

The mandrel —12— is made to correspond to the taper and diameter of the interior of the core —A— while the radial passages —20— and —21— and annular grooves —22— are spaced to correspond to the spacing of the separate sets of openings —*a'*— in said core so that when the core with the yarn cone thereon is placed upon the mandrel —12— the apertures as —*a'*— of both sets will register with the corresponding annular grooves —22—.

It, therefore, follows that when the color-

ing liquid is permitted to flow from the supply tank —17— into the tubular shaft —13— it will also flow through the passages —20— and —21— into the annular grooves —22— and thence through the registering apertures —*a'*— and registering portions of the yarn cone —*a*—.

In order to assure a more even distribution of the coloring liquid through the particular portions or zones of the yarn registering with the apertures —*a'*— and annular grooves —22— means is provided for rotating the tubular shaft —13— and its mandrel —12— together with the core —A— and yarn cone —*a*— and for this purpose the shaft is provided with a pulley —23— adapted to be belted to any available source of power, not shown.

It is evident however that any other suitable means may be provided for effecting the rotation of the yarn cone —*a*— during the application of the coloring liquid thereto with the additional beneficial result that the centrifugal force due to a more or less rapid rotation of the cone will cause the coloring liquid to flow more directly and expeditiously through the restricted zones of the yarn.

A suitable housing —24— may be supported in any desired manner so as to extend the top end downwardly around the sides of the revolving cone —*a*— to receive and collect any excess coloring liquid which may be thrown off from the periphery of the cone during its rotation, said excess material being allowed to escape through an opening —25— at the bottom of the housing where it may be collected and returned to the tank —17— for reuse if desired.

The tank —17— is adapted to contain a limited quantity of the coloring liquid usually just sufficient for coloring one cone, but is provided with a supply pipe —26— adapted to be connected to any source of supply for replenishing the tank —17— when empty, said pipe being provided with a valve —26'— for controlling said supply.

In some instances, where it is impracticable to elevate the tank —17— to give the proper head pressure for the coloring fluid to the cone, the tank —17— may be connected by a pipe —27— to an air pressure pump or other source of pressure supply which is controlled by a valve —27'—.

When the mandrel —12— with the yarn cone thereon is revolved at a relatively high speed, it is necessary to provide means for holding the cone upon the mandrel and for this purpose is provided a crank arm —28— having one end journaled in a bracket —29— and its other end provided with a head —30— having a concave face adapted to engage the closed small end of the tapered core —A— as shown in Figure 2, said arm being spring pressed toward the core by means of a coiled spring —31— to assure the retention of the head —30— against the small end of the core during the coloring operation.

As soon as this latter operation is completed the arm —28— may be moved axially in the bearing —29— against the action of the spring —31— and then turned about its axis out of the path of the cone to permit the latter to be withdrawn from the mandrel —12—.

Immediately following this coloring operation the cores —A— with the partially colored cones —*a*— thereon are subjected to a current of heated air or its equivalent for drying the colored portions of the yarn and also for fixing the colors.

The time required for perforating the cores and for partially coloring the yarn cones is negligible requiring but a few seconds for each operation while the time required for drying and color fixing is necessarily more prolonged and in order that the process may be carried on continuously or without interruption of the perforating and coloring operations it is necessary to provide a considerable number of similar drying units one for each colored cone and at the same time to provide means for supplying the heating and color fixing agent to all of said units and for this purpose is provided an air heater —32— through which air may be forcibly circulated by means of a pump —33—, said heater being connected to a heater pipe —34— having a series of horizontally extending branch pipes —35— in vertically spaced relation sufficient to receive the cones endwise between them.

Each branch pipe is provided with a series of discharge openings —36— in their upper sides, as shown in Figure 4, each discharge opening being surrounded by an upwardly extending tubular nipple —37—.

Surrounding each nipple is a coiled spring —38— having its lower end resting upon the adjacent pipe —35— and its open end supporting a yielding platform —39— having a central stem —40— extending downwardly through a guide opening in the top of the nipple —37—.

Each platform —39— is provided with a central passage —41— extending therethrough the bottom of the stem which is provided near its lower end with lateral branch passages —41'— adapted to communicate with the interior of the nipple —37— and outlet passage —36— of the pipe —35— when the platform is depressed against the action of the spring —38—.

The lower end of the stem —40— is slightly enlarged to form a limiting stop cooperating with the top of the nipple —37— for limiting the upward movement of the

platform —39— by the spring —38— but is of less diameter than the interior of said nipple to allow the passage of air around the same end through the central passage —41— when the platform is depressed.

The platform —39— is of greater diameter than that of the larger end of the tapered core —A— which after being withdrawn from the color supplying mandrel —12— is placed in an upright position with its larger end resting upon the platform —39— with sufficient pressure to depress said platform against the action of the spring —38— and to allow the upper or smaller end of the core to be brought into engagement with a stationary stop —43— on the underside of the next superposed pipe —35—.

As the colored cones are placed upon their respective platforms —39— for drying purposes the depression of said platform opens the ports —41'— to their respective air supply nozzles —36— but in the absence of the cones upon the platforms the communication between their passages —41'— and corresponding nozzles —36— will be cut off by the registration of the apertures —41'— with the top portions of the nipples —37—.

When the colored cones are placed in operative position upon their respective platforms the heated air from the heater —32— will pass into the pipes —34— and —35— and thence through the discharge nozzle —36— and open passages —41'— into the interior of the tapered cores and thence through the apertures —*a'*— and previously colored registering portions of the yarn cone —*a*— to thoroughly dry the previously moistened zones and adjacent portions of the cones and also to fix the color in the yarn.

The perforating device which has been described herein and the drying apparatus which has been described form respectively the subject matter of my divisional application filed June 13, 1929, Serial No. 370,669, and my continuing application filed June 13, 1929, Serial No. 370,670, and are, therefore, not claimed in the present application.

I claim:

1. The hereindescribed process of coloring portions of a yarn cone consisting in projecting a coloring liquid from the interior outwardly to the exterior of the cone, and revolving the cone during the application of the coloring fluid under sufficient speed to assist the passage of the coloring fluid through the cone by centrifugal force.

2. Coloring a hollow mass of yarn in spots comprising rotating the hollow mass and simultaneously applying a coloring fluid to a restricted area of the interior of the mass to be thrown outwardly through said mass by centrifugal force.

3. Random coloring yarn wound in the form of a hollow cone comprising applying a coloring fluid to a limited area of the interior of the cone and rotating the cone about its axis at sufficient speed to cause the coloring fluid to be thrown outwardly to the periphery of the cone by centrifugal force.

4. Random coloring yarn wound in the form of a hollow cone comprising applying a coloring fluid to a limited area of the interior of the cone and rotating the cone about its axis at sufficient speed to cause the coloring fluid to be thrown outwardly to the periphery of the cone by centrifugal force, and forcing air through the portions of the cone registering with said limited area for fixing the color of the dyed portions of the yarn.

5. The method of spotting yarn, which comprises supplying a dyeing liquid to a limited zone of the inner surface of a wound mass of yarn, while rotating the wound mass about an axis lying within its inner surface so rapidly that the liquid is forced by centrifugal force to pass into the part of the mass lying radially outward from this zone of its inner surface, leaving the remainder of the mass uncolored.

6. The method of spotting yarn, which comprises supplying a dyeing liquid to separated zones of the inner surface of a wound mass of the yarn while rotating the mass about its axis so rapidly that the liquid is forced by centrifugal force to pass into the zones of the mass lying radially outward from said zones of its core leaving a part of the mass between its said zones uncolored.

7. The method of spotting yarn, which comprises rotating a wound mass of the yarn about its axis while supplying liquid to a predetermined zone of the inner surface of the mass at such rate that the liquid is forced by centrifugal force into the zone of the mass lying radially outward from said zone of its inner surface before the liquid can spread over the inner surface of the mass.

8. The method of spotting yarn wound on a perforated core which comprises placing the mass with the axis of its core substantially horizontal and rotating it about its axis while supplying liquid to a predetermined zone of the inner surface of the core at such rate that the liquid is forced by centrifugal force through the perforations of the core and into the zone of the mass lying radially outward from said zone of its core before the liquid can spread over the inner surface of the core.

In witness whereof I have hereunto set my hand this 20th day of October, 1925.

WARD N. GERE