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1,572,148

METHOD OF MANUFACTURING COLORED YARNS

Filed August 29, 1924

2 Sheets-Sheet 1

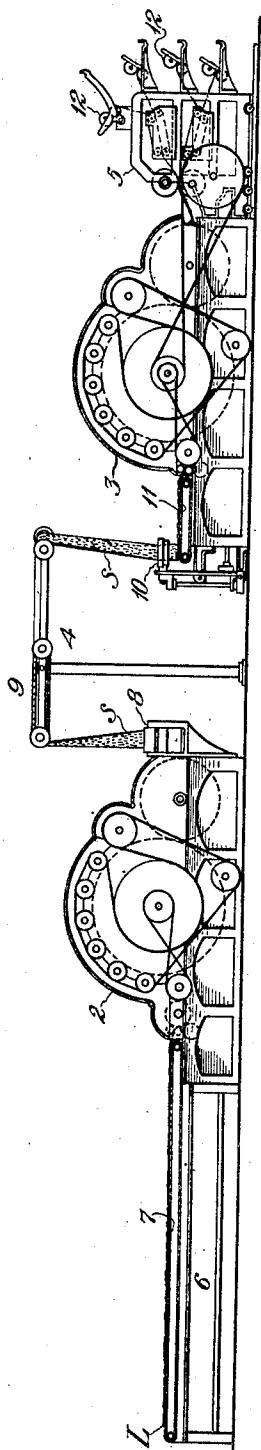


Fig. 1.

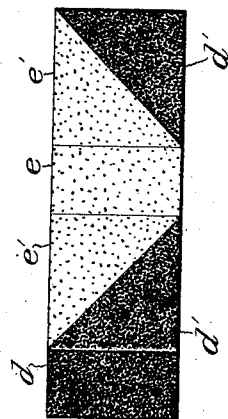


Fig. 3.

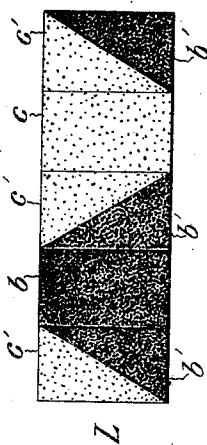


Fig. 2.

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2 Sheets-Sheet 2



Fig. 4.

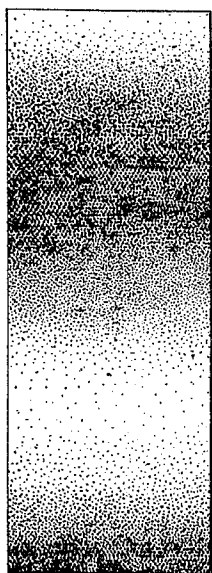


Fig. 5.

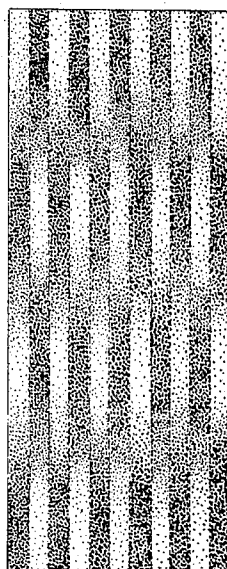


Fig. 6.

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UNITED STATES PATENT OFFICE.

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METHOD OF MANUFACTURING COLORED YARNS.

Application filed August 29, 1924. Serial No. 734,882.

To all whom it may concern:

Be it known that I, WILLIAM J. KERWIN, Jr., a citizen of the United States, residing at New Bedford, in the county of Bristol, State of Massachusetts, have invented certain new and useful Improvements in Methods of Manufacturing Colored Yarns, of which the following is a specification.

This invention relates to an improved method of manufacturing colored yarns to produce shaded or ombré effects, or varicolored tints and hues therein.

A particular object of the invention is to produce yarns of this character from fibers dyed in the raw stock as distinguished from the usual method or process of dyeing the yarn after it has been spun.

A further object of the invention is to produce shaded or varicolored yarns in which the colors are fast and permanent.

Another object of the invention is to produce yarns of the character specified in which the colors are more uniformly distributed and accurately graduated without breaks or streaks therein.

Still further objects of the invention are to simplify the manufacturing process and lessen the labor and time required therefor, whereby to economize in the cost of manufacture.

The following specification, which is illustrated by the accompanying drawings, describes a preferred method of carrying out the invention by way of example only, it being understood that the improved process is capable of variation in the steps, methods and apparatus employed as will hereinafter more fully appear.

In the drawings:

Fig. 1 is a side elevation of "breaker" and "finisher" carding machines of conventional type arranged in tandem and fitted for use with my improved method of manufacture to convert the fiber from lap to roving;

Fig. 2 is a plan view of a combination lap of dyed fiber showing one method of apportioning it in sections of contrasting shades or colors as it is fed to the card or other processing machine;

Fig. 3 is a similar view illustrating a slightly different division of the particolored lap prepared for feeding into the card or other processing machine;

Fig. 4 is a view of a bobbin of yarn showing the shaded or variegated coloring thereof;

Fig. 5 illustrates the shaded or ombré effect which is produced in a fabric woven from the yarn; and

Fig. 6 shows another example of fabric having ombré stripes produced by shaded yarns.

Referring to Fig. 1 of the drawings, 2 designates a breaker card of usual type, and 3 a finisher card arranged in tandem therewith. Between the two cards is a cross feeding mechanism 4, commonly called a scotch feeder, for transferring the sliver from the breaker to the finisher, and at the doffer end of the finisher is a condenser 5. These several units of machinery may be of any suitable construction, the cards being preferably of the full roller type as designed for operation under what is termed the cotton waste or woolen system.

In adapting the above described machines to the purpose of the present invention it is only necessary to make a slight change in the construction of the breaker card. This alteration consists in extending the feed-table 6 to several times its usual length whereby to provide more space for apportioning and laying out the sections of different colored laps on the feed lattice or conveyor 7.

The scotch feeder 4 comprises means for delivering the sliver *s* from the doffer 8 of the breaker card 2 to an elevated conveyor or lattice 9 which transfers it to a traversing carriage 10 acting to lay it crosswise of the feeder lattice 11 at the back of the finisher card 3.

The condenser 5 employed with the finisher card may be of any suitable type, a tape condenser being illustrated in Fig. 1 of the drawings as the preferred form. The function of this unit of machinery is to divide the web from the finisher card doffer into strips which are carried along by tapes to the condenser rolls and rubbed into strands of roving, issuing in a large number of ends which are wound onto jack spools 12. From the condenser 5 the roving is transferred to the spinning machines to be spun into yarn. For the spinning process I may employ ring spinning frames or mules, but as such machines are well known in the art and have

no particular function related to the present method of manufacture it is unnecessary to herein illustrate or describe the same.

A preferred arrangement of machinery for use with my improved method of manufacture having been above described the method of carrying out the steps of the process will next be explained. The novel and essential feature of the present invention consists in using laps composed of fibers dyed in different shades or colors and so dividing, apportioning and combining irregular sections of two or more laps of different shades or colors as to cause one shade to gradually merge into another in the roving, or one color to shade into another tint; or, by combining complementary colors, to produce entirely different tints or hues and variegated effects in the roving and final yarn, as hereinafter more fully explained.

I may use any number of differently colored laps and combine them in varying proportions, but it will be sufficient for an understanding of the invention to explain the simplest method with the use of laps having the fibers dyed in two contrasting shades. For example, to produce a yarn in ombré effects, shading from dark to light and back to dark again, I divide, apportion and combine the two differently colored laps as illustrated graphically in Fig. 2. The dark-stippled sections *b* may represent a lap with the fibers dyed red, blue, green, brown, or any other solid color, while the light-stippled portions *c* may indicate sections of another lap having the stock dyed in a lighter shade of the same color. In carrying out the first step in the process I cut the lap across its width to form rectangular sections and then divide certain of these strips into triangular sections by cutting them across on the diagonal. The lap may be cut manually with shears or divided with a suitable mechanically-operated cutter, the former method having been found convenient in actual mill practice.

After the laps have been cut up into sections in the manner above described the strips of different shades or colors are apportioned and arranged on the lattice or conveyor 7 of the feed table 6 as next explained. To produce a roving, and ultimately a yarn, having the dark shade merging into the light, and the light shading into dark again, a rectangular section *b* of dark colored lap is laid out on the lattice, and contiguous thereto and at either side thereof are placed two triangular sections *b'* of dark lap, with the diagonal edges of these sections preferably extending in opposite directions. I then match a triangular section *c'* of light colored lap with each triangle *b'* of dark lap so that their diagonal edges are contiguous and abutting as shown in Fig. 2. I next apply a rectangular strip

or section *c* of light colored lap and follow this with a triangular section *c'* of the same shade or color abutting its side and corresponding to the previously laid light section *c'* on the opposite side. A triangular section *b'* of dark colored lap is next added to fill out the space across the combination or parti-colored lap *L*, and then another full section of dark lap and so on in regular sequence. The conveyor apron or lattice 7 feeds the lap *L* to the rolls and cylinders of the carding machine 2 and as the feed is relatively slow the operator may place the sections of lap in place on the lattice during its continuous travel without necessitating the stopping of the machine. In some cases two or more thicknesses of lap may be used in the feed to the card, in accordance with the character of the yarn to be produced, and the laps may be doubled before cutting if desired, but it is to be understood that in any event the individual overlying sections on the feed lattice are of the same shade or color.

As the combination or parti-colored lap *L* is passed through the breaker card 2 it is converted into a fine web and delivered by the doffer 8 in the form of sliver *s*, thence passing over the elevated lattice 9 to the traversing carriage 10 of the scotch feeder 4. The carriage 10 traverses the sliver back and forth to lay it in overlapping lengths or folds on the feed lattice 11 at the back of the finisher card 3. It will be understood that as the lap is converted into sliver its fibers are drafted so that it becomes very much elongated and attenuated, but nevertheless the relative disposition of the differently colored fibers remains substantially the same. Consequently, as the sliver issues from the breaker card 2 its fibers will exhibit a coloring or shading in the same proportion as that of the different colored sections going into the makeup of the lap. In other words, a certain proportion or length of sliver will be constituted of dark fibers from the rectangular solid colored sections *b* of the lap *L*, while other portions will contain the light colored fibers from the light sections *c* of the lap. Alternating with and intervening between the dark and light lengths of sliver will be sections in which the dark fibers and light fibers are combined in graduated proportion. That is to say, the dark fibers of the sliver will gradually diminish and the light fibers increase in volume so that the color flows from dark to light and back to dark again in long tapering sections. Now as the sliver *s* is deposited on the lattice 11 at the back of the finisher card 3 it is doubled back and forth by the scotch feed, but the length of the folds being relatively slight as compared to the greatly elongated portions of dark, light and graduated sections of con-

trasting colored fibers, this cross feed or doubling of the sliver has no appreciable effect on the intermingling of the fibers in the roving or ultimate yarn. That is to say, it will not affect the uniformity of appearance of the graduated shading from one tint or color to another in the final product.

As the sliver passes through the finisher card 3 its fibers are more thoroughly intermingled so that as they issue in a web at the doffer the gradations in the color are very regular and uniform with no breaks or streaks showing. The finisher doffer delivers the web to the condenser 5 where it is divided into strips by grooved rolls and fed on tapes to the condenser rolls which rub it into roving. The roving is wound onto jack spools 12 with a large number of ends up and may be spun into yarn directly therefrom by any preferred process.

As the roving issues from the condenser rolls it exhibits colors or shades corresponding to the colored sections introduced into the lap. With the bi-colored lap having sections apportioned and combined as shown in Fig. 2 and above described, the resultant roving from the carding processes will have a relatively long section of dark color, possibly several hundred yards, as produced by the rectangular solid colored section *b* of the lap, which as has been explained, has its fibers greatly drawn out in the sliver. From the dark section the color will shade very gradually throughout a corresponding length to a light section, also of the same length, and then shade back throughout an equal length to the dark again.

The effect produced in the final yarn is substantially the same, as illustrated graphically in Fig. 4. In this view the finished yarn is shown as wound on a filling bobbin, it being obviously impractical to herein illustrate the attenuated strand of a length sufficient to exhibit the gradations from one shade to another. Fig. 4 represents the yarn at the ends of the bobbin B as colored dark, while the yarn at the center of the bobbin is light, and in the intervening portions the colors shade gradually from one to the other. It is to be understood, however, that the disposition of the yarn on the bobbin is an arbitrary matter and may be varied as required; for instance, the light colored portion may be at one end of the bobbin and the dark at the other, or the light at both ends and the dark at the center, or the dark at both ends and the light in the center. This is regulated in the spinning by starting and stopping the machines at intervals in proportion to the yardage produced. When the yarn is being prepared for use in double shuttle looms certain of the bobbins may have the light colored yarn at their ends and others the dark yarn at the ends to produce the de-

sired effects on opposite faces of the fabric into which the yarn is woven.

In Fig. 3 I have illustrated a slightly modified method of apportioning the colored fibers in the lap, the rectangular sections *d* and *e* being shorter and the triangular sections *d'* and *e'* being relatively longer with respect to the selvage or longitudinal edge of the lap. With this division and apportionment the dark and light sections of the yarn will be of less length and the intervening shaded portions more extended, so that the change from one shade to the other is more gradual. Other modifications may be made in the manner of cutting and apportioning the colored sections of the lap if desired and likewise the shape or outline of the sections may be varied. For instance, the lap may be cut on curves with circular boundary lines dividing the sections, or in diamond or other rhombic shapes proportioned to match each other when laid out in alinement. In practice, however, I have determined that the method of dividing and shaping the sections as illustrated in Figs. 2 and 3 gives the most satisfactory results.

It is further to be understood that the invention is not limited to any particular combination or proportion of shades or colors in the fibers to produce certain effects in the yarn. While I have herein described the process as being carried out to produce a yarn shading from dark to light and back to dark again, it will be apparent that more than one color may be employed and a great variety of effects may be produced within the scope and purview of the invention. For example, one color may be blended into another of entirely different hue, or one shade combined with another of the same color. I may also blend complementary colors in such manner and with such effect that several different colors are produced from the primary tints. For example, I may blend blue and orange to produce intervening sections shading into green, and with other colors in the fiber I may make combinations resulting in all the tints of the spectrum, veritably a rainbow hued yarn.

Figs. 5 and 6 illustrate two examples of fabric in ombré effects as woven from shaded yarns. In Fig. 5 a strip of cloth C is represented as having dark sections shading into light, and back to dark again, as produced by weaving with the ombré or shaded filling yarn as represented in Fig. 4.

In Fig. 6 the fabric D is woven with ombré stripes, so-called. These stripes may be of the same color with their dark and light shades alternating across the width of the cloth; or alternate strips may be of contrasting colors as produced in a double shuttle loom, in which case the reverse face of the fabric is of the same pattern with the colors of the stripes alternating. Many

other more complicated patterns and designs may be produced, for instance by jacquard weaving, and the number and variety is practically unlimited. Very beautiful effects are possible in weaves produced from yarns colored as described and my invention has a wide application in the art. It may be employed for cotton, silk and woolen yarns or yarns of any other fiber and is not limited as to the character of the raw stock entering thereinto.

Heretofore in manufacturing colored yarns in shaded or ombré effects the usual practice has been to dye the yarn after it is spun. To produce the shaded effect the yarn is passed through a bath of dye liquor in which the color is alternately made strong and weak by concentration and dilution. This process is generally manual and being slow and laborious limits production, besides requiring great skill and expertness on the part of the operator. Furthermore, uniform results are not obtainable in commercial practice because the strength of the dye cannot be controlled accurately within the required limits and therefore the effects produced are more or less haphazard and irregular. When the yarns dyed by this process are woven into fabrics the colors show in streaks or lines rather than with a gradual merging or gradation from one shade or color to another. Moreover, with this previously used process the dye is not easily fixed on the yarn and therefore the colors are not fast or permanent, but will fade when exposed to light or subjected to washing. With my present improved process I not only produce yarns in fast colors, but the coloring and shading is more accurately and uniformly disposed and graduated so that when the yarn is woven into the goods practically no streaks or irregular places appear. As a further advantage, my present improved process may be carried out without skilled labor and with an economy in time which results in a material saving in the cost of manufacture.

While I have herein described my improved method of manufacture as employed in connection with machinery of a certain type it is to be understood that the invention is not limited in this respect, as other apparatus may be used and the steps of the process varied as desired. That is to say, the colored fibers may be apportioned and combined in the lap prior to other processes besides carding. For example, the preliminary steps of the improved process may be carried out on the finisher picker or scutcher. This unit of machinery is employed for forming laps for the cards and takes the breaker picker laps when used as an intermediate and intermediate laps when used as a finisher. The laps from the breaker picker are usually doubled four laps up at

the back of the finisher and these laps may be cut into sections and apportioned in accordance with a predetermined coloring scheme. With this method the parti-colored laps from the finisher picker would then feed directly to the breaker card without further cutting or dividing into sections. Other methods could also be employed as may suggest themselves to those skilled in the art.

I am aware that it is old in the art to combine fibers of different shades or colors in the lap to produce mixtures in the final yarn. Heretofore, however, where two or more shades or colors have been combined in the lap such shades or colors have been mixed heterogeneously without any definite gradation or proportioning to produce sections of the yarn of distinguishing character. In other words, the yarn produced has a uniform mixture or intermingling of the differently colored fibers from beginning to end without shades or gradations as effected by my improved method of manufacture. It is my belief that the herein described method of apportioning and combining the fibers in the lap to produce a yarn having definite sections of contrasting shades or colors is entirely novel and that the graduated apportioning of the fibers with one shade or color merging into another in the intermediate sections is also new in the art, and therefore I claim these features broadly.

What I claim is:

1. An improved method of manufacturing colored yarns consisting in providing a parti-colored lap composed of tapering sections of contrasting colors or shades disposed in alternate relation progressively along the lap; converting the lap into roving; and spinning the roving into yarn.

2. An improved method of manufacturing colored yarns comprising the following steps: first, dividing a plurality of differently colored laps into sections; second, placing the sections in contiguous relation with one color adjacent a contrasting color; third, converting the lap into roving and finally spinning the roving into yarn.

3. An improved method of manufacturing colored yarns consisting in combining fibers of different shades or colors in the lap with the amount of fiber of one shade or color graduated in opposite proportion to the amount of fiber of a contrasting shade or color disposed alongside thereof longitudinally of the lap, converting the lap into roving with the fibers of different color having the same relative disposition, and finally spinning the roving into yarn.

4. An improved method of manufacturing colored yarns in shaded or ombré effects consisting in dividing a plurality of differently colored laps into complementary sections.

arranging the sections with contrasting colors alternating and with a tapering section of one color combined with a correspondingly tapering section of another color, converting the lap into roving, and spinning the roving into yarn.

5 5. That method of manufacturing yarns in shaded or ombré effects which consists in employing two or more laps having their
10 fibers dyed in different shades or colors, dividing the laps into sections of diminishing and increasing area cut to complementary shapes, arranging the sections in series with the colors alternating and with a narrow
15 ing end of the section of one shade or color matched with a gradually widening section of another shade or color, converting the lap into roving, and spinning the roving into yarn.

20 6. That method of manufacturing colored yarns which consists in dividing a plurality of laps composed of fibers of different shades or colors to produce rectangular and triangular sections thereof, arranging the
25 sections in a parti-colored lap having rectangular sections of one shade or color

bounded by triangular sections of the same shade or color, and alternating rectangular sections of a different shade or color bounded by triangular sections of the same shade 30 or color which are matched with the triangular sections of the other shade or color to fill the space across the lap, converting the continuous parti-colored lap so produced into roving, and spinning the roving into 35 yarn.

7. An improved method of manufacturing yarns to produce alternating sections of contrasting shades or colors therein, consisting in forming a lap from fibers dyed in different shades or colors apportioned in sections 40 of diminishing and increasing area and complementary shapes along its length, carding the parti-colored lap to convert it into sliver having substantially the same 45 relative apportionment of the colored fibers, carding the sliver and converting it into roving, and finally spinning the roving into yarn.

In testimony whereof I affix my signature.

WILLIAM J. KERWIN, JR.