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METHOD AND APPARATUS FOR DRAWING-FRAME BLENDING OF SLIVERS IN
THE PREPARATION OF YARN COMPOSED OF DIFFERENT

LENGTHS OF FIBERS
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FIG. 1

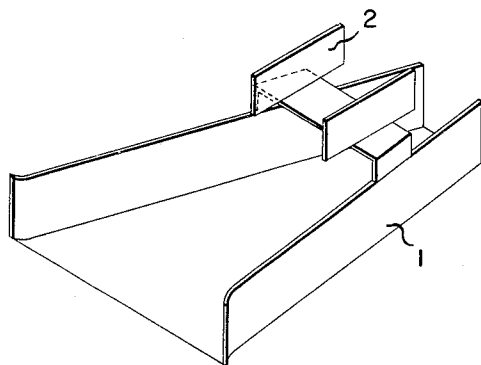
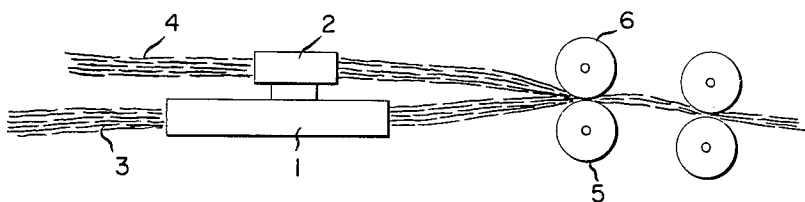


FIG. 2



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METHOD AND APPARATUS FOR DRAWING-FRAME BLENDING OF SLIVERS IN THE PREPARATION OF YARN COMPOSED OF DIFFERENT LENGTHS OF FIBERS

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2 Claims. (Cl. 19—243)

This invention relates to an improved method and apparatus for drawing-frame blending of different kinds of fibers to obtain a more uniform distribution of these fibers throughout the subsequent yarn, and is more particularly concerned with blending natural fibers with synthetic staple fibers.

With the recent developments in the textile industry, the demand for improved techniques in blending different kinds of fibers, for example, natural fibers and synthetic fibers, has correspondingly increased. In the spinning processes involving such blends, the fibers have been mixed at various stages of the processes ranging from opening, picking, carding, or drafting. The most economical method for this mixing is the sliver mixing process on a drawing frame.

In the conventional drawing-frame processes used heretofore for mixing slivers of different kinds of fibers, the slivers of different fibers are arranged in a single layer, side by side and parallel, fed to the drawing frame, and drafted and condensed into a single sliver for processing into yarn. It is inherent in this process that a sliver of blended fibers is produced in a condition wherein the different kinds of fibers are segregated into respective regions corresponding to the arrangement of slivers fed to the drawing frame. The distribution of the fibers and the cross-section of the sliver is in a pattern of relatively large masses of segregated fibers and presents considerable difficulty in subsequent dyeing procedures. Noda, in U.S. Patent No. 3,067,471, issued Dec. 11, 1962, describes the problem and teaches a method for preparing very thin webs of each fiber by drafting each fiber independently and combining the thin webs in laminar juxtaposition before condensing the combined web to form a sliver of the blended fibers. This method requires independent drawing frames for each fiber, and the processing of very thin webs also presents difficulties.

Another problem associated with the drawing-frame blending of two different kinds of fibers, especially fibers of different lengths, has been the loss of control associated with the drafting of the two kinds of fibers when the draft rolls have been set to accommodate the longer length fiber. In the side-by-side arrangements of slivers of different length fibers, considerable tension must be exerted on the longer fibers between drafting rolls in order to compensate or correct for the sag of the shorter fiber sliver between the same rolls.

It is an object of this invention to provide a method of blending two or more different fibers whereby blended slivers of superior blend quality may be produced. A further object is to provide such a method of blending which improves drafting, reduces processing tensions, and decreases waste in drawing. A still further object is to provide apparatus suitable for use with conventional drawing frames for practicing the method.

In accordance with this invention a method of intimately blending two or more different types of fibers is provided which uses conventional drawing-frame apparatus with only the addition of a simple sliver guiding attachment on the back of the drawing frame. The attachment, which is readily fabricated of sheet metal, has a lower guide surface with a flat bottom and upright sides that partially

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converge in the direction of sliver travel from the feed to the back drafting rolls of the drawing frame. An upper guide surface having a flat bottom and upright, substantially parallel sides is mounted on the lower guide surface with the respective bottoms substantially parallel and spaced apart. The sides of the upper guide are parallel to the direction of sliver travel and are preferably spaced more closely together than the exit end of the lower guide surface. Slivers of one type of fiber (C) are fed through the upper guide and slivers of a different type of fiber (D) are fed through the lower guide to be converged into a compact layer which acts as a carrying apron for the fiber (C) slivers during drafting.

The details of the invention will be more clearly apparent by reference to the following drawings in which:

FIGURE 1 is a perspective view of the blending attachment and FIGURE 2 is a side elevation showing the manner in which the slivers to be combined are guided into the drafting rolls.

The blending attachment of the invention as illustrated in FIGURES 1 and 2 comprises two guide surfaces 1 and 2, arranged one over the other, through which the slivers 3 and 4 of the various fibers are conducted to back rolls 5 and 6 of a conventional drawing frame. The lower guide surface 1 has sides which partially converge in the direction of the sliver travel to condense a number of ends of sliver 3 of one of the fibers into a compact layer of parallel slivers at the back drafting rolls. The top guide surface 2 is essentially straight sided or partially flared in order to conduct several ends of sliver 4 of a second fiber in parallel relationship without condensing this sliver and to deposit the sliver of the second fiber onto the top surface of the first slivers. Preferably, the longer-fiber sliver is placed in the bottom or converging guide surface. The parallel slivers are combined in laminar juxtaposition and are led directly to the back rolls of a drawing frame. The drawing frame is adjusted according to known procedures to accommodate the fiber of longer length. The longer length fiber is drafted in a conventional manner, and the shorter length fiber is simultaneously drafted by the top rolls, the longer length fiber acting as a drafting apron.

The invention is illustrated in the example for blending cotton with polyethylene terephthalate fibers, and the cotton fibers are shorter than the polyester fibers. However, the invention is applicable to preparing blends of two or more types of fibers in general, e.g., cotton, rayon or cellulose acetate cellulosic fibers, wool or other natural fibers, and polyester, nylon, acrylic, spandex or other synthetic staple fibers.

Example

A sheet-metal blending attachment was constructed as illustrated in FIGURE 1 with a length of 4½ inches for the lower guide surface and a 2¼ inch length for the upper guide surface. Each guide surface was 1 inch in height. The lower guide surface partially converged in the direction of the sliver travel from a width of 5¼ inches to a width of 2½ inches. The upper guide surface had parallel sides 1⅞ inches apart. The leading edge of both guides had a ¼-inch radial flare. The attachment was used to combine cotton and polyethylene terephthalate staple. Through the lower guide surface were led 5 ends of 55-grain sliver of 1½ inch polyester staple. Three ends of 52-grain cotton sliver of 1½ inch staple length were led through the upper guide surface. The laminated slivers were delivered to the back rolls of a Saco-Lowell drawing frame at a speed of 142 feet per minute to produce about a 50-grain sliver blend of approximately 65% polyester fiber and 35% cotton.

For comparison, sliver of the above description was arranged in side-by-side relationship, alternating the ends

of polyester staple and cotton as often as possible. This arrangement of side-by-side slivers was drawn under the same conditions as above, and the drawn sliver evenness was measured by a Uster tester. The sliver blend made with the described blending attachment had a coefficient of variation of 2.9%, whereas the comparison sliver made by drawing the side-by-side arrangement of different slivers had a coefficient of variation of 3.8%. The coefficient of variation is defined as the ratio of the standard deviation to the mean. The Uster evenness tester is described by A. Hasler and E. Honegger in the article entitled "Yarn Evenness and its Determination," published in the Textile Research Journal, January 1954, pages 73-85.

"Clearer" waste was collected for the same period of time while using each method. It was noted that the use of the blending attachment reduced the amount of waste accumulated by about 50%.

Sliver prepared by each method of blending was processed into yarn and woven into fabrics of identical construction. Both fabrics were cross-dyed in the same bath, leaving the polyester fiber white and dyeing only the cotton. Inspection of the dyed fabrics showed that fabric containing yarn made from the side-by-side blending method contained about 3 filling streaks per foot of yarn due to uneven fiber blending. The fabric made by the process of this invention showed no streaks.

It is apparent that the dimensions of the blending attachment will vary depending upon the number and size of slivers of each fiber to be combined. The most important consideration is the size of the discharge opening of the lower guide surface. This opening should easily accommodate the slivers to be conducted through the lower guide surface but should form a sufficiently compact assembly to prevent any one of the slivers of the top group from falling into the plane of the lower group of slivers.

The width of the opening should not exceed the width of an assembly formed by laying the bottom slivers side-by-side in a single plane with the slivers closely adjacent and parallel. It is not necessary for the slivers conducted through the top guide to be arranged in such close relationship, although it is preferred to have the width of the group of top slivers narrower than the width of the slivers in the bottom guide surface.

The method of blending on the drawing frame by the use of the above-described blending attachment is useful in the preparation of blended yarns consisting of two or more different staples. It is particularly useful for blending staples of different lengths in a single drafting; it overcomes a continuing problem for which a satisfactory solution had not been provided even by the use of complicated spinning systems. The best uniformity of blends has long been achieved, until the present invention, by the mixing of the fibers as early as possible in the process of spinning. It is most surprising, therefore, to find that yarns of improved uniformity, evenness, and with lower waste can be obtained by the method and means of this

invention, by the proper arrangement of slivers of different fibers as delivered to the drawing frame.

While particular embodiments of the invention have been described, it will, of course, be understood that the invention is not to be limited thereto, since many modifications may be made and it is contemplated, therefore, by the appended claims to cover all such modifications that fall within the true spirit and scope of this invention.

Since many different embodiments of the invention may be made without departing from the spirit and scope thereof, it is to be understood that the invention is not limited by the specific illustrations except to the extent defined in the following claims.

I claim:

1. In the drawing-frame process of drafting a plurality of parallel slivers and condensing the slivers into a single sliver, the improved method of feeding the slivers to the back rolls of the drawing frame for blending several slivers of fibers (C) with a greater number of slivers of fibers (D) of longer fiber length than fibers (C) which comprises conducting the uncondensed slivers of fibers (C) in parallel relationship to said back rolls, condensing the slivers of fibers (D) into a flat compact layer of parallel slivers to form a drafting apron for fibers (C) and conducting said layer to the back rolls beneath the slivers of fiber (C) to combine the two types of slivers in laminar juxtaposition with the slivers of fiber (C) entirely on top of the sliver layer of fibers (D), and feeding the combination into the drawing-frame for drafting the slivers into a single sliver.

2. In drawing-frame apparatus for drafting and condensing fibers into sliver, the apparatus including separately driven back and front drafting rolls and means for feeding slivers of fibers to the back drafting rolls, the improvement of sliver guiding surface having a horizontal bottom and vertical sides, the sides converging in the direction of sliver travel from a width of about 5 inches to a width of about 2½ inches to condense a plurality of slivers into a compact layer of parallel slivers feeding to said back rolls, and an upper guide surface having a horizontal bottom and vertical sides spaced about 2 inches apart, the upper guide being spaced above and aligned with the lower guide to conduct a different plurality of slivers in parallel relationship and to deposit the slivers on top of the sliver layer from the lower guide to feed in laminar juxtaposition to the back rolls for intimate blending.

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DONALD W. PARKER *Primary Examiner.*

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,216,064

November 9, 1965

Guy S. Kates, Jr.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 35, after "guiding" insert -- means adjacent to said back rolls comprising a lower guide --.

Signed and sealed this 19th day of July 1966.

(SEAL)

Attest:

ERNEST W. SWIDER

Attesting Officer

EDWARD J. BRENNER

Commissioner of Patents