United States Patent [19]

Johnson

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[54] **METHOD FOR RESTRINGING A THREADLINE**

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[52] **U.S. Cl.** ..... **57/159,** 28/72 R, 57/22

[51] **Int. Cl.** **B65h 69/06**

[58] **Field of Search** ..... 57/22, 34 B, 159, 34.5, 57/157 F; 28/1 R, 72 R

[56] **References Cited**

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Primary Examiner—John Petrakes

[57] **ABSTRACT**

A method of stringing a broken treadline in a high-speed apparatus processing multiple running threadlines that includes the steps of splicing the broken threadline onto a running threadline while maintaining tension in the broken threadline. The broken threadline is then carried by the running threadline through the machine's processing system to the windup station where the two are separated and strung up on new bobbins carried by the windup.

12 Claims, 5 Drawing Figures

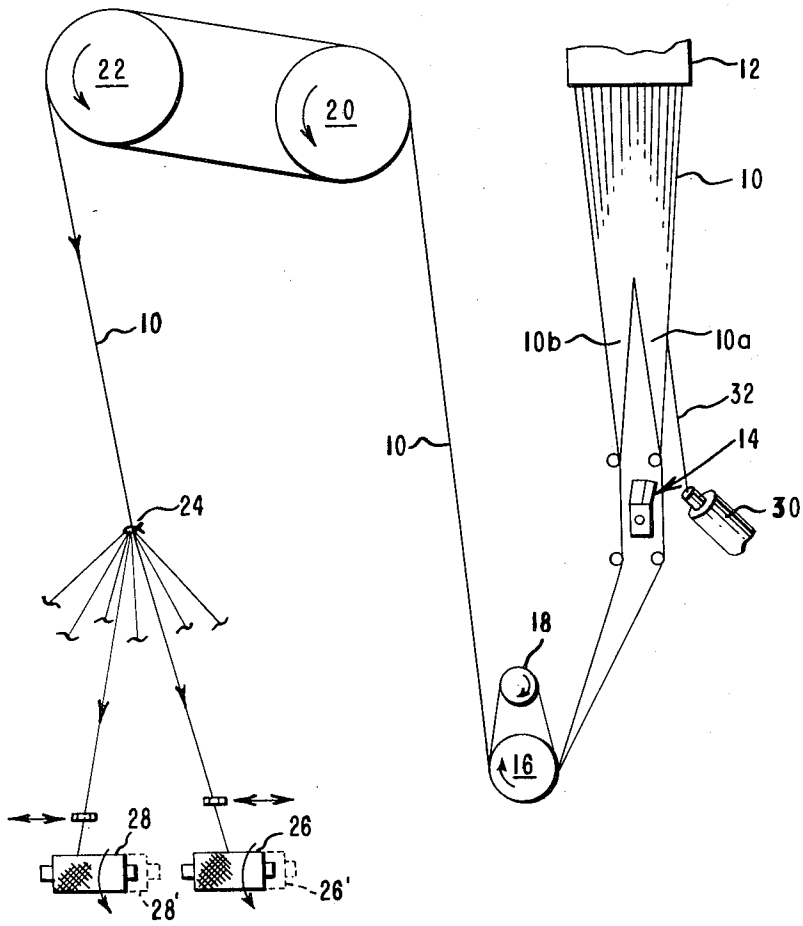


FIG. 1

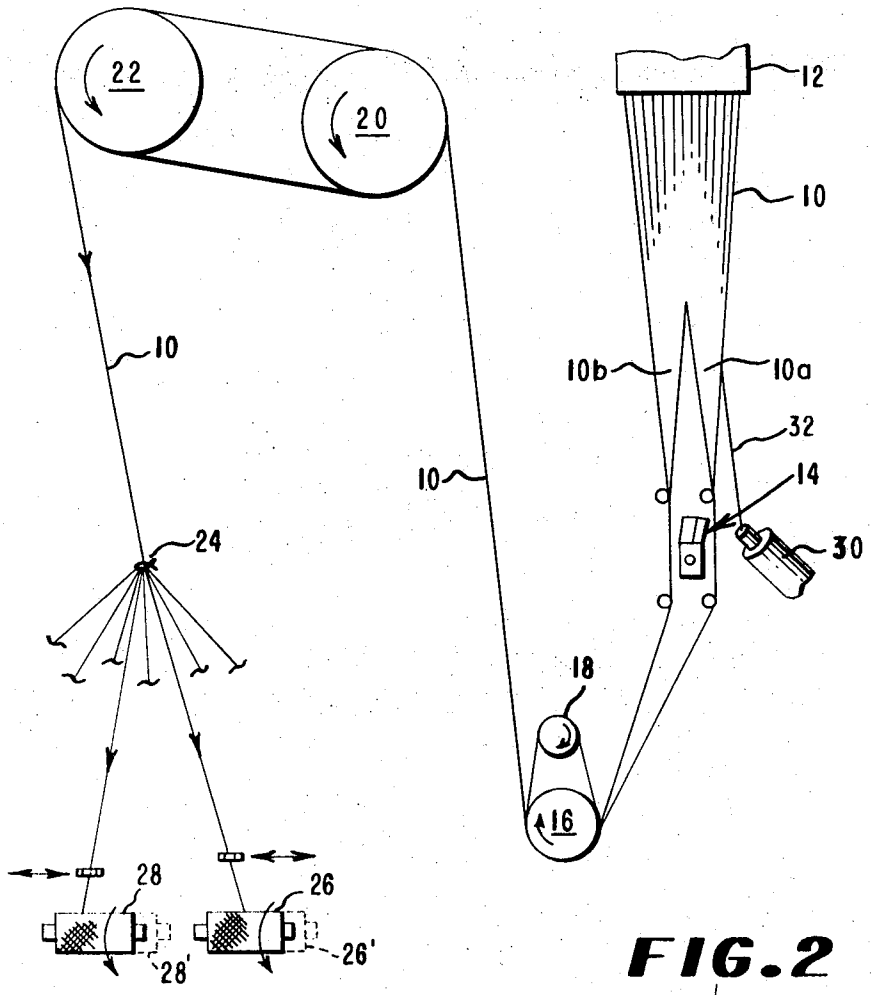


FIG. 2

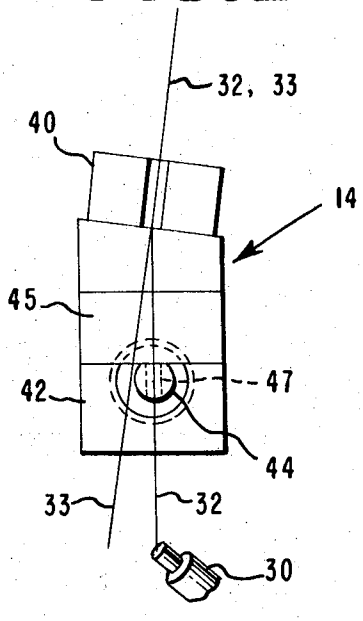


FIG. 3

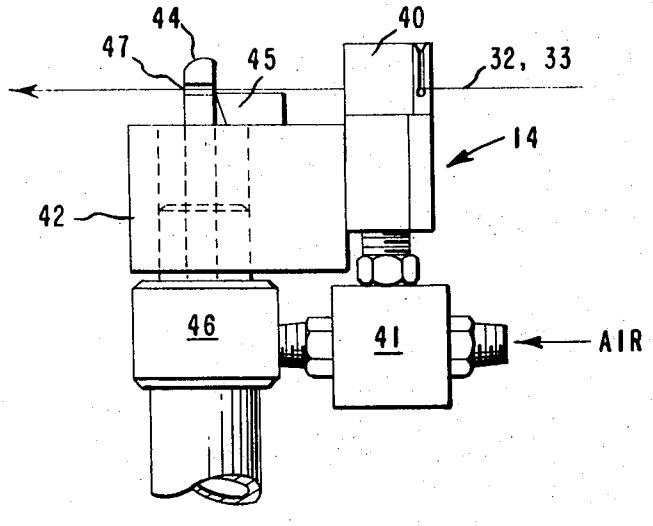


FIG. 4

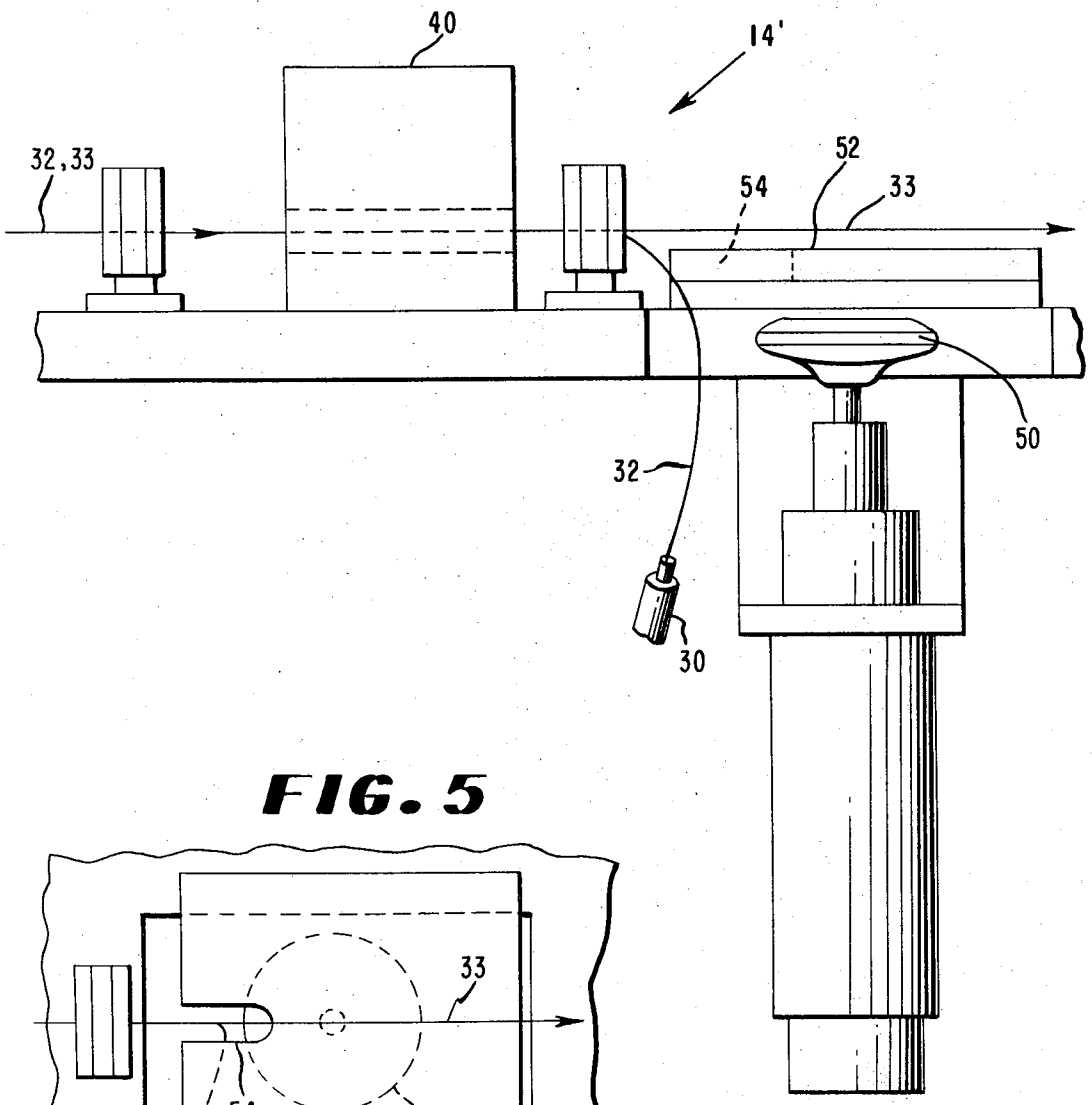
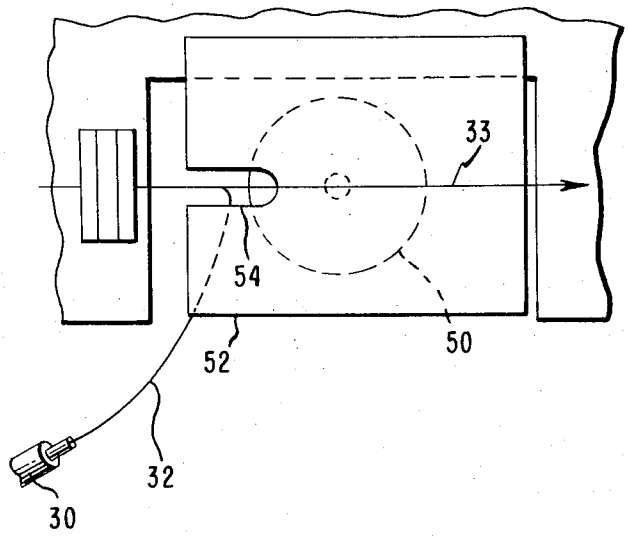


FIG. 5



METHOD FOR RESTRINGING A THREADLINE

BACKGROUND OF THE INVENTION

This invention relates to a method of stringing high-speed multiple threadline processing equipment. More particularly, it relates to a method of restringing a threadline by splicing it to one which is running and serves as a carrier through the processing stations to the vicinity of a winding device where the two threadlines can then be separated and wound into packages.

Many advantages are gained by processing multiple threadlines simultaneously through several successive treatment stations. Aside from reduced redundancy in processing equipment, smaller manufacturing area and reduced capital investment, multiple threadline processing enables high productivity with more uniform end-to-end product qualities. From an operability standpoint, however, control and handling of multiple threadlines are exceedingly difficult. This is particularly true of present high-speed spinning equipment which operates at speeds in excess of 3,000 yards/minute and with very close threadline spacing.

Generally, a threadline warp may be processed through a spinning facility or other yarn handling equipment in one of two ways: the parallel ends may be passed across a large number of treatment rolls by moving past each roll with only a partial S-type wrap, or the threadline may be helically wrapped several times around a roll surface for increased residence time. In such an arrangement, the warp initially contacts the moving roll at one end, progressively moves across the surface and exits at the other end. In the former case, restringing a single broken threadline, particularly around several rolls without disturbing the remainder of the warp, is a tedious, difficult task even for skilled operators. In the latter helically wrapped threadline system, restringing of a broken threadline is very difficult, in fact, there is no apparent way to restring a broken threadline without interfering with the moving threadlines.

SUMMARY OF THE INVENTION

A method for restringing an unstrung threadline in a high-speed apparatus processing multiple running threadlines moving under tension from a source to a windup said method comprising: (a) retrieving the unstrung threadline with a yarn handling device; (b) diverting a running threadline through the jet splicer portion of a splicer-cutter apparatus; (c) diverting the unstrung retrieved threadline through the jet splicer and cutter portions of the splicer cutter apparatus while maintaining tension in said unstrung threadline; (d) interlacing the unstrung threadline with the running threadline to form a splice while practically simultaneously cutting the unstrung threadline upon its exit from the jet splicer whereby the unstrung threadline is carried by the running threadline to the windup; and (e) separating the spliced threadlines at the windup for stringing on new bobbins carried by the windup.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic representation of a highspeed spinning machine in which the method of this invention can be practiced using a fluid splicing device.

FIGS. 2 and 3 are enlarged top and elevation views, respectively, of the splicing device indicated in FIG. 1.

FIGS. 4 and 5 are elevation and top views, respectively, of an alternate embodiment of a splicing device useful in practicing the invention.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

In the method chosen for purposes of illustration, (FIG. 1) a threadline warp **10** comprised of multiple individual threadlines is descending from a spinneret **12.** The warp **10** is divided into two sections **10***a* and **10***b* which pass on either side of splicer **14** and are then recombined around feed rolls **16, 18.** The warp then advances to draw rolls **20, 22,** then through guide **24** from which the threadlines of the warp advance to individual windups such as **26, 28,** where they are wound into packages. A vacuum stringup gun **30** is shown in position adjacent splicer **14** to pick up or retrieve an unstrung threadline designated **32.** The vacuum stringup gun may be of the type disclosed by Miller in U.S. Pat. No. 2,667,964.

As shown in FIG. **3,** splice device **14** includes an open stringup slot interlace jet **40** similar to the type disclosed in U.S. Pat. No. 2,985,995 to Bunting et al., mounted on a rigid block fastened to the machine frame (not shown). Adjacent to and coacting with jet **40** is a reciprocal cutter **44** which is actually a blade attached to the movable rod end of the actuator **46** attached to block **42.** Coacting with cutter **44** is a stationary blade **45** likewise fastened to block **42.** Cutter blade **44** incorporates a notch or aperture **47** which serves to constrain the moving threadline during the cutting sequence. Splice device **14** is mounted angularly on the spinning machine (FIG. **1**) relative to the threadline path in order to permit one threadline to bypass the cutting notch **47** of cutter **44.** The splice device **14** is powered by pressurized air furnished to actuator **46** and jet **40** from a sequence controller **41** which is connected to an energizing valve (not shown) and a source of pressurized air.

In operation, stringup of a broken end with the splice device **14** is accomplished as follows (FIGS. **1** and **2**): a broken threadline **32** is retrieved and manually diverted and threaded through jet **40** and the cutting notch **47** of cutter **44** using the vacuum stringup gun **30** to maintain tension on threadline **32.** A normal running threadline **33** is then selected (which is usually the companion of the threadline pair) and diverted through the jet portion of the splicer only. Except for the temporary minor diversion through jet **40,** threadline **33** is running at normal process speed throughout the entire process system.

Threadline **33** is normally diverted to waste at the windup end of the threadline processing system before the splicing sequence. This may conveniently be done by using a waste yarn aspirating jet.

When both threadlines are in proper position in the splicing device **14** (FIG. **2**), the operator triggers a valve (not shown) which energizes jet **40** and actuator **46.** Jet **40** interlaces the broken threadline **32** to threadline **33.** Cutter blade **44** is retracted downward severing and releasing the now spliced threadline **32** from the stringup gun **30.** Threadline **32** is then carried by threadline **33** through the entire process system. The above sequence takes place in less than a second. The operator then separates the threadlines **32** and **33,** transfers them to their previous proper positions in the warp **10,** restrings the threadlines about separate empty

bobbins such as 26', 28' on the windup unit and the machine is restored to its full operating condition.

In an alternate version of the splice device 14' depicted in FIGS. 4 and 5, a commercially available high-speed continuously operating abrasion wheel 50 is employed in place of reciprocal cutter 44. A cap 52 is positioned over the abrasion wheel. There, a slot 54 milled into cap 52 affords access to the wheel 50 for cutting purposes. With the alternate version, the actual splice cut sequence commences when the operator energizes splice device 14' causing the broken threadline 32 to interlace with a running threadline 33. As soon as device 14' is activated, threadline 32 is pulled into guide slot 54 in cap 52 and against abrasion wheel 50. Broken threadline 32 is thus severed from the stringup gun 30 leaving a resultant tail equal in length to the space between the abrasion wheel and the splice device which is less than 2 inches.

A key to the successful operation of this system appears to be that the splice is formed an instant before the yarn running to the suction device is cut. This is obvious when the abrasion wheel cutter is used. The blade cutter and interlace jet splicer are powered by compressed air from the same source. Since the devices are simultaneously activated, the inertia of the cutter will fractionally delay movement of the blade compared to the action of the interlacing jet. The forming of the splice before cutting the threadline serves to keep tension on the yarn and assists in keeping the threadline in its proper position in the spinning warp.

In a particular embodiment, two or more bobbins are wound on the same chuck. When a break occurs, therefore, it is usual to select a threadline running to the same chuck for splicing with the broken threadline. Selection of a companion threadline carries the broken threadline to the appropriate windup station where it may be placed on a bobbin.

In the present case, the improved splice stringup technique eliminates the protracted down time of the broken threadline and reduces manual manipulation of the threadlines to a minimum. Stringup is effected at high process speeds without any risk of disruption of the warp. More importantly, the stringup technique makes possible restringing of helically wrapped, multiple threadline systems. The splice is of sufficient compactness and strength and carries a minimum length threadline tail between ¼ to 2 inches long. This enables passage of the combined threadlines through the various constricted passageways in the process such as through fluid treatment jets, guides, pins and the like. Further, the interlacing type coupling of the filaments in the splice region permits conveyance of the threadline and splice through elevated temperature draw zones without risk of threadline rupture since the individual filaments in the splice are allowed to stretch or elongate to the same extent as in the main body of the threadline.

While a preferred position for splice device 14 has been shown to be immediately upstream of the feed rolls 16, 18 and while only one splice device 14 is shown to simplify the description, it is understood that any number can be used and located at various points in the threadline path.

Although the invention has been specifically illustrated with reference to spinning equipment, it is applicable to other multiple roll yarn processing equipment.

What is claimed is:

1. A method for restringing an unstrung threadline in a high-speed apparatus processing multiple running threadlines moving under tension said method comprising:
   a. retrieving the unstrung threadline while moving it through a yarn handling device;
   b. diverting a running threadline through a yarn passage of the jet splicer portion of a splicer-cutter apparatus;
   c. diverting the retrieved moving unstrung threadline through said yarn passage while maintaining tension in said unstrung threadline;
   d. interlacing the moving unstrung threadline with the running threadline by directing air under pressure into said yarn passage in a plane perpendicular to the running threadlines to form a splice while practically simultaneously cutting the unstrung threadline upon its exit from the jet splicer whereby the unstrung threadline is carried by the running threadline.

2. The method of claim 1, wherein the apparatus is processing the threadlines through a helically wrapped multiple threadline system.

3. The method of claim 1, wherein the apparatus is processing the threadlines through a S-wrapped multiple threadline system.

4. The method of claim 1, wherein said unstrung threadline is cut upon its exit from the jet splicer forming a splice tail between ¼ and 2 inches in length.

5. The method of claim 1, said high-speed being in excess of 3,000 yards per minute.

6. The method of claim 1, said unstrung threadline being a broken threadline.

7. A method for restringing an unstrung threadline in a high-speed apparatus processing multiple running threadlines moving in excess of 3,000 yards per minute under tension from a source to a windup, said method comprising:
   a. retrieving the unstrung threadline by moving it through a yarn handling device;
   b. diverting a running threadline through a yarn passage of the jet splicer portion of a splicer-cutter apparatus;
   c. diverting the retrieved moving unstrung threadline through said yarn passage while maintaining tension in said unstrung threadline;
   d. interlacing the moving unstrung threadline with the running threadline by directing air under pressure into said yarn passage in a plane perpendicular to the running threadlines to form a splice while practically simultaneously cutting the unstrung threadline upon its exit from the jet splicer whereby the unstrung threadline is carried by the running threadline to the windup; and
   e. separating the spliced threadlines at the windup, for stringing on new bobbins carried by the windup.

8. The method of claim 7, wherein the apparatus is processing the threadlines through a helically wrapped multiple threadline system.

9. The method of claim 7, wherein the apparatus is processing the threadlines through a S-wrapped multiple threadline system.

10. The method of claim 7, wherein said unstrung threadline is cut upon its exit from the jet splicer forming a splice tail between ¼ and 2 inches in length.

11. The method of claim 7, said high-speed being in excess of 3,000 yards per minute.

12. The method of claim 7, said unstrung threadline being a broken threadline.

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