July 5, 1966 M. R. WINTERBOTTOM ETAL 3,258,904

WINDING OF TEXTILE FILAMENTS OR YARNS

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Fig. 1.

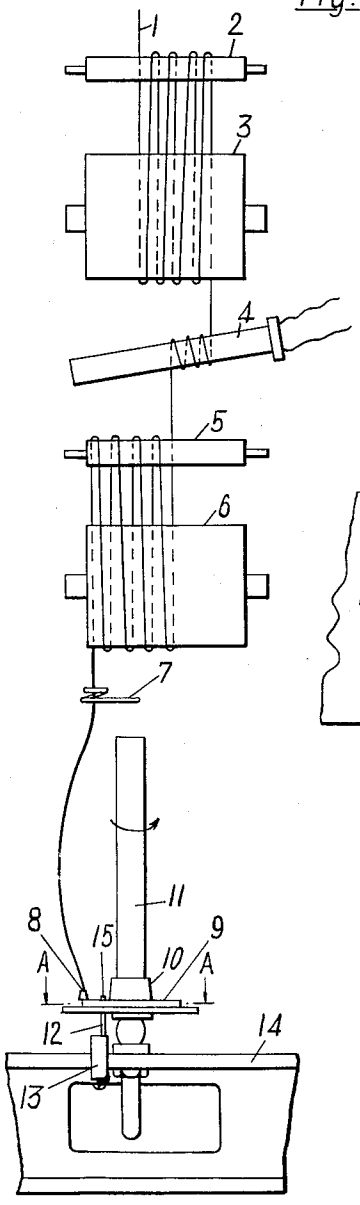

Fig. 2.

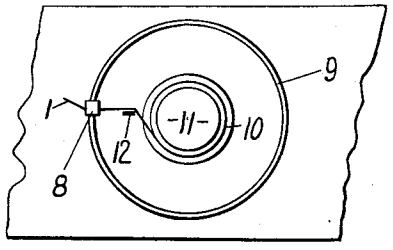

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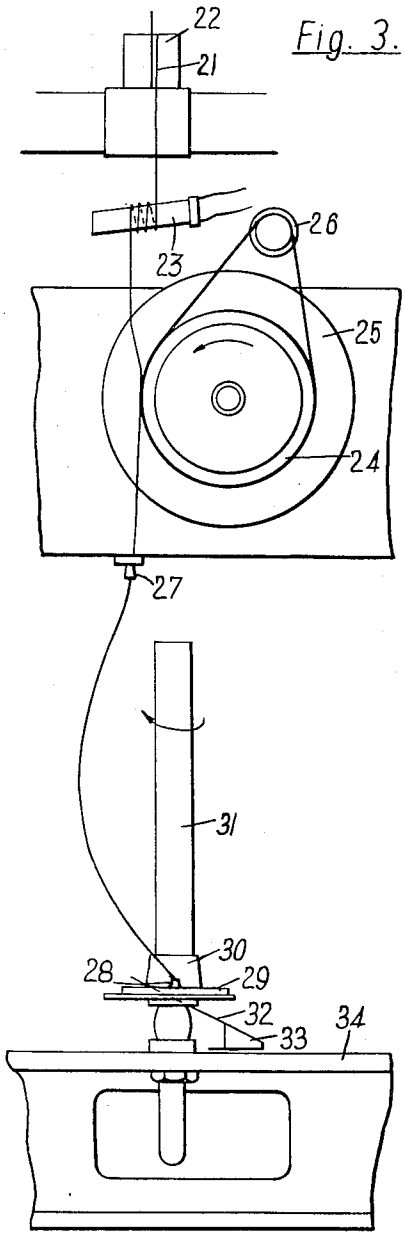
Fig. 3.



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WINDING OF TEXTILE FILAMENTS OR YARNS

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10 Claims. (Cl. 57—34)

This invention is concerned with improvements in or relating to the winding of synthetic textile filaments or yarns and particularly, though not exclusively, to the winding thereof after a drawing operation in which heat is applied thereto.

In the commercial production of polyamide and other synthetic polymeric filaments it is necessary to subject the as-spun filaments to a stretching or drawing operation in order to orient and impart a desirably high tenacity to them. Thus as-spun filaments, obtained, for example, by solution or melt spinning a particular polymer, may be stretched or drawn in the solid state by passing the filaments between two pairs of rollers, known as the feed and draw rolls respectively, the peripheral speed of the draw rolls being higher than that of the feed rolls by an amount sufficient to impart the required amount of stretch to the filaments. In order to obtain drawn filaments of uniform denier it has been found convenient to localise the point at which the drawing takes place by passing the filaments around a snubber pin placed between the feed and draw rolls. This process is frequently referred to as cold drawing. However some polymeric filaments, for example polyesters, are not readily stretched unless first subjected to some form of heating treatment. Such heating treatment may take the form of passing the filaments over a hot plate positioned between the feed rolls and the snubber pin, or more conveniently the snubber pin itself may be heated. It has also been found convenient to utilise a heated snubber pin in processes involving the simultaneous drawing and false-twist crimping of polymeric filaments such as that described in the British Patent No. 890,053.

Filaments may also be heated on the run in other processes such as, for example, false-twist crimping and length stabilising processes. In such processes the heating means usually comprises a plate or a tube.

A difficulty encountered in the heating of filaments on the run is that associated with "threading up" and "start up" of the process, since it is often desirable for technical reasons to thread-up with the parts of the apparatus stationary.

If in the threading-up operation filaments are left in stationary contact with the heating means for any considerable time, these filaments may degrade and thus be weakened with the result that an excessive number of breaks may occur on starting up. This can be avoided by threading-up with the heating means cold, starting up and then allowing the heating means to reach the required temperature. In this instance however much yarn is wasted before the heating means attains the required temperature and the process is operating satisfactorily.

The difficulty can be overcome when the heating means is a heated plate merely by arranging that the yarn be held out of contact with the plate during threading-up and moved into contact therewith when the threading-up has been completed. A similar arrangement can be utilised where the heating means comprises a tube, through which the yarn passes, by a lengthwise gap or gate in the tube through which the yarn may be passed when the threading-up has been completed.

When the yarn is required to be wrapped around the heating means, e.g. a heated snubber pin or draw roll, however, the aforementioned technique is no longer of assistance since attempts to cause the yarn, which may be moving at 1500 to 2000 ft./min., to be wrapped around the heating means frequently leads to threadline breaks.

In order to avoid the threadline breaks at start up it is necessary only that the yarn should not be in stationary contact with the heating means and thus become excessively degraded. Thus if in the threading-up of a machine for drawing yarn using a heated snubber pin, for example, the machine is run at a very low speed then threading-up should be possible without any of the attendant difficulties previously mentioned.

At these low machine speeds however the tension in the yarn is very low there being a complete absence of balloon tension. As a result, when winding in a ring-and-traveller system, the traveller tends to stick, owing to the frictional resistance between the traveller and the ring, and to remain stationary. Under these circumstances yarn, particularly when containing a crimp such as is obtained in the process described in the aforementioned British Patent No. 890,053, frequently gets caught on the traveller with the result that tension then builds up in the yarn between the bobbin and the traveller while the yarn moving to the traveller becomes slack and may loop or tend to slip off the draw rolls. If the tension in the yarn between the bobbin and the traveller increases sufficiently then the yarn breaks. Usually, however, the tension in the yarn overcomes the frictional resistance between the traveller and the ring and the traveller then leaps forward and, instead making only a single revolution, it overruns by a few turns and the slack yarn tends to tangle itself around the bobbin with the result that the position has to be threaded up again.

It should be mentioned that when running a drawing machine which has a ring-and-traveller wind-up system at very low speeds it is essential that the yarn, which is not being treated under normal process conditions, should not be wound onto the receiving package but should be wound onto a waste receiving area, such as a waste sleeve. For this purpose the ring rail is normally kept at its start-up position.

We have now found that with the ring rail in its start-up position means may be provided for maintaining a substantially even tension in the yarn sufficient to maintain the traveller in motion for one revolution at a time, and which does not affect the winding of yarn onto the package in the normal manner.

According to one aspect of the present invention there is provided a process for winding yarn onto a bobbin by a ring and traveller system in which the leading end portion of the length of yarn is wound onto a waste-receiving end portion of the bobbin on which the main length of yarn is not wound, comprising causing the bobbin to rotate at a lower speed than the normal winding speed, imparting a tension to the yarn in addition to the tension normally imparted by the ring and traveller system by means restraining the traveller from a normal free rotation around its ring during said low speed rotation of the bobbin and thereafter increasing the speed of rotation of the bobbin and freeing the traveller from said rotational restraint.

According to another aspect of the invention there is provided an apparatus for winding yarn onto a rotating bobbin having at one end portion thereof a waste-receiving area, comprising a spinning ring carrying a traveller normally freely rotatable thereabout, said spinning ring encircling the bobbin and having its plane substantially at right angles to the axis of the bobbin, and being mounted on a reciprocating frame adapted to remain stationary in a position in which yarn is wound onto the waste-receiving area of the bobbin and means to restrain the normal free rotation of the traveller around its ring when the tension

in the yarn is substantially below that attained under normal winding conditions.

It is to be understood that the term bobbin includes any suitable yarn package support.

The invention and apparatus for carrying it into effect is illustrated in the accompanying diagrammatic drawings, wherein:

FIGURE 1 is an elevation of one embodiment of the invention when employed on a machine adapted to draw a yarn using a heated snubbing pin.

FIGURE 2 is a plan view of the embodiment shown in FIGURE 1 along the line A—A.

FIGURE 3 is an elevation of another embodiment of the invention when applied to a machine adapted to draw and simultaneously false-twist crimp a yarn.

Referring now to FIGURES 1 and 2, an undrawn yarn **1**, for example a polyester yarn, from a supply thereof is wrapped a plurality of times around a feed roll **3** and a freely rotatable separator roll **2**, passed around a heated snubbing pin **4** and then is wrapped a plurality of times around a draw roll **6** and separator roll **5** in the conventional manner. From the draw rolls the yarn is taken through a yarn guide **7** to a traveller **8** on a spinning ring **9** where it is wound onto the waste sleeve **10** of rotating bobbin **11**. A yarn restraining means in the form of a leaf spring **12** is fixed to a clamp **13** mounted on the machine frame **14**. The top **15** of the spring **13** protrudes above the level of the ring when the latter is in position to wind yarn onto the waste sleeve **10** of the bobbin.

In stringing up the machine is set to run at a yarn wind-up speed of 5–10 ft./min. This slow speed may conveniently be attained by fitting an auxiliary motor and an over-running (free wheel) clutch, which clutch transmits power to the machine drive shaft at low speed running only. During high speed running, i.e. normal winding speed, the clutch permits the low speed auxiliary motor to free wheel.

While running at low speeds the spinning ring is stationary in a position in which yarn is wound up onto the waste sleeve of the bobbin. In this position the spring protrudes above the ring and restrains the yarn between the traveller and the waste-sleeve thus effectively preventing the traveller from moving around the ring thereby increasing the tension in the yarn between the bobbin and the draw-roll. When this tension approaches that normally obtaining in the threadline under normal operating conditions the yarn pushes the spring aside and the traveller, thus released, makes a single revolution around the ring. In making this one revolution some tension in the yarn is lost and hence further movement of the traveller is again prevented by the spring strip until the yarn tension has increased to the required level again. The effect of the spring strip is, therefore, to maintain tension in the yarn and prevent it slipping off the draw-roll or separator roll and becoming entangled around the bobbin whilst other positions on the machine are being threaded-up.

When all positions have been threaded-up the machine is then set to operate normally, the speed of rotation of the bobbin is increased to the normal winding speed and the ring rail is raised to enable yarn to be wound onto the bobbin. In this position the topmost portion of the spring strip is below the level of the ring and hence there is no danger of it contacting the yarn during winding and so producing the uneven tensions in the yarn wound on the bobbin.

In FIGURE 3 the invention is shown applied to an apparatus for the simultaneous false-twisting and drawing of a yarn such as is more fully described in the British Patent No. 890,053. A yarn **21** taken from a supply thereof is passed once round the feed roll **22**, twice round the heated snubbing pin **23** and thence to the draw roll **24** with flange **25**. The snubbing pin is set off from the draw roll so that the yarn in passing from the pin to the draw roll rubs against the flange **25** and has a false twist imparted to it. The yarn makes 3 passes around the draw roll **24** and the separator roll **26** and is then taken through the yarn guide **27** to the traveller **28** in a spinning ring **29** whence it is wound onto the waste sleeve **30** of a rotating bobbin **31**. A leaf spring **32** is mounted on a block **33** which in turn is then mounted on the machine frame **34**. The leaf spring **32** passes inside the ring **29** between the ring and the waste sleeve and is adjacent to the former so that it contacts the traveller when the ring is, as shown in a position to wind yarn onto the waste sleeve.

During low speed winding at string-up when the yarn is being wound onto the waste sleeve, the spring contacts the traveller and restrains it from moving round the ring thereby increasing the tension in the yarn between the bobbin and the draw roll. When this tension approaches that obtained in the threadline under normal running conditions the traveller bends the spring and passes over it to make a single revolution around the spinning ring. As a result tension in the yarn is lost and the spring prevents the traveller from making a further revolution until the tension in the yarn has increased to the required level again.

The spring strip therefore operates to have the same effect as in the embodiment described with reference to FIGURES 1 and 2. When yarn is being wound onto the bobbin proper the top most portion of the spring strip is below the lowest level reached by the spinning ring and therefore does not interfere with the winding.

In the embodiments described above, the slow speed of wind-up during the threading-up process prevents yarn from being in contact with the heated snubber pin for sufficient time to cause undue degradation of the yarn and hence normal winding can be started without an excessive number of breaks occurring attributable to weakness in the yarn caused by degradation.

Although the invention has been described with particular reference to the use of a leaf spring as a restraining means, it is not limited thereto and any other suitable form of restraining means, e.g. a pivotally mounted counter balanced rod or an annular rubber bush making frictional contact with the traveller when the ring is in the start-up position, may be employed.

What we claim is:

1. A method for winding yarn onto a bobbin employing a ring and traveller system, said bobbin having a waste-receiving end portion onto which the leading end portion of the yarn is wound comprising, rotating the bobbin at a speed lower than the normal winding speed, imparting a tension to the yarn in addition to the tension normally imparted by the ring and traveller system by restraining the traveller from a normal free rotation around its ring during said low speed rotation of the bobbin and thereafter increasing the speed of rotation of the bobbin and moving the traveller from said rotational restraint.

2. A method according to claim **1** wherein the traveller is restrained intermittently from a normal free rotation around its ring by means acting on the portion of yarn between the traveller and the said waste receiving end portion of the bobbin.

3. A method according to claim **2** wherein the restraining means comprises a leaf spring.

4. A method according to claim **1** wherein the traveller is restrained from a normal free rotation around its ring by means acting intermittently on the said traveller.

5. A method according to claim **4** wherein the restraining means comprises a leaf spring.

6. Apparatus for winding yarn onto a rotating bobbin having at one end portion thereof a waste-receiving area, comprising a spinning ring carrying a traveller normally freely rotatable therearound, said spinning ring encircling the bobbin and having its plane substantially at right

angles to the axis of the bobbin and being mounted on a reciprocating frame, said frame being adapted to have a stationary position at which yarn is wound onto the waste-receiving area of the bobbin, and means to restrain the normal free rotation of the traveller around its ring when the tension in the yarn is substantially less than that attained under normal winding conditions.

7. Apparatus according to claim 6 wherein the means acts on the portion of yarn between the traveller and the waste-receiving area of the bobbin.

8. Apparatus according to claim 7 wherein the means comprises a leaf spring.

9. Apparatus according to claim 6 wherein the means acts on the traveller.

10. Apparatus according to claim 9 wherein the means comprises a leaf spring.

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