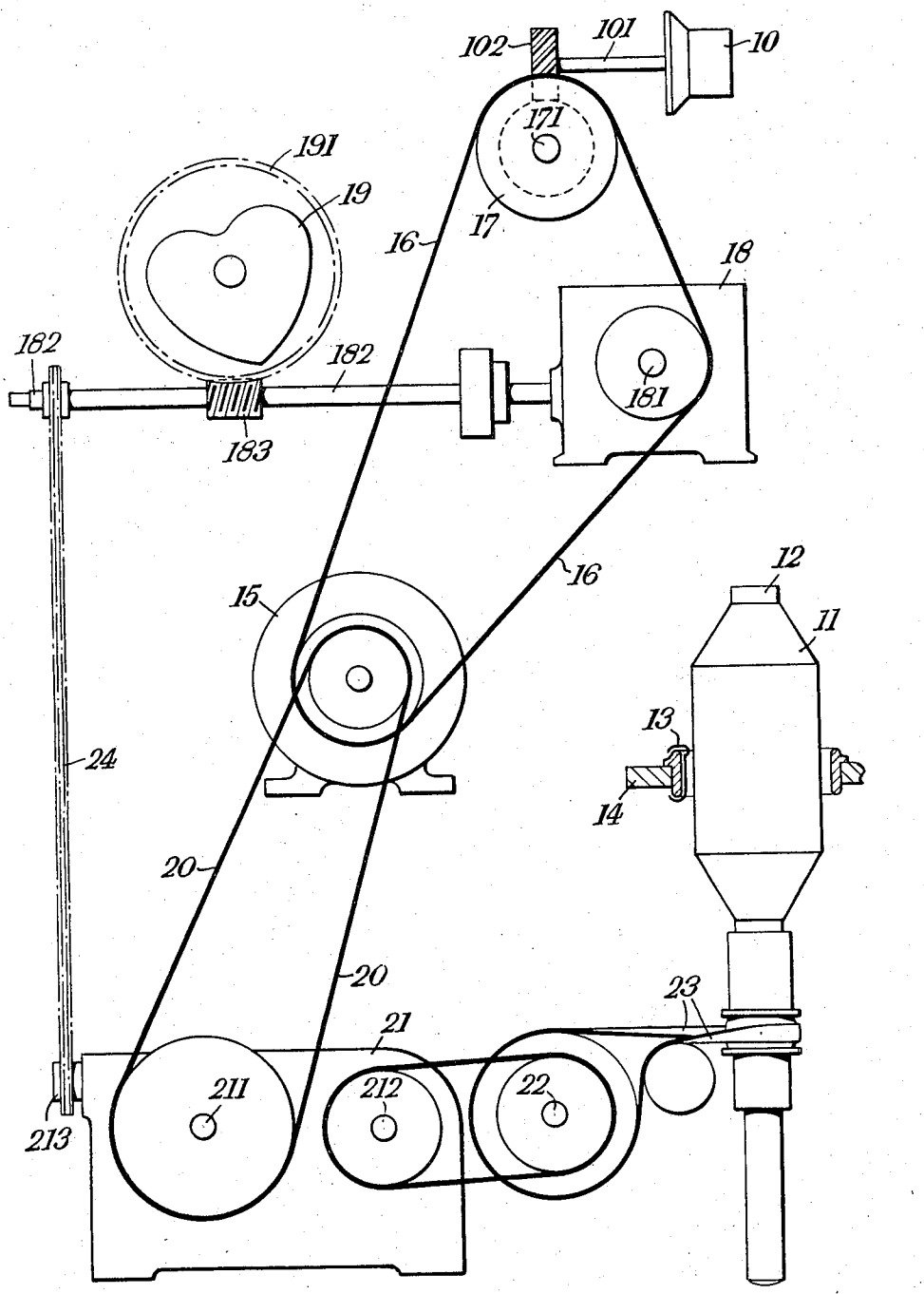
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RING SPINNING AND TWISTING MACHINE AND PROCESS

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RING SPINNING AND TWISTING MACHINE AND PROCESS

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This invention relates to an improved method of winding yarns or filaments on to a package by means of a ring and traveller.

In conventional spinning or twisting machines of the ring and traveller type, the yarns are wound on to a package on a spindle which is rotated at a speed which is so related to the speed at which yarn is forwarded to the package that a predetermined number of twists per inch are inserted in the yarn as it is being wound on to the package. In machines such as drawtwisters, the amount of twist inserted into the filaments is usualy very low because of the high speed at which the filaments are forwarded to the package and the comparatively low speed of the spindle carrying the package. In conventional drawtwisters the spindles run at a constant speed throughout the formation of the package but the traveller speed varies considerably according to the diameter at which yarn is being wound on to the package.

The object of this invention is to provide an improved method of operating spinning and twisting machines of the aforesaid type whereby production may be increased and traveller wear will remain within acceptable limits.

According to the invention we provide a method of winding textile yarns or filaments at a constant rate on to a rotary package carried by a driven spindle by means of a ring and traveller, in which the spindle speed is decreased as the winding-on diameter increases. The spindle speed may be varied inversely as the winding-on diameter to maintain the traveller speed substantially constant.

In the application of the invention to a drawtwister for processing synthetic filaments, the filaments may be drawn and passed at high speeds in excess of 3,000 ft. per minute to a package on ring and traveller spindles. The spindles are driven through a variable speed device which can be controlled so that the spindle speed when winding on a certain diameter ensures that the traveller will lag behind the spindle to wind all the delivered yarn on to the package but will not exceed the maximum allowable speed as hereinafter defined.

If L equals the yarn delivery rate in feet per minute and *dl* equals the initial winding-on diameter in inches the spindle will be required to make $L \times 12/\pi\ dl$ r.p.m. to wind yarn on the initial diameter *dl*.

With the spindle rotating at this speed for the initial winding-on diameter, the traveller would remain stationary and winding-on would take place without any twisting. If the spindle speed were increased, say by 1,000 r.p.m., yarn would be wound on the package and the traveller would move on the ring at a speed of 1,000 r.p.m. in the same direction as the spindle and twist would be inserted.

The spindle speed, to effect winding-on at different diameters, can be calculated from the formula given above, and the traveller speed can be held substantially constant at a desired speed by adding that speed to the calculated spindle r.p.m. required for winding-on.

The traveller speed may be chosen so that it is just sufficient to induce a controlling tension in the yarn, but on the other hand when the drawtwister is not running to give the maximum yarn speed, as determined by the drawing and heating conditions, it may be possible for the constant traveller speed to be the maximum permissible

traveller speed that can be achieved without burning or excessive wear on the travellers.

When using constant spindle speeds, in accordance with prior practice, the traveller speed increases with bobbin diameter and in many cases it has been impossible to build large packages because of the excessive traveller speeds which would result. The present invention overcomes this disadvantage since by varying the spindle speed the traveller speed can be held substantially constant irrespective of package size and ring diameter.

In its simplest form the invention may be applied to drawtwisters in which all the spindles are driven from a common source and the input speed of the material is constant. The building motion would preferably provide a parallel build, i.e., in which all the coils in each layer are wound on at the same diameter, so that it is only necessary to decrease the spindle speed gradually as the winding-on diameter increases.

The invention may be applied to machines using random doffing, but in this case the speed of each spindle would require to be independently variable.

The invention may also be used for winding other than parallel-wound bobbins, as previously defined, but provision being made for varying the spindle speed according to the varying winding-on diameter in each chase.

One form of drawtwister apparatus suitable for the performance of the method which characterises the invention is illustrated diagrammatically by the accompanying drawing. In this apparatus the numeral **10** denotes a drawroll of the drawtwister, by which filaments are delivered to a take-up package **11** which is mounted on a driven spindle **12**, the operation of winding the filament on the package being executed by a traveller **13** freely mounted on a ring **14**. The building motion (not shown) by which the package is formed is of conventional parallel-build type in which each layer or chase is wound upon the package at a uniform diameter.

The driving shaft **101** of the drawroll **10** is driven by a main driving motor **15** through a belt or chain **16** which passes over a pulley or sprocket **17** geared to a wormwheel **102** on said shaft **101**. The shaft **171** extends longitudinally throughout the machine (or a section thereof) and is employed to drive each of the drawrolls **10** through individual gearing similar to that shown.

The belt or chain **16** also drives the input shaft **181** of a reduction gear box **18**, the output shaft **182** whereof drives the building motion cam **19** through the worm **183** and worm wheel **191**. The building motion may be of any well-known type for producing parallel-wound packages. For example, the cam **19** may be used to operate the conventional building motion lever having a variable-length arm connection to the ring rail.

A second belt or chain drive **20** is taken from the driving motor **15** to the input shaft **211** of a variable speed unit **21**, the output shaft **212** whereof drives the spindle driving shaft **22**, and the drive is taken from this shaft to the spindle **12** in known manner, for instance, by a tape drive **23**.

The control shaft **213** for the variable speed unit **21** is connected by a chain drive **24** to the shaft **182**, and this drive may be so arranged that there is a gradual reduction in the output from the variable speed unit as the building motion lays successive layers on the package.

By these means, the spindle speed can be gradually reduced, so that the traveller speed remains substantially constant throughout the build of the package, in spite of the increasing diameter at which the filaments are wound on the package.

It is obvious that other alternative arrangements could be used to drive the control shaft **213** of the variable speed unit; for instance, a servo-motor could be connected to said shaft and caused to rotate intermittently

on a signal received from the building motion, or the ring rail, after each traverse had been completed.

What I claim as my invention and desire to secure by Letters Patent is:

1. The method of winding textile yarn and filament material in a parallel build upon a rotary package carried by a driven spindle by means of a ring and traveller comprising supplying said material at a constant rate to said ring and traveller and varying the rotational speed of said spindle inversely to the gradually increasing winding-on diameter of said spindle thereby to maintain a substantially constant predetermined traveller speed.

2. The method of claim 1, in which said material is wound in package form and said spindle speed rotational speed is varied inversely correspondingly to the variations in the winding-on diameter of said spindle.

3. The method of claim 1 in which said material drawn from a supply at constant speed is wound in package form with parallel build.

4. Apparatus for winding yarns or filaments in a parallel build on to a package comprising a rotary spindle, yarn delivery means for delivering yarn at a constant rate, a ring and traveller by which the yarn from said delivery means is wound on to a package on said spindle, and means to vary the spindle speed inversely as the winding-on diameter increases to maintain said traveller speed constant at a predetermined speed.

5. Apparatus according to claim 4, wherein said means to vary said spindle speed comprises a variable speed unit having a variable speed output connected to drive said spindle, a constant speed input drivably connected to a constant speed drive and a control speed input drivably connected to a builder motion drive of said apparatus.

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