Oct. 14, 1941. R. LITTLE ET AL 2,258,899

YARN TWISTING AND WINDING APPARATUS

Filed Oct. 7, 1940 2 Sheets-Sheet 1

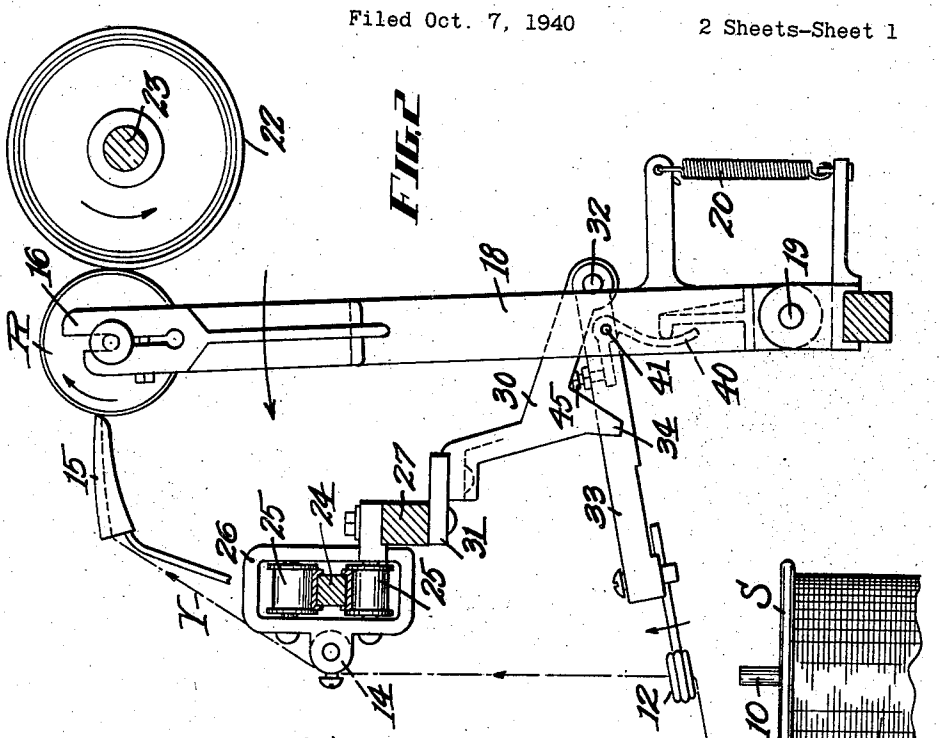

FIG. 2

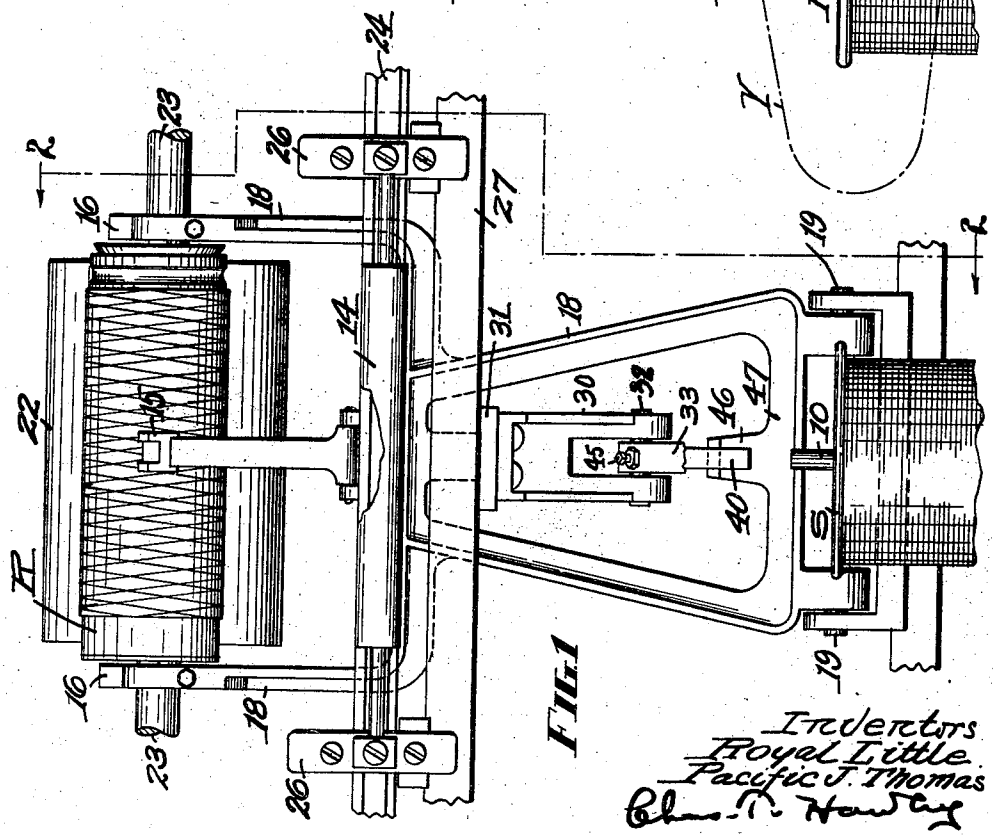

FIG. 1

Inventors
Royal Little
Pacific J. Thomas
Robert T. Hawley

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YARN TWISTING AND WINDING APPARATUS

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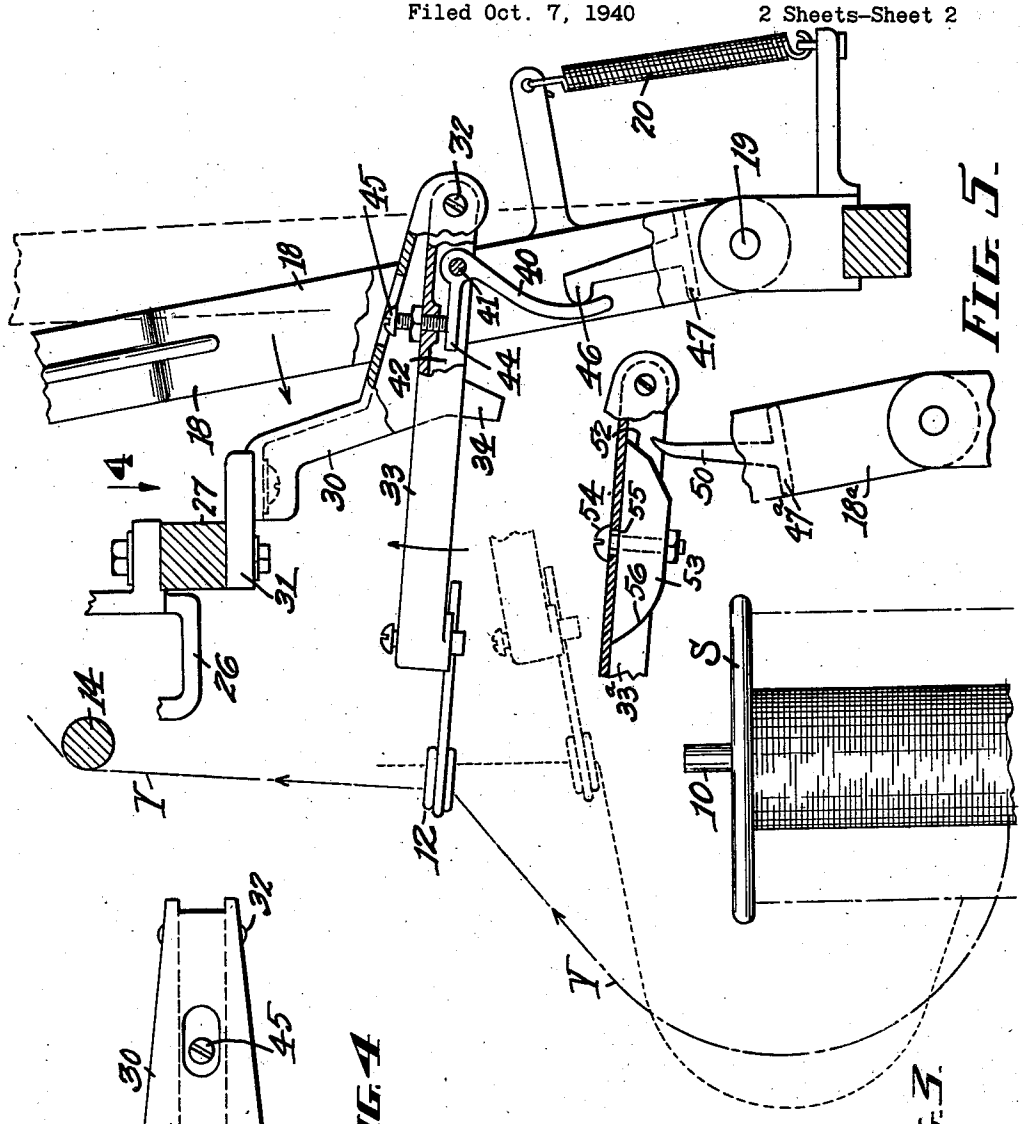

FIG. 1.

FIG. 3.

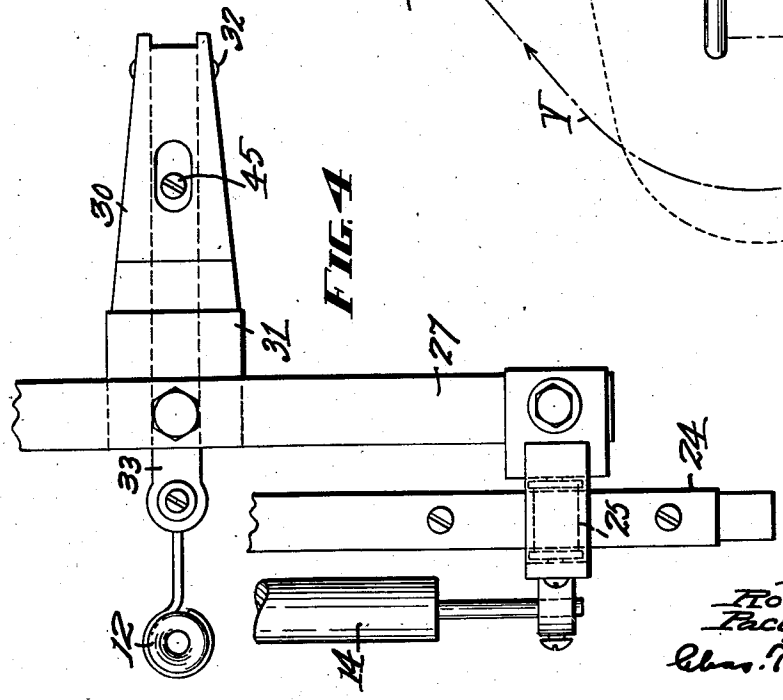

FIG. 4.

Inventors.
Royal Little
Pacific J. Thomas.
By Attorney
Chas. T. Hawley

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YARN TWISTING AND WINDING APPARATUS

Royal Little, Providence, R. I., and Pacific J. Thomas, Scranton, Pa., assignors, by direct and mesne assignments, to U. S. Textile Machine Company, Scranton, Pa., a corporation of Pennsylvania

Application October 7, 1940, Serial No. 360,058

8 Claims. (Cl. 57—62)

This invention relates to apparatus for twisting yarn and for winding the same in a yarn package. In such machines, commonly termed "up-twisters," the yarn is unwound from a supply spool or package mounted on a twister spindle rotated at constant speed, and the yarn is wound onto a take-up roll or delivery package driven by surface contact at a substantially constant peripheral speed. It is the general object of our invention to provide improved yarn twisting and winding apparatus of the up-twister type in which provision is made for controlling the yarn tension during the twisting and winding operation.

The twisting spindles revolve at a speed which causes the yarn to balloon between the supply spool on the spindle and a yarn guide located above the spindle and in alignment with the axis of rotation thereof.

If a flyer is used on the twister spindle, the yarn tension increases as the spool approaches emptiness, and the speed is limited by the amount of tension which the yarn will stand when the spool is nearly empty.

If, on the other hand, no flyer is used, the tension varies in the opposite manner, being greatest with a full spool and least with a nearly empty spool. The spindle speed is then limited by the tension which the yarn can stand when the bobbin is full. But at a spindle speed thus limited, the yarn tension for a nearly empty spool may fall below that tension which is necessary to make satisfactory yarn.

It is found that the yarn tension varies approximately according to the plane area enclosed by the ballooning yarn and by a line drawn from the yarn guide to the unwinding surface.

It is a further object of our invention to provide means for controlling the yarn tension by regulating and varying this balloon area during unwinding of a spool by changing the position of the yarn guide relative to the twister spindle and said spool.

More specifically we provide means for automatically increasing the axial distance between the yarn guide and the rotating supply spool as the unwinding of the spool progresses. This offsets the tendency of the balloon to decrease in area as the spool decreases in effective diameter. We further provide cam mechanism by which the relative movement of the yarn guide may be closely and accurately controlled to produce the desired results.

Our invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

A preferred form of the invention is shown in the drawings, in which—

Fig. 1 is a front elevation of our improved apparatus;

Fig. 2 is a sectional side elevation thereof, taken along the line 2—2 in Fig. 1;

Fig. 3 is an enlarged sectional side elevation of certain parts;

Fig. 4 is a partial plan view, looking in the direction of the arrow 4 in Fig. 3; and

Fig. 5 is a side elevation, partly in section, showing a modification of certain parts appearing in Fig. 3.

Referring to the drawings, our improved twisting and winding apparatus comprises a twister spindle 10 which is of any usual type and which is rotated at constant speed from any suitable source of power. A supply spool S or other suitable yarn package is mounted on the twister spindle 10 and is rotated thereby.

The yarn Y is drawn upward from the rotating spool S through a yarn guide 12 and over a guide roll 14 and is then directed by a pivoted guide member 15 to the surface of a take-up or delivery roll R, which roll is rotatably mounted between the forked upper ends 16 of a swinging frame or support 18 mounted on fixed pivots 19. A spring 20 (Fig. 2) normally swings the supporting frame 18 and roll R yieldingly to the right in Fig. 2, so that the surface of the roll is pressed firmly against a drum 22 mounted on a continuously rotated shaft 23.

Consequently, the roll R is driven at a constant surface speed, which speed remains unchanged, regardless of the diameter of the mass of yarn wound on the take-up roll, and thus a substantially fixed number of turns of twist is imparted to each inch of yarn drawn upward and wound on the roll R.

The guide member 15 is hinged on a traverse rod 24 which is longitudinally reciprocated by suitable driving mechanism, in timed relation to the speed of rotation of the winding drum 22. The traverse rod 24 is reciprocated between guide-rolls 25 mounted in rectangular frame members 26, which in turn are secured to a fixed bar or rod 27 extending longitudinally of the machine. In general operation, as thus far described, the machine is or may be of a usual commercial type.

A bracket 30 is secured to a plate 31 fastened to the under side of the bar 27 and provides a fixed pivot 32 for a yarn guide lever 33, in the

free end of which the yarn guide 12 is adjustably secured. Lugs 34 on the bracket 30 guide the lever 33 in its swinging vertical movement.

A cam lever 40 (Fig. 3) is pivoted at 41 in a longitudinal recess 42 between the sides of the lever 33. A horizontal extension 44 on the lever 40 is positioned for engagement by an adjusting screw 45 threaded in the lever 33, so that the operative position of the lever 40 relative to the lever 33 may be accurately determined. The cam surface of the lever 40 is engaged by an upwardly extending and offset projection 46 carried by the lower member 47 (Fig. 1) of the swinging frame 18.

Having described the details of construction of our improved twisting and winding apparatus, we will now describe the use and operation thereof.

The cam lever 40 is so adjusted by the screw 45 that the yarn guide 12 will occupy the lower position indicated in Fig. 2 when the roll R is substantially empty and is driven directly by the drum 22, it being assumed that the spool S is conversely full of yarn.

As the twisting and winding operation proceeds, the amount of yarn on the spool S decreases and tends to produce decreased balloon tension on the yarn, as previously explained. At the same time, the diameter of the yarn mass on the roll R correspondingly increases and this increase of yarn on the roll R swings the supporting frame 18, together with the roll R, to the left as viewed in Figs. 2 and 3 and against the tension of the spring 20.

Such movement of the frame 18 toward the full line position shown in Fig. 3 causes the lug 46 to move the cam lever 40, which in turn causes the lever 33 to move upward and causes the yarn guide 12 to move toward the raised full line position shown in Fig. 3.

By selecting a suitable profile for the cam 40, the upward movement of the yarn guide 12 may be accurately related to the increase of diameter of the yarn mass on the roll R and to the corresponding decrease in diameter of the yarn mass on the spool S.

If a correct ratio is thus maintained between the decrease in diameter of the yarn mass on the supply spool S and the elevation of the yarn guide 12, ballooning of the yarn Y can be satisfactorily controlled, so as to maintain the required tension on the yarn Y during the unwinding of the spool S.

This removes the main objection to operation without a flyer and makes available the higher practicable speed of such operation, with corresponding increase in production.

It has been found for instance that a machine ordinarily limited to 8500 R. P. M. by use of flyers can be operated as high as 13,000 R. P. M. with our vertically shiftable yarn guide and with equally satisfactory results.

In Fig. 5 we have shown a modified construction in which an engaging member 50 mounted on the lower member 47a of a swinging frame 18a projects upward and engages the end 52 of a cam block 53 fitted within and below the lever 33a and secured thereto by a bolt 54 extending through a slot 55. As the member 50 engages the surface 52 at a point substantially further from the axis of the swinging frame 18a, the cam action is more rapid and positive, particularly in the first part of the upward movement of the lever 33a.

In actual operation, it is quite commonly desirable to have the upward movement of the lever 33a completed by the time the spool S is from one-half to three-quarters unwound, as it is found that no further upward movement of the lever 33a and guide 12 is commonly required during the removal of the remaining part of the yarn from the spool S.

If desired, the cam block 53 may be provided with a second and different cam surface 56 at its opposite end and may be reversed when a different ratio of movement of the lever 33a is desired.

Having thus described our invention and the advantages thereof, we do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what we claim is:

1. Apparatus for twisting and winding yarn comprising a twister spindle rotated at constant speed and on which a supply spool is mounted, a take-up roll on which the twisted yarn is wound, means to drive said roll at constant yarn-surface speed, a yarn guide interposed between said spindle and said take-up roll and positioned substantially in alignment with the spindle axis, and automatic means to increase the axial spacing of said yarn guide from said spindle and spool in predetermined positive and direct relation to the increase in diameter of the yarn mass on the take-up roll.

2. Apparatus for twisting and winding yarn comprising a twister spindle rotated at constant speed and on which a supply spool is mounted, a take-up roll on which the twisted yarn is wound, means to drive said roll at constant yarn-surface speed, a yarn guide interposed between said spindle and said take-up roll and positioned substantially in alignment with the spindle axis, and automatic means to progressively change the axial spacing of said yarn guide from said spindle and spool during the transfer of yarn from said spool to said take-up roll and to position said yarn guide in direct relation to the diameter of the yarn mass on said take-up roll.

3. In a yarn twisting apparatus in which the yarn is drawn axially from a rotating spool and is wound on to a peripherally driven yarn package, in combination, a yarn guide operative between said spool and package, and means directly responsive to any increase in the diameter of the yarn mass on said package and effective to progressively raise said yarn guide during the transfer of the yarn from said spool to said package.

4. Apparatus for twisting and winding yarn comprising a twister spindle rotated at constant speed and on which a supply spool is mounted, a take-up roll on which the twisted yarn is wound, means to drive said roll at constant yarn-surface speed, a movably mounted yarn guide interposed between said spindle and said take-up roll and positioned substantially in alignment with the spindle axis, a movable support in which said take-up roll is mounted for movement away from said driving means as the yarn mass on said roll increases in diameter, and an actuating connection between said movable support and said movable yarn guide by which said guide is moved axially away from said spindle as said take-up roll and support are moved away from said driving means.

5. The combination in twisting and winding apparatus as set forth in claim 4, in which the actuating connection includes cam means to produce a variable ratio of movement between said

support and said guide as said support moves from said driving means.

6. Apparatus for twisting and winding yarn comprising a twister spindle rotated at constant speed and on which a supply spool is mounted, a take-up roll on which the twisted yarn is wound, means to drive said roll at constant yarn-surface speed, a swinging supporting frame for said roll, means to press said roll and frame yieldingly toward said driving means, a lug on said frame, a yarn guide, a lever in which said guide is mounted for movement in substantial alignment with the spindle axis, a cam member pivoted in said lever, and means to adjust said member in said lever, said lug engaging said cam member and variably raising said yarn guide as the take-up roll and supporting frame are swung from said driving means by the increasing diameter of the yarn mass on said roll.

7. Apparatus for twisting and winding yarn comprising a twister spindle rotated at constant speed and on which a supply spool is mounted, a take-up roll on which the twisted yarn is wound, means to drive said roll at constant yarn-surface speed, a swinging supporting frame for said roll, means to press said roll and frame yieldingly toward said driving means, a lug on said frame, a yarn guide, a lever in which said guide is mounted for movement in substantial alignment with the spindle axis, and a cam member secured to said lever and engaged by said lug, whereby said supporting frame coacts with said lever to progressively raise said yarn guide as the take-up roll and supporting frame are swung from said driving means by the increasing diameter of the yarn mass on said roll.

8. In yarn twisting and winding apparatus in which the yarn is drawn from a spool rotated by a twister spindle at constant speed and is wound in a rotated yarn package having constant surface speed, that improvement which comprises a driving roll, a take-up roll supporting a yarn mass which yieldingly engages the surface of said driving roll and which is moved from the axis of said driving roll as said yarn mass increases in diameter, a movable yarn guide, and operative connections between said take-up roll and said yarn guide, through which said roll is effective to raise said guide as the diameter of the yarn mass increases.

ROYAL LITTLE.
PACIFIC J. THOMAS.