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(58) Field of search

D1D

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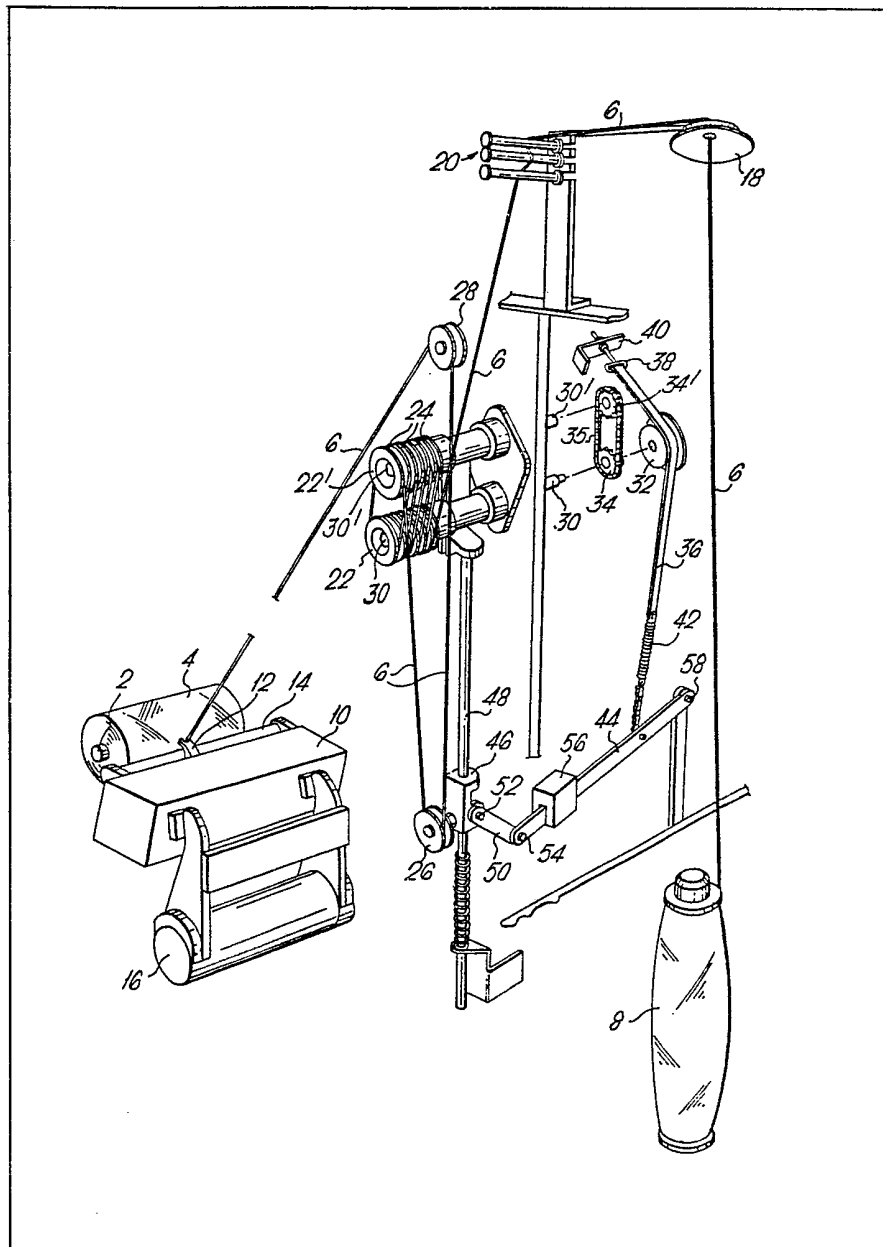
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(54) Tension control in yarn winding
or spooling machines

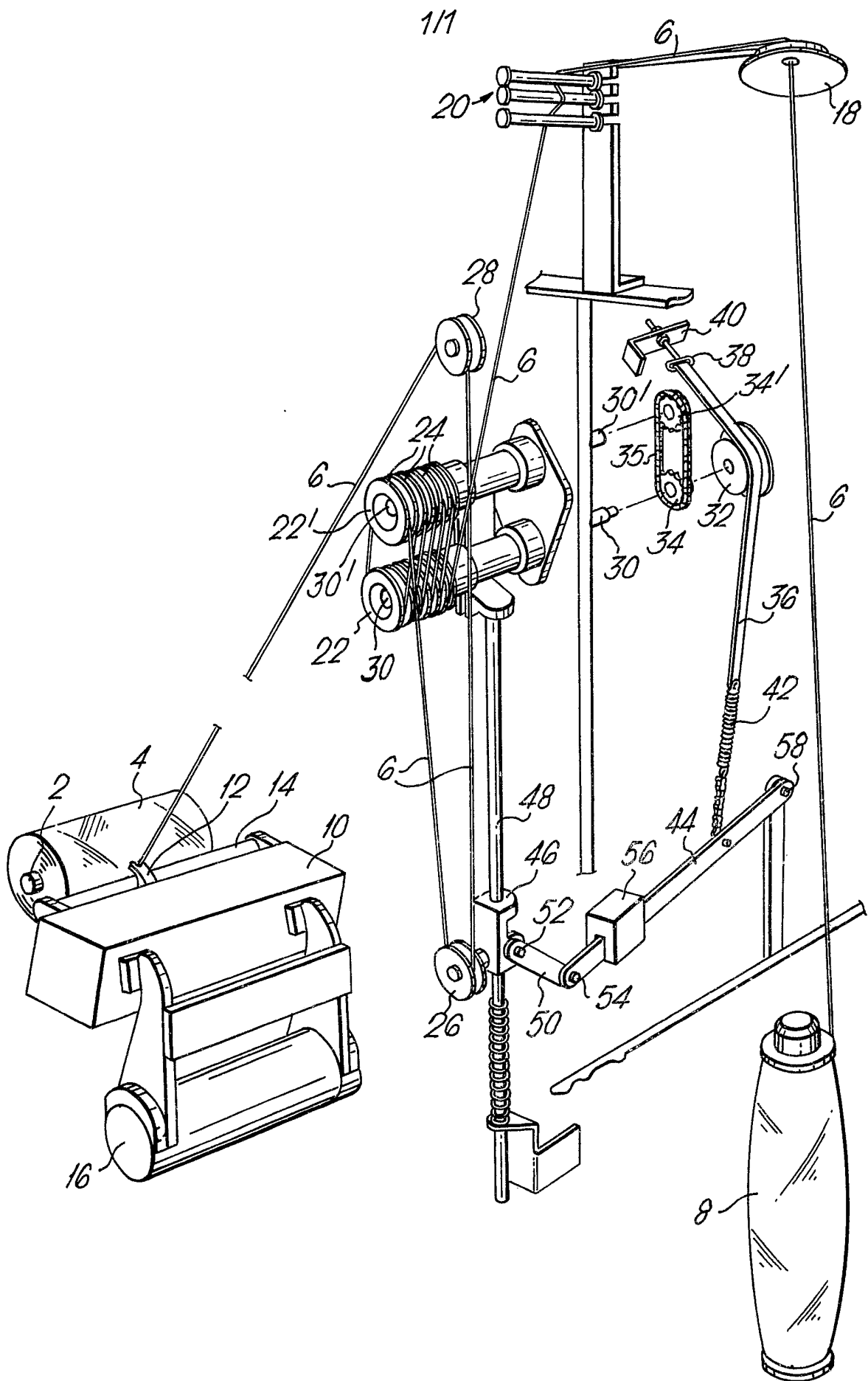
(57) A yarn winding apparatus with a
winding spindle (2) has two "tension"
pulleys (22, 22') with braking means
(32, 36) to restrict the free rotation of
the pulleys and thus provide tension

for the yarn (6). Control means (26)
senses tension in the yarn and
adjusts the braking means
accordingly.

The braking force is reduced as the
tension in the yarn being wound
increases and vice versa, so that
tension in the yarn remains
substantially constant.



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SPECIFICATION

Improvements in and relating to textile yarn winding or spooling machines

This invention relates to textile yarn winding or
5 spooling machines.

In such machines and particularly in those
having a constant speed winding spindle,
problems arise during winding of the package due
to the fact that as the diameter of the package
10 increases, so does the tension in the yarn being
wound.

This can lead to an effect known as
"telescoping" wherein inner layers of yarn which
are wound at a relatively low tension are squeezed
axially along the spindle by the outer layers which
15 are all of relatively high tension. This produces a
package of undesirable shape since the inner
layers will protrude beyond the outer layers and
will cause unwinding problems when the package
20 is being used to feed the next machine in the
processing line, e.g. a twisting machine.

The general object of this invention is to obviate
these problems.

Yarn winding apparatus in accordance with the
25 invention has a winding spindle driven preferably,
at constant speed and includes at least one
rotatable "tension" pulley and cooperating
member (preferably a second rotatable pulley) in
the yarn path around which the yarn passes, a
30 number of times, braking means being associated
with the "tension" pulley to restrict its free
rotation and thus provide tension for the yarn,
control means being provided to sense the yarn
tension and to adjust the tension pulley braking
35 means according to whether the yarn tension is
above or below a predetermined value, so that the
braking force is reduced as the tension in the yarn
being wound increases and vice versa.

Two rotatable grooved "tension" pulleys are
40 preferably provided around which the yarn passes
a number of times and which are driven together
in unison. Such an arrangement is particularly
suitable for yarns made by twisting together one
or more thermoplastic tapes. The grooves in the
45 tension rollers are preferably tapered and as the
yarn pulls down into the taper as it winds around
the grooves, any coggles which might exist in the
yarn as a result of it having been formed by
twisting under light tension, are removed. It also
50 gives a nice rounding effect to the yarn to remove
any sharp edges which might protrude from the
surface. It is also preferable that the grooved
rollers taper outwardly in a divergent fashion from
the point when the yarn first engages the rollers to
55 the point where it leaves them as this tightens the
yarn into the grooves.

The control means may conveniently comprise
a rotatable pulley which is mounted to move,
against a bias, when the tension in the yarn passes
60 around the pulley increases, the said movement
acting to reduce the braking effect of the braking
means on the "tension" pulley.

The braking means may comprise a belt of
friction material bearing against a drum fixed to a

65 shaft of the rotatable "tension" pulley(s), the belt
being slackened so as to decrease its frictional
engagement with the drum as the pulley of the
control means moves in response to an increase in
the yarn rotation. The belt is preferably connected
70 to the control means through a spring so that the
braking belt is applied against the drum in an even
manner.

The invention will now be further described by
way of example with reference to the
75 accompanying sketch drawing of one embodiment
of a yarn winding machine in accordance with the
invention.

The apparatus comprises a winding spindle 2
which is driven at constant speed and on which a
80 precision package 4 is wound from yarn 6 which is
pulled over the end of a free standing supply
package 8 (by "free standing" is meant an
arrangement in which the yarn is pulled, preferably
over the end, of a package rather than the package
85 being mechanically driven to let-off the yarn or by
the yarn being released from a controlled speed
supply source).

The yarn is precision wound on the package 4
by a standard type of traverse guide mechanism
90 housed in a box 10, the yarn guide 12 of the
mechanism being reciprocated by the traverse
mechanisms along a length of the spindle 2. A
roller 14 is mounted on the box to engage against
the side of the package and as the package
95 increases in diameter, the traverse mechanism
pivots, against a bias, about an axle 16.

After leaving the supply package 8, the yarn
passes upwardly through a guide 18 around a
tension device 20 which comprises three fingers
100 adjustable relative to each other to increase or
decrease the tension which is required to draw the
yarn through the fingers.

The yarn 6 then passes around the lower end of
a pair of "tension" rollers 22, 22' each of which
105 has six grooves 24, the yarn therefore passing
around the pair of tension pulleys six times before
leaving the upper "tension" pulley 22' to extend
downwardly and to pass around a freely rotatable
pulley 26 forming part of the control means for a
110 braking device used to restrict free rotation of the
pulleys 22, 22'.

After passing around the pulley 26, the yarn 6
then passes around a guide pulley 28 and then
passes to the yarn guide 12.

115 The axles 30, 30' of the grooved "tension"
pulleys 22, 22' each carry chain wheels 34, 34'
connected by a chain 35 so that the two pulleys
rotate in unison. A brake drum 32 is connected to
the lower "tension" pulley axle 30 and in engaged
120 by a friction belt 36, the upper end 38 of which is
connected to a fixed bracket 40 and the lower end
of which is connected through a spring 42 to a
pivotal link 44 forming part of the control means.

As the tension in the yarn increases due, for
125 example, to an increase in the diameter of the yarn
package 4, the pulley 26 which is mounted on a
bracket 46, which bracket is slidably mounted on
a rod 48, will move upwardly along the rod and a
link 50 which is connected at 52 to the slide

bracket 46 will also move upwardly causing the end of the link 44 which is pivoted at 54 to the link 50, to move upwardly against the bias provided by a weight 56. As the other end of the link 44 is pivoted at 58 to a fixed part of the machine, the upward movement of the free end of the link 44 causes the brake belt 36 to be slackened decreasing the braking force on the drum 32 and consequently the tension on the yarn, which is provided by the two tension rollers 22, 22', thus that as the package diameter increases, the tension in the yarn remains substantially constant.

If for any reason the tension of the yarn were to decrease, then the weight 56 would cause the bracket 46 and the pulley 26 to move downwardly along the rod 48 and this downward movement would cause the friction belt 36 to tighten against the brake drum 32 causing the tension pulleys 22, 22' to provide increased tension in the yarn until the equilibrium position was again reached.

It will be appreciated that the weight 56 may be replaced and/or its position on the link 44 may be adjusted.

The spring 42 which connects the end of the belt 36 to the link 44 acts to apply the belt 36 against the drum 32 in an even manner to ensure that there is no abrupt change in tension. The position of the bracket 40 may also be changed relative to the braking drum 32 so as to alter the arc of contact of the brake belt makes to the drum.

The grooves 24 in the rollers 22, 22' are tapered in such a way that the yarn is pulled into the groove as it passes around the pulleys so as to remove any coggles which might exist in the yarn and to give a rounded shape to the yarn. The rollers also taper outwardly from the point where the yarn first engages the roller 22 to the point where it leaves the roller 22' and this also helps to tighten the yarn into the grooves.

The provision of grooves in the tension rollers whilst not being essential, is particularly advantageous when the yarn is one made by twisting together one or more thermoplastic tapes.

It is possible to use as the tension rollers a single plain roller and for example, a fixed pin, the axes being offset to provide the necessary pitching of the yarn or web on the roller.

It will be appreciated that the braking of the tension rollers in the apparatus of the invention is determined by the tension of the yarn itself as measured at a point after the yarn has left the tension rollers and before it is wound onto the winding spindle.

CLAIMS

1. Yarn winding apparatus having a driven winding spindle and including at least one rotatable "tension" pulley and cooperating member in the yarn path around which the yarn passes a number of times, braking means being associated with the "tension" pulley to restrict its free rotation and thus provide tension for the yarn, control means being provided to sense the yarn

65 tension and to adjust the tension pulley braking means according to whether the yarn tension is above or below a predetermined value, so that the braking force is reduced as the tension in the yarn being wound increases and vice versa.

2. Apparatus as claimed in Claim 1 wherein the cooperating member is a second rotatable "tension" pulley, both "tension" pulleys being driven together in unison.

3. Apparatus as claimed in either Claim 1 or 2 wherein tapered grooves are provided in the tension pulley(s).

4. Apparatus as claimed in Claim 3 wherein the grooved pulleys taper outwardly in a divergent fashion from the point when the yarn first engages the pulley(s) to the point where it leaves them.

5. Apparatus as claimed in any preceding claim wherein the control means comprises a rotatable pulley which is mounted to move, against a bias, when the tension in the yarn passing around the pulley increases, the said movement acting to reduce the braking effect of the braking means on the "tension" pulley.

6. Apparatus as claimed in Claim 5 wherein the bias is provided by a weight cooperating with the control means.

7. Apparatus as claimed in any preceding claim wherein the braking means comprises a belt of friction material bearing against a drum fixed to a shaft of the rotatable "tension" pulley(s), the belt being slackened so as to decrease its frictional engagement with the drum as the pulley of the control means moves in response to an increase in the yarn tension and vice versa.

8. Apparatus as claimed in Claim 7 wherein the belt is connected to the control means through a spring so that the braking belt is applied against the drum in an even manner.

9. Apparatus as claimed in any preceding claim wherein the winding spindle is driven at a constant speed.

10. Apparatus as claimed in any preceding claim including a free standing source of yarn.

11. A yarn winding apparatus substantially as herein described with reference to the accompanying drawings.

New claims or amendments to claims filed on 21/4/83

Superseded claims All

New or amended claims:—

1. Yarn winding apparatus having a driven winding spindle and including at least two rotatable "tension" pulleys connected so as to rotate in unison and located in the yarn path around which the yarn passes a number of times, braking means being associated with the "tension" pulleys to restrict their free rotation and thus provide tension for the yarn, control means being provided to sense the yarn tension and to adjust the tension pulleys braking means according to whether the yarn tension is above or below a predetermined value, so that the braking force is reduced as the tension in the yarn being

- wound increases and vice versa.
2. Apparatus as claimed in Claim 1 wherein tapered grooves are provided in the tension pulleys.
- 5 3. Apparatus as claimed in Claim 2 wherein the grooved pulleys taper outwardly in a divergent fashion from the point when the yarn first engages the pulleys to the point where it leaves them.
- 10 4. Apparatus as claimed in any preceding claim, wherein the control means is mounted to move, against a bias, when the tension in the yarn passing around the pulleys increases, the said movement acting to reduce the braking effect of the braking means of the "tension" pulleys.
- 15 5. Apparatus as claimed in Claim 4 wherein the bias is provided by a weight cooperating with the control means.
6. Apparatus as claimed in any preceding claim, wherein the braking means comprises a belt of
- 20 friction material bearing against a drum fixed to a shaft of one of the rotatable "tension" pulleys, the belt being slackened so as to decrease its frictional engagement with the drum as the control pulley moves in response to an increase in the yarn tension and vice versa.
- 25 7. Apparatus as claimed in Claim 6, wherein the belt is connected to the control pulley through a spring so that the braking belt is applied against the drum in an even manner.
- 30 8. Apparatus as claimed in any preceding claim, wherein the winding spindle is driven at a constant speed.
9. Apparatus as claimed in any preceding claim including a free standing source of yarn.
- 35 10. A yarn winding apparatus substantially as herein described with reference to the accompanying drawings.