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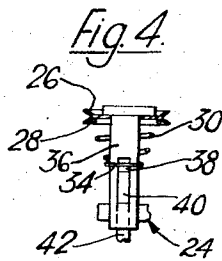
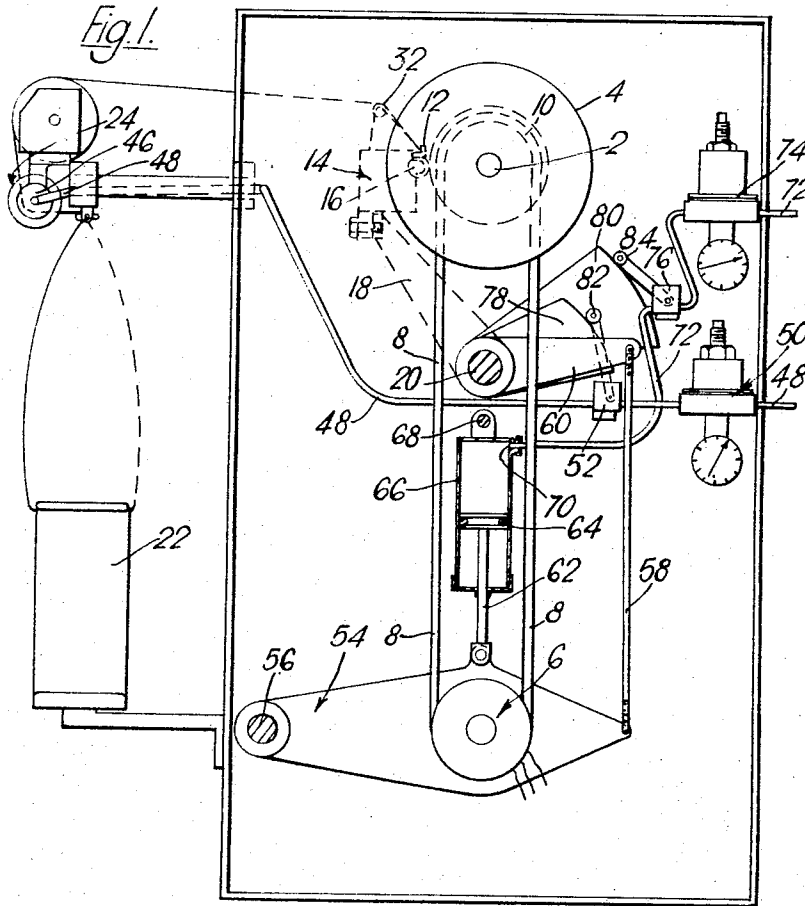
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3,366,340

TEXTILE WINDING MACHINES

Filed Jan. 21, 1966

2 Sheets-Sheet 1



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Fig. 2

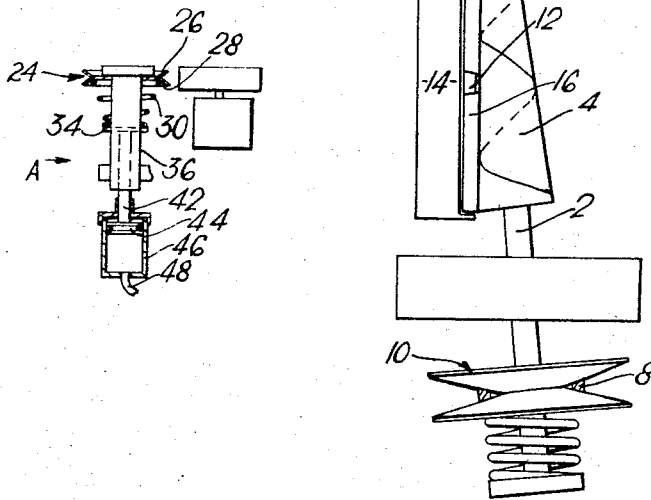
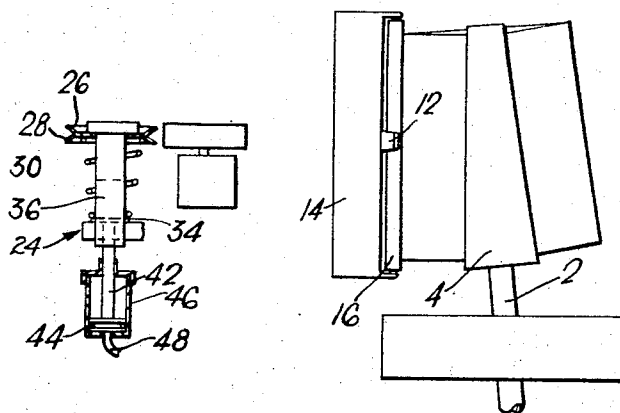


Fig. 3



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**TEXTILE WINDING MACHINES**

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7 Claims. (Cl. 242—18)

**ABSTRACT OF THE DISCLOSURE**

A yarn winding device wherein two control valves are actuated by separate cams as the package diameter increases to reduce tension in the yarn by reducing the fluid pressure to a yarn tensioning device.

This invention relates to yarn winding machines for the production of rolls, cheeses and the like packages, in which the yarn is wound on a rotated spindle by being laid thereon by a traversing device, including a rotary member through which the yarn is caused to be reciprocated along the spindle.

When such a machine is used to wind continuous filament synthetic yarn, such as nylon, Acrilan, and the like, it has been found that the ends of a roll, or cone, being wound tend to bulge as the package diameter increases, leading to the package having soft ends which causes subsequent difficulties when the package is to be unwound. This problem does not normally occur with standard staple spun yarns, through with some of these yarns the problem does arise to a certain extent.

In a yarn winding machine in accordance with the invention, the tension of the yarn being wound can be decreased during winding by a control device which is operated by the pressure of hydraulic fluid, preferably, compressed air. It has been found that the decrease of yarn tension during increase of package diameter, very significantly reduces the bulge effect mentioned above.

It has also been found that a further factor which affects the bulge effect is the pressure exerted against the side of the package by the winding head or traversing device. A machine in accordance with the invention may have a second control device which reduces this pressure during winding and which is operated by the pressure in a second hydraulic fluid supply line (the fluid also preferably being compressed air).

The pressure of the compressed air, or other hydraulic fluid, may conveniently operate the control device or devices through a piston and cylinder for each device movement of a piston being effective to vary the tension in the yarn by, for example, increasing or decreasing the pressure of a spring acting on drag washers, or discs and movement of the other piston acting through a mechanical linkage to cause the winding head to press with lesser or greater force against the side of the package.

The alteration of pressure of the compressed air for one or both of the control devices takes place during winding due, for example, to the change of setting of control pressure reduction valves caused by the relative movement of a cam or cams and their followers, which movement occurs as a consequence of a change in size of the diameter of the package being wound. If both control devices are provided, then two cams would normally be present, each operating a separate pressure reduction valve in one of the two compressed air supply lines, respectively.

Movement of the cams may conveniently be achieved through a linkage connected to the winding head so that as the winding head moves outwards due to its engage-

ment against the side of the package, so the cams, or their followers, are moved in a direction to cause a reduction in the pressure acting on the two control devices causing a reduction both in the tension of the yarn being fed to the winding head and in the pressure at which the winding head bears against the package.

It will be appreciated that the extent of the variation in tension and pressure during winding can itself be varied to suit different types of yarn in a very simple manner by, either altering the shape of the cams or by altering the pressure of the source of hydraulic fluid.

An embodiment of a yarn winding machine in accordance with the invention, will now be described by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a diagrammatic side elevation of the machine;

FIGURE 2 is a diagrammatic plan view of the winding spindle and yarn tensioning device, at the commencement of a winding operation;

FIGURE 3 is a view corresponding to FIGURE 2 but showing the parts in their position at completion of the winding operation, and

FIGURE 4 is a detailed view of a part of the yarn tensioning device.

The machine has a winding spindle 2, carrying a conical former or mandrel 4 on which the package is wound. The spindle 2, is driven by a motor 6 through a V-belt 8 which engages round a pulley on the motor shaft, and round an expanding pulley 10, secured at the end of the spindle 2. The expanding pulley is designed to operate in the manner described and illustrated in the specification of our Patent No. 3,070,319. The package is formed by the yarn being laid on the spindle by a traversing mechanism comprising a rotary traverse scroll (not shown) having a continuous groove which guides a follower providing a yarn guide 12 so that as the traverse scroll is rotated the yarn guide 12, is reciprocated along the spindle, so as to lay the yarn in cross laid layers on the conical centre mandrel to create a package of high and very even density.

The traverse scroll is carried in a winding head, generally indicated at 14, and having a roller 16 which bears against the side of the package being formed so that the yarn guide is maintained close to the surface of the package. As the diameter of the package increases, the winding head which is mounted on a bracket 18 pivots away from the winding spindle about an axle 20.

The yarn is led to the winding head from a supply cop or the like, generally indicated at 22, through a yarn tensioning device generally indicated at 24 in FIGURE 1. This device comprises a pair of discs 26, 28 (see FIGURE 2, 3 and 4) which are pressed together by means of a conical spring 30 and between which the yarn passes before being laid over a guide pulley 32 on the winding head.

The tension exerted on the yarn by the tension device depends upon the tension of the spring 30 and this can be varied by a control device comprising a plate 34 against which the outer end of the spring abuts and which is mounted for sliding movement along a rod 36 carrying the discs, the plate being guided by a projection 38 (see FIGURE 4) which engages in a slot 40 in the rod. The plate 34 is secured to the outer end of a piston rod 42, connected to a piston 44, in a compressed air cylinder 46, the cylinder being open to a source of compressed air (not shown) through a supply pipe 48. The supply pipe passes through a main pressure reduction valve 50, and a control pressure reduction valve 52.

The pressure of air in the supply pipe is at a maximum at the commencement of winding (as illustrated in FIGURE 2) so that the plate 34 is forced along the rod 36,

compressing the tension spring 30 so that the tension exerted on the yarn passing between the discs 26, 28 is at its maximum. During winding the pressure in the supply pipe is reduced by operation of the control pressure reduction valve 52 so that at the completion of the winding operation the spring has been relaxed to its full extent, as indicated in FIGURE 3, and the tension of the yarn is at its minimum.

The motor 6 is carried by a sole plate or bracket 54 which is pivotally mounted at 56 and is connected by means of a chain 58, to an arm 60, secured to the axle 20 and hence the bracket 18. In the position shown in FIGURE 1 the weight of motor acting through the chain 58 exerts a couple on the axle 20, tending to turn the bracket 18 in a clockwise direction as seen in FIGURE 1 so as to cause the roller 16 to bear against the side of the package. This couple continues to be exerted, despite the outward movement of the winding head caused by increasing diameter of the package.

The couple exerted by the weight of the motor is reinforced by the pressure exerted on the sole plate 54 by a control device comprising a piston rod 62 connected to a piston 64 acting in a compressed air cylinder 66. The cylinder is pivotally fixed to the machine frame at 68 and has an inlet 70 connected to a compressed air supply pipe 72. This supply line is connected to a source of compressed air, not shown, through a main pressure reducing valve 74 and a control reducing valve 76. It will be appreciated that the pressure of the compressed air in the cylinder controls the pressure exerted on the sole plate by the piston rod 62 and hence the pressure between the package being wound and the winding head.

The operation of the two control valves 52, 76 for the compressed air supply pipes 48 and 72 is achieved by means of two cams 78, 80 connected to the axle 20 and arranged so that as the winding head is moved outwardly in an anti-clockwise direction, as shown in FIGURE 1, the two cams also move in that direction causing their followers 82, 84 to move in a clockwise direction as seen in FIGURE 1. Each of the two followers is directly connected to one of the two control valves 52 and 76 respectively. The arrangement is such that as the package diameter increases and the cams move anti-clockwise, the control valves are adjusted so as to reduce the pressure of the air in the two supply pipes so that the pressure on the package by the winding head reduces as the package diameter increases and so that the tension on the yarn being supplied to the winding head is reduced. It has been found that the combination of these two factors reduces the tendency of the bulging of the package being wound, even when the yarn is a synthetic continuous filament yarn, to an extent where the effect, if not completely absent, is immaterial.

It will be appreciated that the setting of the tension variation and pressure adjustment can be done very simply by alteration of the two main pressure reduction valves 50 and 74, before commencement of a winding operation, or by changing the shape of the two cams.

The shape of the two cams can vary from that shown in the drawing and can be readily ascertained for any particular yarn by experiment. If, for example, it was desired to have a package in which the tension of the yarn was reduced more quickly, or in a different way than the variation in the pressure at which the winding head presses against the package, this may be provided for by suitable cam shapes.

For many types of yarn it may be found that variation of the pressure at which the winding head bears against the package is unnecessary and that reduction of yarn tension during winding will be sufficient to eliminate bulging of the ends of the package being wound.

It is possible, when a less fine adjustment of the control devices is required, to use only a single cam and valve combination to operate both the yarn tension control

device and the control device for adjustment of the pressure between the winding head and the package.

I claim:

1. A yarn winding machine comprising a driven spindle to receive a take-up package, a traversing device including means to reciprocate a yarn guide eye along the spindle to lay the yarn on the package, said traversing device being mounted for movement away from said spindle, a tensioning device located in the path of the yarn in advance of the traversing device, said tensioning device being operable in response to the pressure of fluid in a fluid supply line, a pressure regulator located in said fluid supply line, linkage means connecting said traversing device to said pressure regulator, movement of said traversing device away from said spindle acting to adjust the pressure regulator so as to decrease the pressure of fluid in said fluid supply line, whereby said tensioning device will be operated to reduce the tension applied to the yarn.

2. A yarn winding machine comprising a driven spindle, a traversing device having a winding head mounted on a pivotal arm and including means for reciprocating a yarn guide along said spindle, a yarn tensioning device located in the path of the yarn in advance of the traversing device, a fluid supply line connected to said traversing device, alteration in the pressure of fluid in said supply line being operative to alter the tension applied to yarn passing through said tensioning device, a pressure reduction valve located in said fluid supply line, a cam and a cam follower device relative movement of which acts to adjust the pressure reduction valve, and linkage connecting said winding head to said cam and cam follower device so that as the winding head pivots away from said spindle said valve is adjusted to reduce the pressure in said supply line thereby causing the tension applied to the yarn by said tensioning device to be reduced.

3. A yarn winding machine according to claim 2 wherein said tensioning device comprises a cylinder, a piston working in said cylinder one side of said piston being open to said fluid supply line, and a pair of yarn drag washers or discs connected to said piston and between which yarn is directed to pass.

4. A yarn winding machine comprising a driven spindle to receive a yarn take-up package, a traversing device including a winding head and means to reciprocate a yarn guide along said spindle, said winding head being pivotally mounted for movement in a direction at right angles to said spindle, control means acting to press said winding head against the side of a package mounted on the said spindle, said control means being responsive to pressure in a fluid supply line, a pressure reduction valve located in said fluid supply line, a cam and cam follower device connected both to said pressure reduction valve and said winding head whereby as said winding head moves away from said spindle said cam and follower device will actuate said pressure reduction valve to reduce the pressure in the fluid supply line to operate said control device to reduce the pressure exerted against the package by the winding head.

5. A yarn winding machine as claimed in claim 4, in which the control means comprises a cylinder, a piston working in said cylinder, one side of the piston being open to said fluid supply line, said piston being connected by a mechanical linkage to said winding head, movement of said piston causing said winding head to press with variable force against the side of the package.

6. A yarn winding machine according to claim 5 wherein said linkage comprises a pivoted sole plate carrying a motor to drive said driven spindle, said sole plate being connected to a pivotal arm carrying said winding head through a link.

7. A yarn winding machine comprising a driven spindle to receive a yarn take-up package, a traversing device including a winding head and means to reciprocate a yarn guide along said spindle, a yarn tensioning device located in the path of the yarn in advance of said traversing

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device, a fluid supply line connected to said tensioning device, alteration in the pressure of fluid in said supply line acting to alter the tension applied to the yarn passing through the tensioning device, a pressure regulator located in said fluid supply line and connected to said winding head whereby movement of said winding head away from the spindle in a direction at right angles to said spindle acts on said pressure regulator to reduce the pressure in the fluid supply line connected to said tensioning device, a control device acting to cause said winding head to bear against the side of a package mounted on said driven spindle, a second fluid supply line connected to said control device, variation in the pressure of said second fluid supply line being operative to alter the pressure of the winding head against the package, a second

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pressure regulator located in said fluid supply line and connected to said winding head whereby movement of said winding head away from said spindle also acts to reduce the pressure acting on said control device which acts to reduce the pressure at which the winding head bears against the package.

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