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B. A. PETERSON

2,190,106

WINDER

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Fig. 1.

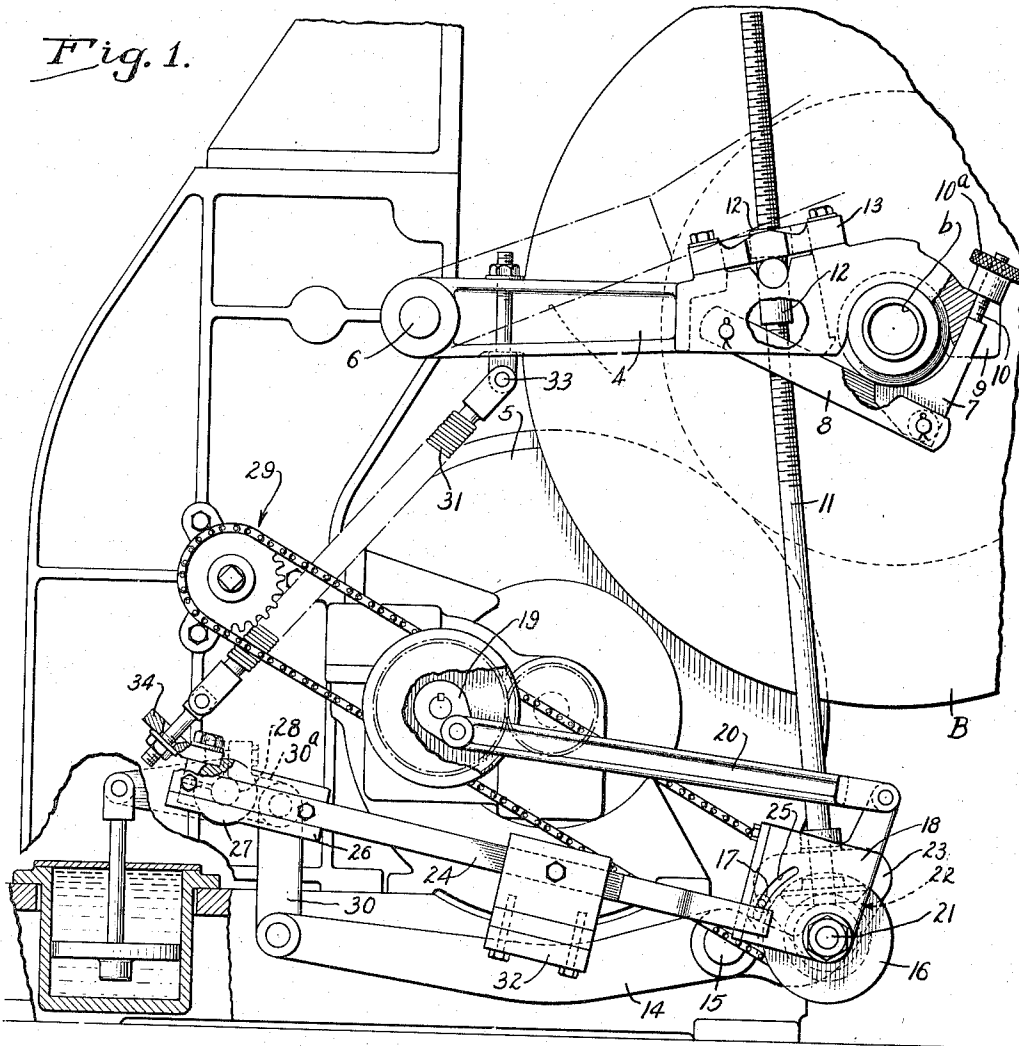


Fig. 2.

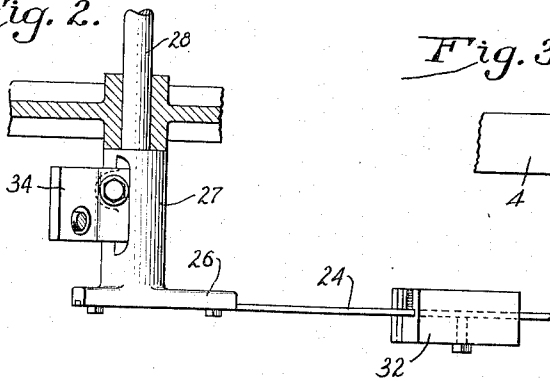
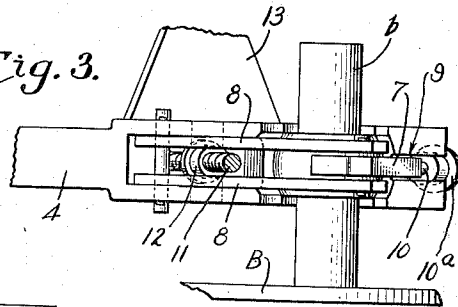


Fig. 3.



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WINDER

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11 Claims. (Cl. 28—26)

The invention relates to a machine for winding yarn onto a container such as a warp beam, and has more particular reference to a mechanism of the type shown in my prior Patent No. 2,070,371

for controlling the pressure between the yarn mass being wound and the friction driving drum.

Some classes of work require the winding of yarn onto a so-called dye beam, which after a yarn mass is wound thereon, is placed in a dye vat for the purpose of coloring the yarn. Because of the presence of acids in the dye, the beams are commonly made of metal. Such metallic beams are substantially heavier than wooden section beams and it has been found that because of this increased weight, the density of the yarn mass wound upon the beam is such as to prevent the free passage of the dyeing fluid therethrough. Moreover, the empty metallic dye beams vary substantially in weight.

With the foregoing in view, it is the object of the present invention to provide a mechanism which is operative to counterbalance the weight of the dye beam when supported in the winder in driving relation to the friction drum, and which is operative to compensate automatically for the gradually increasing weight of the yarn mass and also adjustable to compensate for dye beams of different weights, thereby insuring the production of yarn masses of the desired predetermined density.

In carrying out my invention, I employ a warper mechanism structurally similar in many respects to that shown in my said prior Patent No. 2,070,371.

In Fig. 1 of the drawing, I have shown a fragmentary end elevational view of such mechanism modified in accordance with my invention.

Fig. 2 is a fragmentary plan view partially in section to illustrate details of construction.

Fig. 3 is a fragmentary underside view showing a preferred form of means for detachably fastening the warp beam in position in the warper.

In the drawing, B designates a warp beam mounted in a warper of which one end only is shown. The beam is supported at each end upon an arm 4, in driving relation to a friction drum 5 rotatably mounted in the frame work of the warper and driven by any preferred means. One end of each arm 4 is pivoted to the warper frame at 6 and its other end carries a suitable clamping means cooperating with a trunnion b of the beam to hold the latter removably in place. Preferably said clamping means comprises a clamping member 7 pivoted on the end of a pair of links 8 having their other ends pivoted to the

arm 4. The free end of the arm is bifurcated as at 9 to receive a stem 10 rigid with the clamping member and threaded to receive a knurled nut 10^a.

Depending from the arm 4 at each end of the warper is a screw rod 11. Near its upper end it engages with a nut 12 carried by a cap member 13 which is secured to the arm adjacent the beam trunnion b. The rod 11 is supported at its lower end upon a lever 14 pivoted at 15. For the purpose of raising the arm 4 as the yarn mass increases in size, the screw rod is intermittently rotated. The mechanism employed to effect such intermittent rotation is the same as that shown in said prior patent. Briefly, it comprises a roller ratchet device having a disk 16 and a coacting roller 17 carried by a member 18 which is constantly oscillated by a crank disk 19 and pitman 20. The disk 16 is fast upon a shaft 21 connected by beveled gearing 22 to the rod 11, a yoke 23 being provided to form a connection between the rod and the shaft 21.

Operation of the roller ratchet to drive the screw rod 11 is under the control of an arm 24 having one end arranged to coact with the ratchet roller, which for this purpose is movable in an arcuate slot 25. The other end of the control arm 24 is secured to a cross bar 26 on a sleeve 27 (Fig. 2) which in turn is fast upon a rock shaft 28 supported in the warper frame. Movement of the rock shaft in a clockwise direction (Fig. 1) carries the free end of the control arm 24 downwardly so as to permit the ratchet roller to move into operative engagement with the disk 16, and movement in the opposite direction renders the ratchet drive ineffective. When desired, the screw rod 11 may be rotated manually by means of a chain and sprocket mechanism generally designated 29, just as in said prior patent.

The end of the lever 14 opposite that connected to the screw rod 11 is connected by a link 30 to a crank arm 30^a also fast on the rock shaft 28 so that when the rock shaft is turned in a clockwise direction the lever 14 is rocked in a direction to raise the screw rod and thereby impart a lifting movement to the warp beam. Such turning movement of the rock shaft is produced by the joint action of a contractile spring 31 and an adjustable weight 32.

The spring 31 is in the present instance connected at one end to the arm 4 at a point 33 located a short distance forwardly of the pivotal axis 6 of the arm. At its other end the spring

is connected to a short arm 34 rigid with the sleeve 27 and extending rearwardly therefrom. Thus it will be seen that as the yarn mass increases in size and the arm 4 is raised, the tension of the spring 31 is increased so as to exert a rotative force upon the rock shaft 28 in a clockwise direction as viewed in Fig. 1. Accordingly, the forward end of the lever 14 is raised together with the rod 11 connected thereto, thereby applying a lifting force to the warp beam. At the same time, the free end of the control arm 24 is lowered so as to render the roller ratchet mechanism operative to turn the screw rod. Thus the arrangement is such that the tension of the spring is intermittently adjusted to counterbalance the gradually increasing weight of the yarn mass.

The weight 32 is mounted on the control arm 24 so as to be effective in augmenting the counterbalancing effect produced by the spring 31 by an amount corresponding to the weight of the empty dye beam. Because, as above indicated, the dye beams vary in weight, the weight 32 is capable of adjustment so as to counterbalance exactly the weight of the dye beam which may be in use. Such adjustment is obtained in the present instance by shifting the weight longitudinally of the control arm. To increase the range of adjustment, the weight may be of sectional construction as shown clearly in Fig. 1.

It will be observed that by the construction and arrangement employed, it is possible to insure the winding upon a dye beam of a yarn mass of proper density to insure uniform results in the dyeing of the yarn. The gradually increasing weight of the yarn mass wound upon the beam is effectually counterbalanced by the spring 31 whose tension is automatically adjusted intermittently through the operation of the roller ratchet drive means for the screw rod 11; and the weight 32, being adjustable over a wide range, is capable of counterbalancing dye beams of widely varying weights without disturbing the tension of the spring in relation to the gradually increasing weight of the yarn mass.

In the operation of the apparatus described above an empty beam B is first positioned on the supporting arms 4 (Fig. 1). The weight 32 is then slid back and forth along the lever arm 24, and if necessary sections added to or removed from the weight 32, until the weight of the particular warper beam is counterbalanced to an extent sufficient to limit the pressure of the beam on the winding drum 5 to a preselected value. It will be noted that the counterbalancing force of the weight 32 is applied in a counterclockwise direction about the pivot 15 while the weight of the beam is applied in an opposite or clockwise direction about the pivot 15 (as viewed in Fig. 1). In particular, a downward force is applied to the lever 24 by the weight 32 so that a clockwise torque is applied to the rock shaft 28 and, consequently, a force is applied to the arm 14, through the medium of links 30^a and 30, in a manner tending to oscillate the arm 14 counterclockwise about the pivot 15. On the opposite side of the pivot 15, which supports the arm 14, the weight of the warper beam B applies a force downwardly through the rod 11 to the casting 23 and thence to the shaft 21 carried by the right hand end of the arm 14. It will thus be seen that in this initial counterbalancing operation the spring 31 plays no part. By adjusting the position and mass of the weight 32 in the manner just described any particular warper beam can be accurately

counterbalanced to a sufficient extent that a preselected pressure is applied by the beam B to the winding drum 5 upon which it rests.

Having initially adjusted the weight 32 to counterbalance the weight of the empty beam B, the winding of yarn on the beam may be initiated by rotation of the winding drum 5, which in turn drives the beam B through peripheral contact with the yarn mass on it. As the yarn mass is progressively formed on the beam the total weight of the yarn mass increases so that a progressively greater counterbalancing force is required in order to retain a substantially uniform pressure of the yarn mass against the winding drum 5. The additional counterbalancing force for this purpose is automatically applied by the spring 31.

To this end advantage is taken of the fact that the diameter of the yarn mass increases as the weight increases. The tension in the spring 31 is increased in proportion to the diameter of the yarn mass on the beam so that the spring tension increases roughly in proportion to the increases in yarn mass weight. In particular, an increase in the diameter of the yarn mass swings the beam supporting arm 4 counterclockwise (as viewed in Fig. 1). Furthermore, as the arm 4 moves progressively in a counterclockwise direction, the spring 31 is stretched out and exerts a correspondingly increasing torque on the rock shaft 28 tending to oscillate it clockwise. This clockwise torque on the rock shaft 28 is transmitted to the arm 14 through links 30^a—30 so that the arm 14 tends to turn counterclockwise about its pivot 15. In other words, a progressively greater force is applied about the pivot 15 in opposition to the force applied at the other side of this pivot from the beam B.

It is true that the tensioned spring 31 exerts a downward force on the beam supporting arm 4 which augments, rather than counterbalances the weight of the beam and yarn mass on it. This augmenting force is of little consequence, however, because of the leverage connections at the opposite ends of the spring 31. In particular, it will be seen that the upper end of the spring 31 is connected to the arm 4 at a point quite close to the pivot 6 so that the force applied to the arm 4 acts through a very short movement arm with respect to the pivot 6. At the lower end of the spring 31, however, the counterbalancing force is applied about the pivot 15 through the long lever arm 14 so that there is a very substantial force multiplication. The net effect is that as the beam supporting arm 4 is swung upward the resulting tension in the spring 31 causes a progressively increasing counterbalancing force to be applied about the pivot 15. It will thus be seen that with the arrangement described the pressure of the beam B on the winding drum 5 is maintained substantially uniform throughout the filling of the beam.

In the winding operation described above, since the beam supporting arm 4 swings counterclockwise a substantial distance, it is desirable that some means be provided for correspondingly lengthening the operative connection between the arm 4 and the right hand end of the lever arm 14. It is for this purpose that the rotatable rod 11 and travelling nut 12 are included. During the winding operation the counterclockwise movement of the beam supporting arm 4 gradually tends to release the downward thrust on the rod 11 so that the lever arm 14 pivots slightly in a counterclockwise direction and the arm 24

swings downward somewhat. This clears the end of the arm 24 from the ratchet roller 17 so that the latter is free to engage the ratchet disk 16 with the result that the rod 11 is rotated by means of the ratchet drive and threaded through the nut 12. This rotation of the rod continues until the nut 12 is moved axially along it a sufficient distance that the downward thrust on the rod 11 is increased until the lever system 14—30—30a—24 returns to its previous position and the end of the lever 24 again disables the ratchet mechanism. This adjustment operation is repeated at intervals throughout the winding of the yarn mass in the warper beam with the result that the effective length of the linkage between the arm 4 and the lever 14 is changed progressively to compensate for the progressive increase in the diameter of the yarn mass.

I claim as my invention:

1. In a winding machine, the combination of a friction driving drum, a warp beam upon which a yarn mass is to be wound, means for supporting the warp beam with the yarn mass in peripheral contact with said drum, and a counterbalancing mechanism including a spring, means for automatically adjusting the tension of the spring to compensate for the gradually increasing weight of the yarn mass being wound, and a weight adjustable to compensate for variations in the weight of different yarn beams.

2. In a winding machine, the combination of a friction driving drum, means for supporting a warp beam in driving relation to said drum including a pivotal support, a lever pivoted intermediate its ends, a spring operatively connecting said beam support with one end of said lever, means adjustably connecting the other end of said lever with the beam support, power driven means operative upon the adjustable connecting means as the size of the yarn mass being wound upon the beam increases in size so as to change the length thereof proportionately, said power driven means including an intermittently driven device and a control member for said device operable as an incident to an increase in the tension of said spring to render said device effective whereby to counterbalance the gradually increasing weight of the yarn mass being wound, and means for exerting an additional counterbalancing force on said lever adjustable to compensate for variations in the weight of different yarn beams.

3. In a winding machine, the combination of a friction driving drum, means for supporting a dye beam in driving relation to said drum, means including a spring operative automatically as the size of the yarn mass being wound increases to counterbalance the gradually increasing weight of the yarn mass, said counterbalancing means including a lever operatively connected with the warp beam, and manually adjustable means acting upon said lever to augment the counterbalancing effect of said spring by an amount proportional to the weight of the empty dye beam.

4. In a winding machine, the combination of a friction driving drum, means for supporting a warp beam in driving relation to said drum, and a counterbalancing mechanism including two counterbalancing means one operative to compensate automatically for a gradually increasing weight of the yarn mass being wound, and the other to compensate for variations in the weight of different yarn beams.

5. In a winding machine, the combination of a friction driving drum, means for supporting a

dye beam in driving relation to said drum, means operative automatically as the size of the yarn mass being wound increases to counterbalance the gradually increasing weight thereof, and manually adjustable means for augmenting the counterbalancing effect of said spring by an amount proportional to the weight of the empty dye beam.

6. In a winding machine, the combination of a driving drum, means for supporting a warp beam in driving relation to said drum, means including a spring operative automatically to exert a gradual increasing lifting force on said dye beam, and means adjustable independently of the spring means and operative to augment the lifting force exerted by the spring to compensate for variations in the weight of the different beams.

7. In a winding machine the combination of, a power driven winding drum, a warp beam, means including a pivoted supporting member for holding said warp beam generally above said drum with a yarn mass wound on the beam in peripheral frictional contact with the drum, whereby gravity forces the beam and yarn mass down against the drum, and means including a tension spring having one end thereof anchored to said pivoted member for exerting a counterbalancing force on said beam tending to hold the same away from said drum and which counterbalancing force varies in proportion to the diameter of the yarn mass on said beam.

8. A winding machine embodying a friction driving drum and a warp beam as well as means for movably supporting the warp beam above said drum and with a yarn mass wound thereon in frictional driving contact with the drum, characterized by the inclusion of means for automatically maintaining a substantially uniform pressure between said drum and the yarn mass on said beam irrespective of the increase in weight in the yarn mass as the latter is wound on to the beam.

9. In a winding machine, the combination of a friction driving drum, means for supporting a warp beam in driving relation with said drum, means for counterbalancing a portion of the total weight of the beam and yarn mass bearing against said drum, a connecting means adjustable in length and operatively connecting said counterbalancing means and said warp beam supporting means, power driven means operable automatically as the size of the yarn mass being wound upon the beam increases to adjust the length of said connecting means to change correspondingly the length thereof, said power driven means including an intermittently driven device and a control member for said device, and a weight adjustably mounted on said control member and operative to exert an additional counterbalancing force on said warp beam to counterbalance the weight of the empty beam.

10. In a winding machine the combination of a friction driving drum, means for supporting a warp beam in driving relation to said drum, means for counterbalancing a portion of the total weight of the beam and yarn mass bearing against said drum, a connecting means adjustable in length and operatively connecting said counterbalancing means and said warp beam supporting means, and power driven means operable automatically as the size of the yarn mass being wound upon the beam increases to adjust the length of said connecting means to change correspondingly the length thereof.

11. In a winding machine, the combination of a friction driving drum, means for supporting a

warp beam in driving relation to said drum, means for counterbalancing a portion of the total weight of the beam and yarn mass bearing against said drum, a connecting means adjustable in length and operatively connecting said counterbalancing means and said warp beams supporting means, power driven means operable automatically as the size of the yarn mass being wound upon the beam increases to adjust the length of said connecting means to change correspondingly the length thereof, said power driven means including a roller type ratchet mechanism and control means for intermittently rendering said ratchet means operative to adjust said connecting means.

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