W. G. DENN.

WARP BALLING MACHINE.

APPLICATION FILED JAN. 6, 1909.

942,813. Patented Dec. 7, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

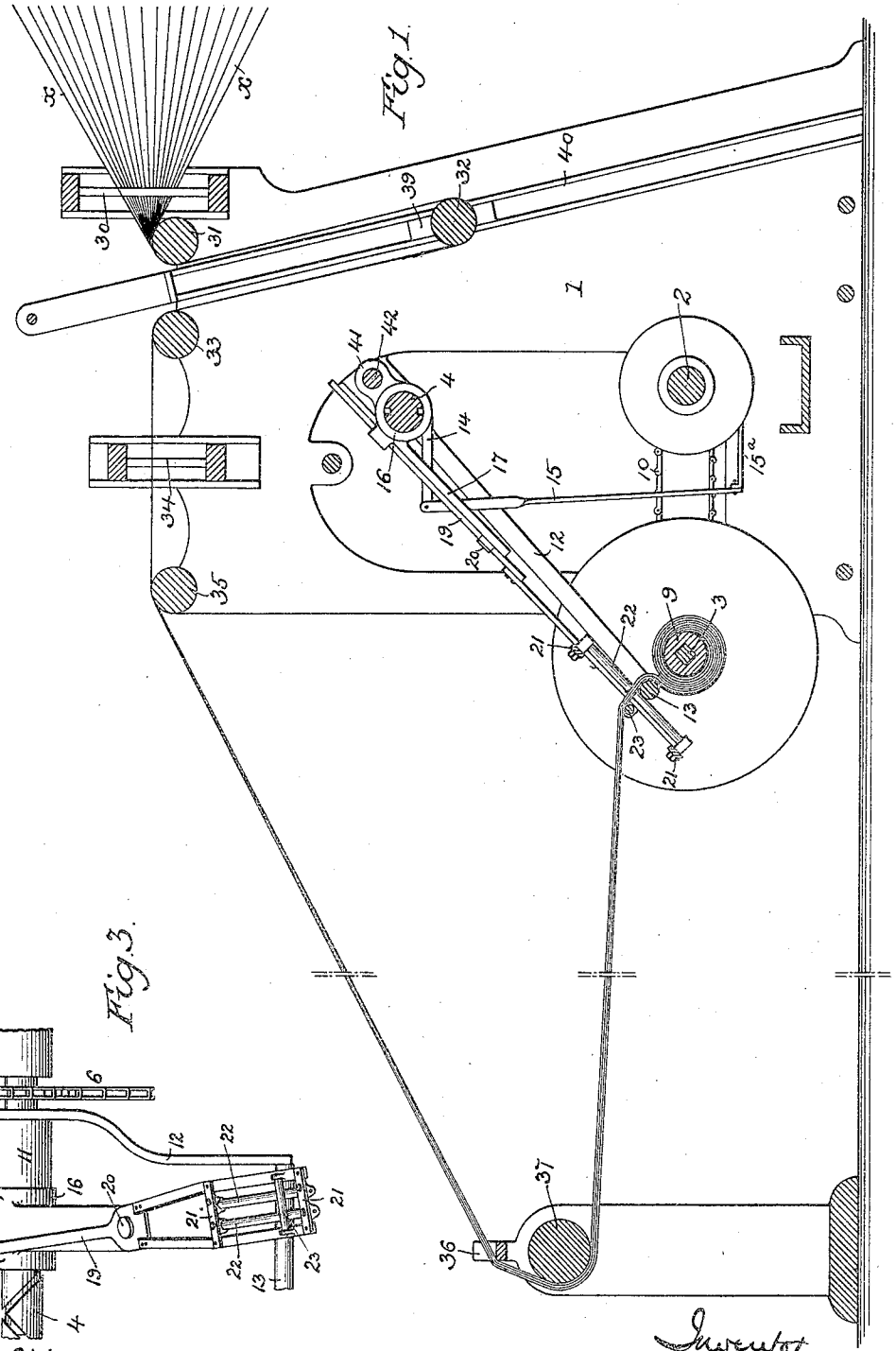
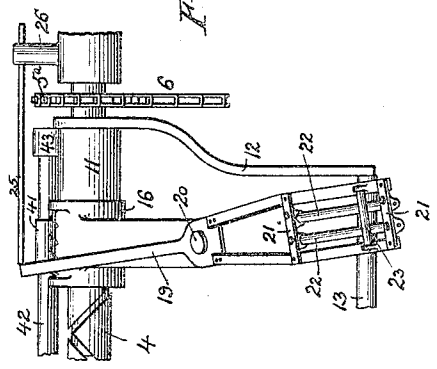


Fig. 3.



Witnesses
Harry L. Smith.
Hamilton D. Turner

Inventor
Walter G. Denn
by his attorneys
Smith & Baxter

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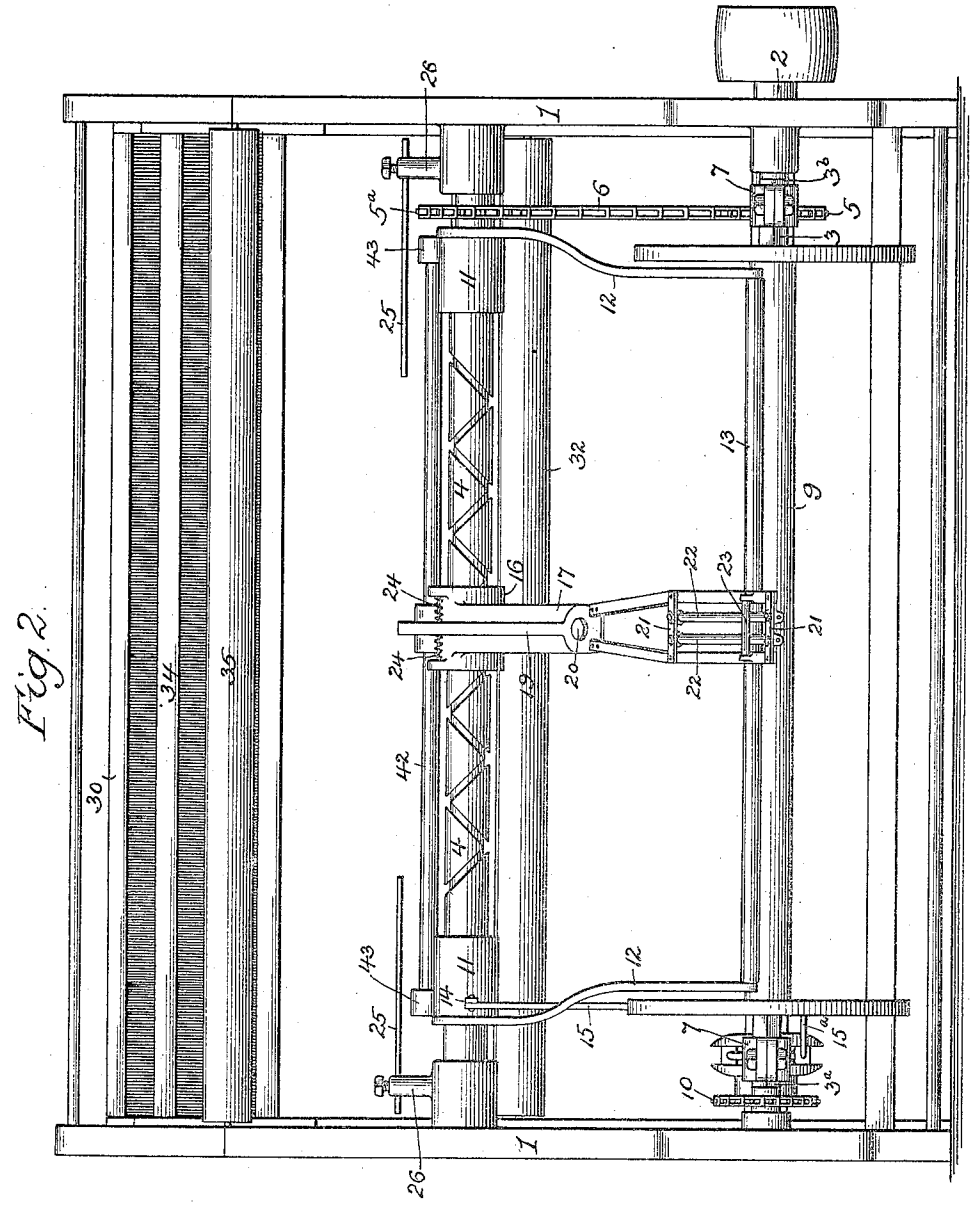

Fig 2.

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UNITED STATES PATENT OFFICE.

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WARP-BALLING MACHINE.

942,813. Specification of Letters Patent. Patented Dec. 7, 1909.

Application filed January 6, 1909. Serial No. 471,014.

To all whom it may concern:

Be it known that I, WALTER G. DENN, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Warp-Balling Machines, of which the following is a specification.

What is termed a "warp ball", and will hereinafter be referred to as such, is not, strictly speaking, a "ball" but a wooden core or spool (hereinafter termed a spool) upon which is wound, from end to end, the bunched warps, which may, for convenience, be termed a "warp rope", although it is not twisted.

Heretofore the warp ball has been rotated by surface contact with a driving drum in order to insure a uniform surface speed of the ball from beginning to end of the winding operation, but this method of winding is objectionable not only because of the pressure necessary to insure positive driving contact, but also because, at the ends of the ball, where the direction of the lay of the warp rope is reversed, the wind is thicker than in the intermediate portions of the ball, due to the fact that for a small fraction of time the guide is practically stationary while the rotation of the ball continues and this thicker wind imposes extra pressure upon the end portions of the ball and causes the breaking down of the same, which precludes the formation of a true and square end on the ball.

One object of my invention has therefore been to produce a perfectly wound and uniform ball without excessive pressure upon any part of the same, and a further object has been to prevent the thickening of the end portions of the ball as compared with the intermediate portions of the same. These objects I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal section of sufficient of a warp balling machine to illustrate my present invention; Fig. 2 is a front view of the same, and Fig. 3 is a detached view illustrating one of the features of my invention.

In the drawings, 1—1 represent opposite frames provided with bearings for the driving shaft 2, for the winding shaft 3, 3^a, 3^b, and for a cross threaded feed or traverse shaft 4, the latter being directly and positively driven at uniform speed from the main shaft 2 in any suitable manner, the means employed in the present instance for accomplishing this result being sprocket wheels 5 and 5^a located, respectively, on the driving shaft and on the screw shaft and connected by a chain 6, as shown in Fig. 2.

The winding shaft is composed of end members 3^a and 3^b, and a central member 3, which, during the operation of the machine, is in driving connection with the end members 3^a and 3^b through the intervention of suitable couplings 7 which engage squared portions of the shafts. These couplings are split and separable, and when they are separated the central member 3 of the winding shaft can be removed from or restored to position between the end members. This central member of the winding shaft is passed through the core or spool 9 upon which the warp ball is to be wound, and is introduced into the machine with said spool upon it before the winding operation is begun and is removed from the machine with the completed warp ball after the winding operation has been completed, being then removed from the spool on which the warp ball has been wound and re-applied to an empty spool for re-application to the machine.

The end member 3^a of the winding shaft has power applied to it in any desirable way from the differentially speeded member of any suitable form of speed changing device, that which I have selected for present illustration being one of the type shown in Letters Patent No. 681,144, dated August 20th, 1901, an endless chain 10 being, in the present instance, employed for transmitting motion from a sprocket wheel on said differentially speeded member of the device to a sprocket wheel on the end member 3^a of the winding shaft.

Mounted upon the screw threaded feed or traverse shaft 4 so as to be free to turn thereon are a pair of sleeves or collars 11, to which are secured arms 12, the latter carrying at their outer or lower ends a roller 13 which extends throughout the greater portion of the length of the spool 9 and bears upon the windings of the warp rope as the latter are applied to the spool. Another arm 14 upon one of the collars 11 is connected by a rod 15 to the controlling member 15^a of the speed-changing device with the effect that, as the windings accumulate upon the spool and increase the diame-

ter of the ball, the roller 13 will be lifted, the collars 11 partially turned, the arm 14 raised, and the controlling member 15ª of the speed-changing device so actuated as to gradually decrease the speed of the differentially speeded member of the same, and, as a consequence of this, the winding shaft will be rotated at a gradually decreasing speed from the beginning to the end of the winding operation in order to maintain a substantially uniform speed of surface rotation of the ball irrespective of its constantly increasing diameter, whereby the uniform speed of rotation of the speed screw 4 and the uniform rate of reciprocation of the traverse guide operated thereby will result in a uniform pitch or lay of the successive convolutions of the warp rope from the beginning to the end of the winding operation.

The guiding device for the warp rope is constructed and operated in the following manner: Upon the feed screw 4 is mounted a nut 16 having an inwardly projecting lug engaging the threads of the feed screw, so that continuous rotation of the latter in one direction will result in traversing the nut 16 from end to end of the feed screw, first in one direction and then in the other.

The nut 16 is provided with a projecting arm 17 upon which is mounted a lever 19, pivoted to the arm at 20, the lower arm of the lever being forked and the members of said fork being connected by transverse bars 21, which carry bearings for a pair of rollers 22, the latter contacting with the roller 13 and running upon the same with a minimum amount of friction as the nut 16 is traversed from one end of the feed screw to the other. The warp rope passes between these rollers 22 and around and under the roller 13, as shown in Fig. 1, and, in order to support the warp rope in its proper relation to the rollers 22, the opposite members of the forked arm of the lever 19 have bearings for a transverse roller 23 over which the warp rope passes before passing between the rollers 22, said warp rope being thereby fed to the warp ball without any material friction upon it and being wound without undue compression.

In order to prevent overloading or thickening of the ball at the ends I provide for accelerating the movement of the guide in respect to the rate of movement of the nut 16 at each end of the traverse of said guide, this quickening of the movement of the guide at each end of the ball counteracting the overloading effect which would otherwise be due to the temporary stoppage of travel of the guide at the time when the direction of movement of the nut 16 is being reversed at each end of the feed screw 4. This acceleration in the movement of the guide is effected by mounting the free end of the upper arm of the lever 19 between coiled springs 24 interposed between said lever arm and suitable stops on the nut 16, as shown in Fig. 2, and by providing, at each end of the machine, contact rods 25 for engaging the upper arm of the lever as the nut 16 approaches the limit of its movement at each end of the feed screw, contact of the lever with these rods causing said lever to swing upon its pivot 20 and this movement being added to the normal movement of the nut 16 at each end of the travel of the latter, movement of the lever in either direction compressing one of the springs 24, which causes back movement of the lever to its normal position as soon as the direction of movement of the nut 16 is reversed, this movement being also in excess of the normal movement of the nut whereby there is an increase in the pitch or angular lay of the warp rope at each end of the ball, which prevents undue accumulation or thickening of the wind at the ends and enables me to produce balls of uniform diameter throughout and with true and square ends.

The contact rods 25 are, by preference, longitudinally adjustable in their supports 26, in order that the accelerated movement of the yarn rope guide may be begun at any desired time before the nut 16 reaches the end of the feed screw and ended at any desired time after said nut starts on its back movement.

The warp threads or strands x are drawn from spools upon a conveniently located creel frame and pass first through a comb 30, thence around a guide roller 31, thence around a tension roller 32, thence around another guide roller 33 and through a second comb 34 to a guide roller 35, from whence they pass to a condensing or bunching device consisting of a loop or eye 36, of the desired width or diameter, whereby the strands are collected into a rope or bunch of the desired size which passes first around a guide roller 37, and thence to the directing roller 23 of the laying guide. The tension roller 32 is carried by bearings 39, which are free to slide in inclined guides 40 on the side frames, whereby the weight of the roller and its bearings is exercised to impart the desired degree of tension to the threads or strands, and take up any slack which may be produced by reason of the overrunning of the spools by momentum after the winding operation has been completed.

In order to prevent turning of the nut 16 upon the feed screw 4 a lug 41 at the back of said nut engages and is free to slide longitudinally upon a rod 42 mounted at its ends in similar lugs or projections 43 on the sleeves or collars 11, as shown in Fig. 2.

While I have illustrated and described my improved warp balling machine in the form in which I prefer to construct the same, my invention in its broader embodiments is not

limited to such specific construction, many modifications of detail being permissible within the scope of my invention.

I claim:—

1. The combination, in a warp balling machine, of a winding device, and means for laying the warp rope, said means comprising a screw-actuated nut and a guiding lever pivotally mounted upon said nut so as to have movement, irrespective of the latter, to increase the speed of movement of the guiding device in respect to that of the nut.

2. The combination, in a warp balling machine, of a winding device, and a warp rope guiding device comprising a screw-actuated nut, a lever pivoted thereto and carrying a guide for said warp rope, and means for contacting with said lever and imparting movement thereto as the nut approaches the limit of its travel in either direction.

3. The combination, in a warp balling machine, of a winding device, a warp rope guiding device comprising a screw-actuated nut, a lever pivoted thereto and carrying the guide for said warp rope, means for contacting with said lever and imparting movement thereto as the nut approaches the limit of its travel in either direction, and springs for returning the lever to normal position after such movements.

4. The combination, in a warp balling machine, of a winding device, a guiding device for the warp rope, comprising a pair of guide rollers between which said rope passes and a superposed transverse roller over which it passes, and means for longitudinally reciprocating said guiding device.

5. The combination, in a warp balling machine, of a winding device, a roller for contacting with the surface of the ball, a guiding device having a pair of rollers contacting with said first mentioned roller and receiving the warp rope between them and a superposed transverse roller, whereby said warp rope is directed to said pair of rollers.

6. The combination, in a warp balling machine, of a winding device, a guiding device for the warp rope comprising a pair of guide rollers between which said rope passes, and a guide roller disposed transversely to said pair of rollers, and means for longitudinally reciprocating said guiding device.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

WALTER G. DENN.

Witnesses:

HAMILTON D. TURNER,

ELSIE FULLERTON.