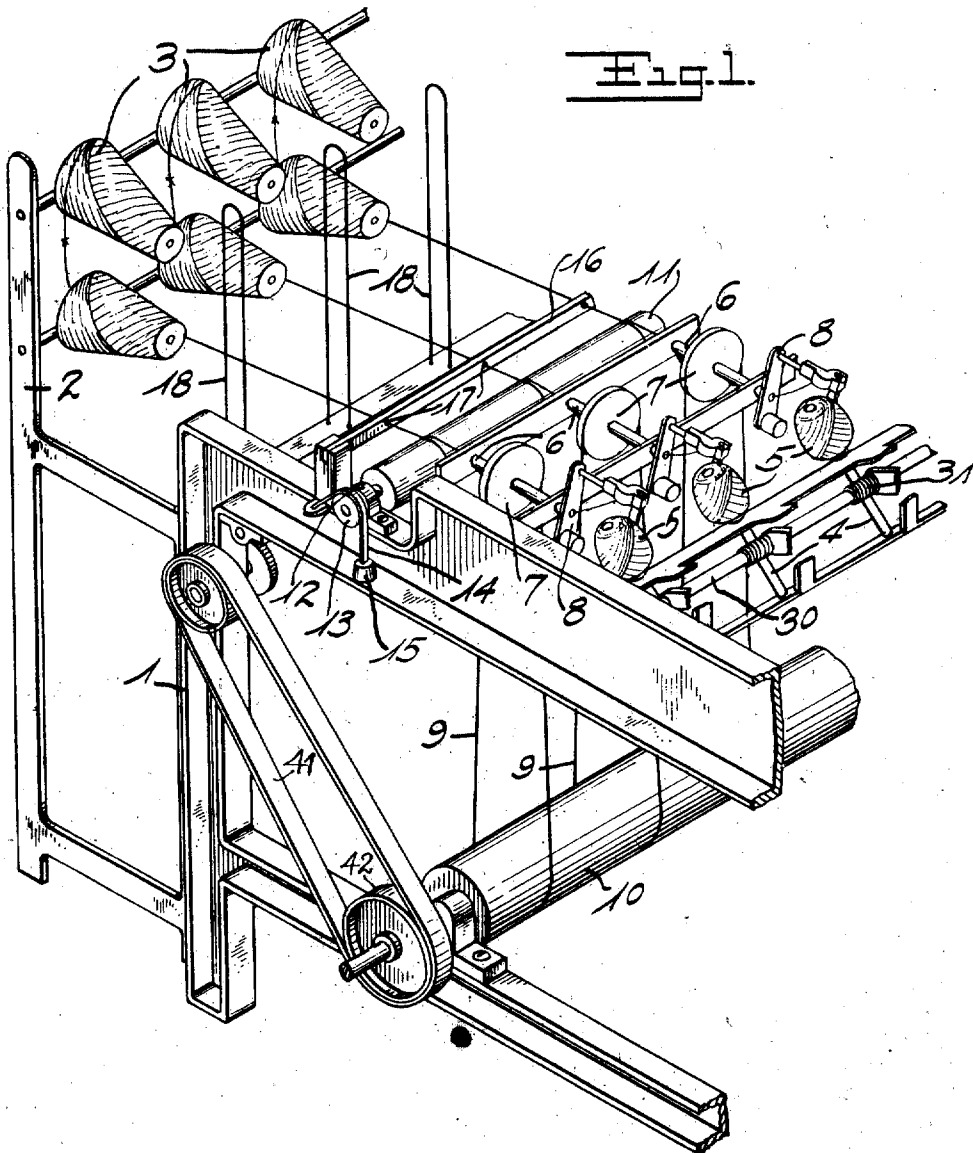


1,250,436.

Patented Dec. 18, 1917.
2 SHEETS—SHEET 1.

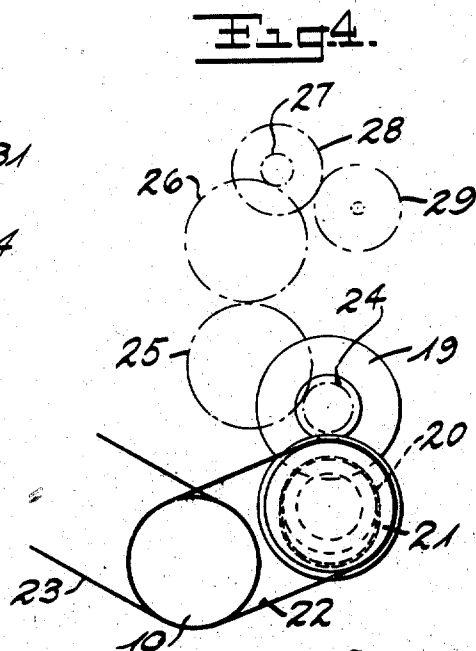
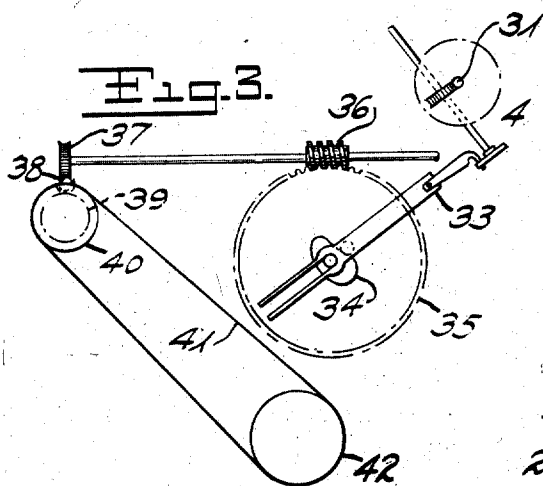
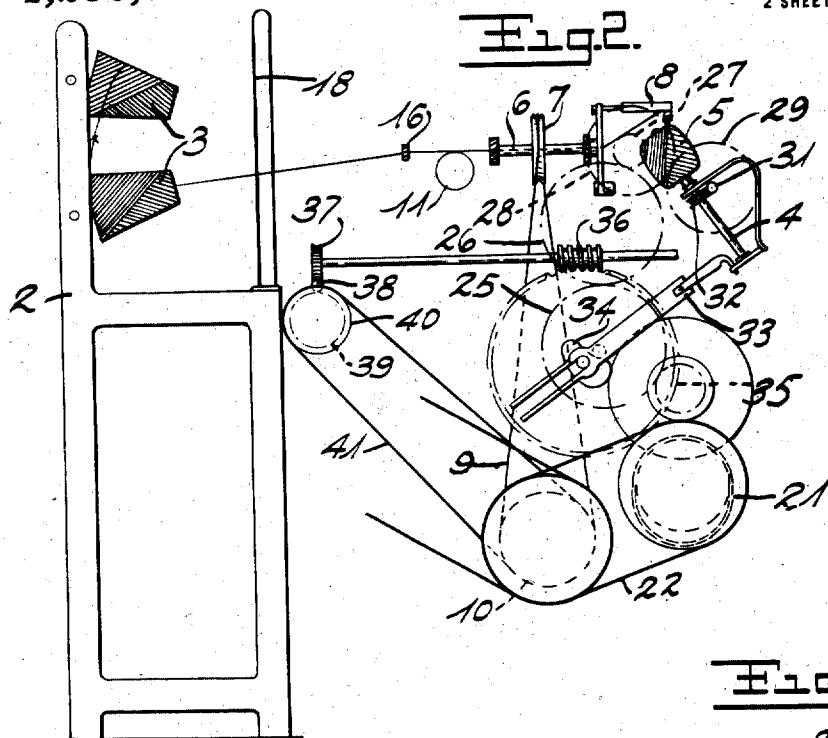


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M. CURRY.
BALLING MACHINE.
APPLICATION FILED APR. 6, 1917.

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2 SHEETS—SHEET 2.

1,250,436.



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UNITED STATES PATENT OFFICE.

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BALLING-MACHINE.

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To all whom it may concern:

Be it known that I, MALCOLM CURRY, a citizen of the United States, residing at Holyoke, county of Hampden, State of Massachusetts, have invented a certain new and useful Improvement in Balling-Machines, of which the following is a full, clear, and exact description.

My invention relates to balling machines and has for its object to provide a machine for simultaneously winding a plurality of threads (by which I mean any twisted strands of yarn, embroidery cotton, cord and the like) into a corresponding number of balls of substantially uniform size, weight and compactness. A further object is to provide means for equalizing the tension on a plurality of threads being balled. A further object of my invention is to decrease labor now necessary in balling and to reduce loss and waste in balling thread and the like.

Heretofore in balling machines independent tension-producing devices have been used for the various threads passing to the fliers, the result being that any error or change in adjustment resulted in unequal tensions upon the various threads, a similar result being also produced by any variation in the threads themselves or variation in the action of any of the tension devices. Such variations are liable to result in a poorly balled product, since the balls wound with the greater tension are more compact, and balls wound during the same winding period with different tensions, vary in size and in weight. Moreover, if a ball is wound with too great a tension, it will be pulled out of shape and snarled so that the yarn thereon is wasted.

In the old apparatus it was particularly difficult to make a uniform adjustment for balling tensions because the tensions for much of the balling has to be a light tension in order that the ball shall not be too compact or hard, and another object of my invention is to provide a balling machine having means for securing interdependent tensions on the various threads which are not only substantially the same for all threads, but are light. Another object of my invention is to provide means for delivering a plurality of threads to the balling fliers at substantially uniform rates and interdependent tensions determined by the

combined pull of all of said threads. Another object is to provide means for simultaneously adjusting the tensions on all of the threads.

In carrying out my invention, I use a tension equalizer which is common to a plurality of threads controlled thereby. I preferably make this in the form of a very light hollow continuous roller, mounted so as to be freely revoluble under the combined pull of the series of threads in engagement therewith, and having a contact surface in engagement with said threads sufficient to provide friction great enough to prevent the threads slipping thereon when the tension is that normally desired. This tension equalizer is also a speed equalizer which maintains the speed of the several threads equal at any given time, in spite of the fact that such equal speed varies from time to time.

Where the number of threads used is likely to be at some times the full capacity of the machine and at others substantially less than full capacity, I preferably mount the roller in anti-friction bearings and provide a brake to be used when the machine is used at full capacity so that the tensions on the threads may be made the same for full capacity or less. This brake is a variable brake so that it can be adjusted for any number of threads above the number required to actuate the roller so as to supply the desired tension when the brake is out of action.

The following is a description of an embodiment of my invention, reference being had to the accompanying drawings, in which:

Figure 1 shows in perspective a machine embodying my invention;

Fig. 2 is a longitudinal section of the same;

Fig. 3 is a diagram showing the gear train for tipping the ball-holding spindles, and

Fig. 4 is a similar view showing the gearing for revolving the ball spindle.

Referring more particularly to the drawings, 1 is a frame supporting a creel 2 for cones 3 of thread including yarn, crochet and embroidery cotton and the like located at one side of the frame, at the other side of which is a multiple balling mechanism including the ordinary revolving and tipping spindles 4, on which the balls 5 are wound, and fliers made up of the hollow shafts 6, pulleys 7 and arms 8 and suitably mounted. The shafts carrying the

pulleys 7 are driven by bands or belts 9 from a common drive roller 10 driven from any convenient source of power so that the fliers always revolve at substantially the same rate. Between the fliers and the creel 2 is located a roller 11. This roller is mounted so as to revolve in bearings 12 which are preferably anti-friction bearings and has its shaft provided with a brake pulley 13 which is engaged by a brake strap 14 carrying a variable load, such as a weight 15 so that a variable braking effect can be produced upon the roller or the braking effect entirely removed therefrom. Between the roller 11 and the creel 2 is a bar 16 having a plurality of guide openings 17 through which the yarn passes, these guide-openings being out of alinement with the vertical planes passing through the axes of the hollow shafts 6 of the fliers. The result of this is that as a thread is wound once around the roller 11 in passing from the guide 16 to the shaft 6, it is spaced apart so as to not rub against itself in going from the guide to a flier. The axes of the flier shafts 6 are preferably substantially tangential to the roller 11 at the points where the threads leave the roller in passing to the fliers, as shown in Fig. 2. Between the guide-bar 16 and the creel 2 are hairpin separators 18, between each pair of which a thread passes, as shown in Fig. 2, in order to prevent the thread from one cone whipping onto the thread from an adjacent cone. Preferably the creel 2 provides means for supporting two cones 3 so as to point substantially toward a corresponding guide opening 17 and the roller 11 for supplying thread to a single flier, the inner end of one cone being connected to the outer end of the other so as to permit of the replacement of a full cone for an empty cone at any time without interrupting the action of the machine.

The spindles 4 are rotated about their axes in the ordinary manner by a train of gearing illustrated diagrammatically in Figs. 2 and 4. A cone pulley 19 is driven, through a belt 20, by another cone pulley 21, which is driven by a contact belt 22 from the cylinder 10, which is itself driven by suitable power through the belt 23. The cone pulley 19 drives a gear 24 meshing with the gear 25, which in turn meshes with the gear 26, which through the gear 27 drives a shaft carrying the gear 28, which in turn drives the gear 29, which is mounted upon an elongated shaft 30 bearing worms 31, which engage with worm gears 32 mounted upon the several spindles 4. By this means the spindles 4 are given the necessary rotation during the operation of the machine.

The spindles 4 are tipped about the axis of the shaft carrying the worms 31 by means of an arm 33 which engages and is actuated by a cam 34 driven by a gear 35, which in

turn is driven by a worm 36, on a shaft actuated by a worm gear 37 and worm 38 driven by a gear 39, which is connected by a pulley 40 and belt 41 with a pulley 42 on the shaft of the roller 10. This mechanism tips the ball spindles in the ordinary manner.

In the operation of balling machines, the rate at which the thread is drawn off from the cones varies with the size of the ball. In operating these machines, the winding of all the balls is begun at the same time so that all the threads move through the fliers at substantially the same rate, although that rate varies according to the size that the ball has reached. In my machine, the threads as they pass around the roller 11 act upon the roller so as to revolve it on account of their combined pulls thereon, thus producing a uniform rate of delivery to all the fliers, which is dependent upon all the pulls and resulting in a substantially uniform tension upon the threads passing to all the fliers, the speeds and tensions of the threads delivered, therefore, being interdependent and substantially equal. Moreover, the tension is substantially constant although the speed of the thread varies.

The roller 11 is preferably made as light as possible and I form it of a hollow cylinder, lightly mounted. This cylinder is so made as to present a smooth surface. The contact of the thread therewith is such that under ordinary or desired tension the threads do not slip thereon. For winding soft cotton into loose balls I preferably wind the threads at least once around, making the diameter of the cylinder 11 about $2\frac{1}{4}$ inches, and the weight and diameter of the cylinder such that with the minimum number of threads that will be likely to be used, the turning pull on the individual threads will be such that a ball will be formed with sufficient compactness to be self-supporting, and still not be hard. If twice as many threads are in use, of course the pull on the individual threads would be half as much unless means were provided for increasing their tension. In order to increase the tension under such circumstances, I apply the brake 14, 15, adjusting the weight 15 to the proper degree for the number of threads and in this way whatever may be the number of threads above the minimum, I am able to secure the desired interdependent tension by properly adjusting the brake. I have shown my equalizing roller in the form of a continuous roller and that is the preferred form of construction.

As will be evident to those skilled in the art, my invention permits of various modifications without departing from the spirit thereof or the scope of the appended claims.

What I claim is:

1. In a balling machine, the combination

of a creel for delivering a plurality of threads to be balled, a plurality of balling mechanisms comprising a flier for each of said threads, means for rotating said fliers, and means actuated by the combined pulls of said threads for producing interdependent and substantially equal tensions on said threads as they are delivered to said fliers.

2. In a balling machine, the combination of a creel for delivering a plurality of threads to be balled, a plurality of balling mechanisms comprising a flier for each of said threads, means for rotating said fliers at substantially equal speeds, and rotating tension producing and equalizing means engaged by and mechanically connecting all the threads passing to said fliers and rotated by the combined pull of said threads thereon at a speed varying as the speed of said threads.

3. In a balling machine, the combination of a creel for delivering a plurality of threads to be balled, a plurality of balling mechanisms comprising a flier for each of said threads, means for rotating said fliers at substantially equal speeds, and rotating tension producing and equalizing means engaged by and mechanically connecting all the threads passing to said fliers and rotated by the combined pull of said threads thereon at a speed varying as the speed of said threads, the engagement of each thread therewith producing a friction sufficient to prevent slipping of the thread on the friction surface.

4. In a balling machine, the combination of a creel for delivering a plurality of threads to be balled, a plurality of balling mechanisms comprising a flier for each of said threads, means for rotating said fliers at substantially equal speeds, rotating tension producing and equalizing means engaged by and mechanically connecting all the threads passing to said fliers and rotated by the combined pull of said threads thereon at a speed varying as the speed of said threads, and means for braking said tension producing and equalizing means.

5. In a ball winder, the combination of a creel adapted to carry a plurality of supplies of thread, a series of fliers having hollow shafts for balling the threads, means for imparting to said fliers substantially equal speeds, and a light weight tension roller located between said creel and said fliers and adapted to be engaged by the threads passing from said creel to said fliers, and rotated

by the combined pulls of said threads, said supplies being cone-shaped cops having their axes pointing substantially toward said roller.

6. In a ball winder, the combination of a creel adapted to carry a plurality of packages of thread, a series of fliers having hollow shafts for balling the thread, means for imparting to said fliers substantially equal speeds, a tension roller located between said creel and said fliers and adapted to be revolved by the combined pull of the threads passing from said creel to said fliers, the axes of the flier shafts being substantially tangential to the cylindrical surface of said roller at the point where the threads leave it.

7. In a ball winder, the combination of a creel adapted to carry a plurality of packages of thread, a series of fliers having hollow shafts for balling the thread, means for imparting to said fliers substantially equal speeds, a light weight tension roller located between said creel and said fliers and adapted to be revolved by the combined pulls of the threads passing from said creel to said fliers, and guides for said yarn located between said creel and said roller and lying outside of the vertical planes passing through the axes of said fliers.

8. In a balling machine, the combination of a creel, a plurality of balling fliers, means for revolving said fliers at substantially equal speeds, and means revolved by the combined pull of said threads for determining and substantially equalizing the tension of threads supplied to said fliers from said creel, the means for determining the tension of any one thread being controlled by all the threads.

9. In a balling machine, the combination of a creel, a plurality of balling fliers, means for revolving said fliers at substantially equal speeds, means revolved by the combined pull of said threads for supplying to said fliers threads from said creel under substantially the same tension, and means for simultaneously adjusting the tensions of all of the threads passing to said fliers.

10. In a balling machine, the combination of a creel, a plurality of balling fliers, means for revolving said fliers at substantially equal speeds, and means actuated by the combined pull of said threads for supplying yarn to all of said fliers at substantially equal rates of speed, increasing as the size of the balls being wound increases.

MALCOLM CURRY.