

Sept. 6, 1955

K. P. SWANSON

2,716,780

TOP ROLL FOR DRAWING MECHANISMS

Filed Feb. 16, 1952

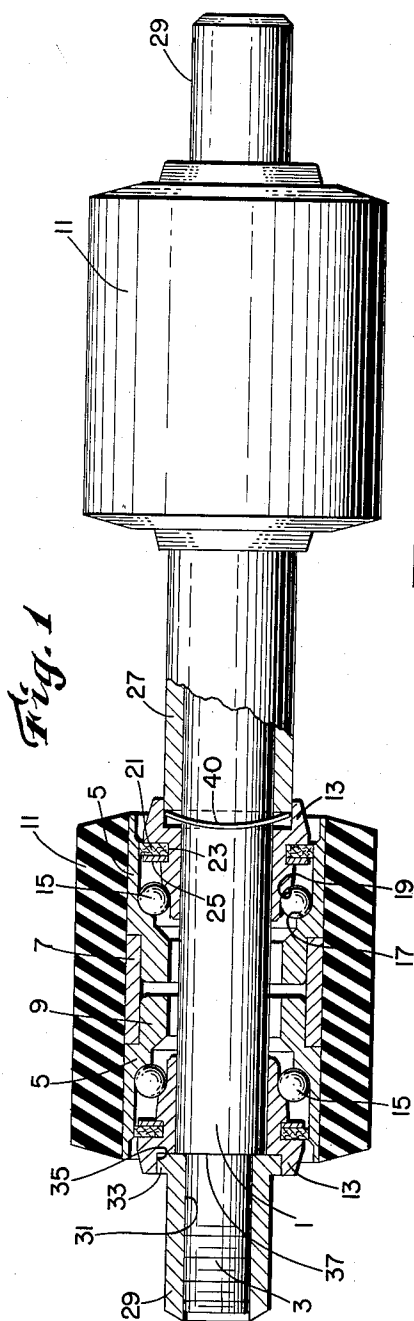


Fig. 1

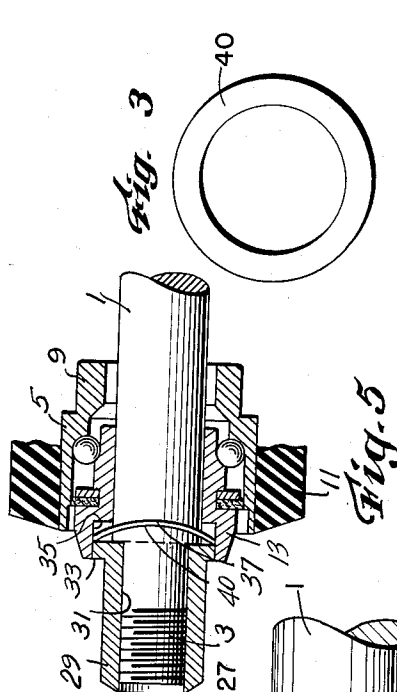


Fig. 3

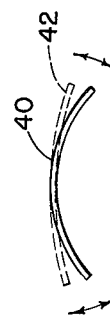


Fig. 4

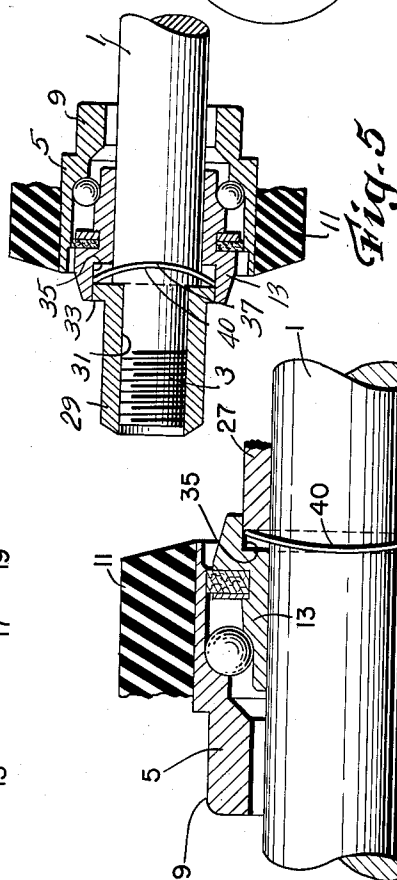


Fig. 2

Kenneth P. Swanson,
Inventor
 by Robert K. Randall,
Attorney

1

2

2,716,780

TOP ROLL FOR DRAWING MECHANISMS

Kenneth P. Swanson, Abington, Mass., assignor to Textile Engineering Corporation, Whitman, Mass., a corporation of Massachusetts

Application February 16, 1952, Serial No. 271,903

13 Claims. (Cl. 19—142)

This invention relates to top rolls for spinning and roving frames, and in particular to shell rolls of the anti-friction type in which the bosses are formed of shells rotating on ball bearings about an axle or shaft which remains stationary in the cap bars of the frame. While the superiority of these ball bearing shell type rolls over the older solid type rolls in many respects is well recognized, their relatively greater first cost and the need for skill and care in adjusting them has hindered the full realization of their advantages.

In the ball bearing types of top rolls as commonly constructed the bearing balls run on cones which require to be shifted manually along the shaft to adjust the bearings and then fixed in position, and such adjustment requires a considerable degree of experience, skill, and care to eliminate all play and resulting wobble of the roll shells or the alternative fault of setting the bearings too tight for free rotation, either error in adjustment producing defective yarns. This factor has impeded the general adoption of the anti-friction type shell roll, since the mills employing such top rolls have recurring occasion to take the rolls apart to renew the cots thereon and to clean out and renew the grease employed therein for lubrication. Since unskilled employees and ones seldom familiar with the problems are often used on this job, reassembly of the top rolls with lack of proper experience and training in the necessary adjustment of the bearings usually puts a relatively large proportion of the top rolls out of working order, with ensuing unwarranted condemnation of the rolls.

This problem of bearing adjustment is also a source of difficulty to the manufacturer of the top rolls as well, and is reflected in the cost of the rolls. In the different types of ball bearing top rolls there are from 8 to 12 or more points in the length of the roll where lost motion or slack can arise as a result of the unpredictable cumulative effect of the tolerances which must be allowed in manufacturing the individual parts. In many types of these rolls, the outermost cones are in screw-threaded engagement with the shaft for adjustment purposes or are positioned by similarly screw-threaded sleeves, these parts in both cases extending outward beyond the roll shells for accessibility in adjusting, often being extended out to the ends of the shaft as end caps which fit into the notches of the cap bars and thus hold the top rolls in their working positions. Since the eventual over-all length of the top roll or the total span of the roll shells is the product of the algebraic sum of all the tolerances as they might occur in any given roll, there was no way of governing this eventual length closely enough to hold it within the requisite $\frac{1}{32}$ " tolerance. Further, adjusting screws have conventionally been provided to hold the adjustable cones or the end caps in place, and the insertion of these screws and the attendant manipulation of the cones in taking up the play and setting the parts accurately to give the proper bearing tensions have been time-consuming operations additionally requiring considerable training and skill on the part of the adjustors.

Eventual wear in the bearings likewise gives rise in the mills to occasion for readjustment to take up slack, which similarly evokes the risk of impairing the operation of the top rolls by improper setting of the bearings.

With the object of avoiding these difficulties in the making and use of these anti-friction top rolls so as to make them cost less and work better, I have devised a novel and improved construction in which the end caps or other members which retain the slidably mounted cones on the shaft, are made to seat against stops formed on the shaft. These members serve to load one or more resilient members serving as a spring or springs which urge one or more of the cones into its or their roll shells and thus automatically take up all slack throughout the whole series of parts on the shaft and adjust the bearing tension. The stops on the shaft predetermine the inmost positions attainable by the end caps and thus limit the extent of spring loading and thus the bearing tension to the degree needed for proper working of the top roll in use. In the preferred form a simple metallic spring washer is seated in the recessed inward end of each cone which is adjacent to the saddle-engaging sleeve or neck at midlength of the top roll, the spring bearing against the cone and the end of the sleeve or a shoulder on the neck.

This construction eliminates the adjusting screws hitherto required to be provided in the end caps or otherwise for adjustably positioning the outer cones or end caps, saves a very substantial amount of time otherwise required from assembling in adjusting the bearings to get rid of end play, obviates the need for skill and experience in setting the bearing tensions, avoids all possibility of setting the bearings too tight, and makes it possible to predetermine the over-all length of the roll before assembly. It reduces the variable dimensions hitherto introduced at a dozen or so points to one, namely the distance between the shoulders formed at the terminus of the screw-threaded extremities of the shaft on which the end caps are screwed, these shoulders being located outwardly of the cones because the cones are mounted on the full-diameter surface of the shaft to hold the cones in true coaxial relation.

Thus in assembling the roll the end caps or cones are simply screwed onto the shaft as far as they will go, bringing up against these shoulders. These shoulders thus act as stops limiting to a very narrow scope the amount of compression of the circular spring washer, and hence the amount of tension which can be built up in this spring. The spring creates and governs the exact bearing tension for which it was calculated, and eliminates the need for close tolerances in making the various parts, the construction requiring only that the total length of the parts on the full-diameter portion of the shaft be less than the distance from shoulder to shoulder on the shaft. The working range of the spring between extremes of its possible deformation is easily made to lie where its resistance or tension remains substantially constant. It cannot be overstressed or immobilized, no matter how tightly the cones or end caps may be screwed onto the shaft.

An illustrative embodiment of the invention is shown in the accompanying drawings, in which

Fig. 1 is a side elevation of a top roll according to the invention, shown partly in axial section.

Fig. 2 is an enlarged axial section of the parts at the spring end of the sectioned roll shell of Fig. 1.

Figs. 3 and 4 are face and edge views of the circular spring.

Fig. 5 is an axial section of one end of a top roll showing the spring means located at the outer end of the roll shell.

The improved roll comprises a shaft 1 which is of

3

uniform diameter throughout its length except that its end portions 3 are of reduced diameter and externally screw-threaded. Each of the roll shells is composed of two oppositely disposed cup-shaped elements 5 joined by a ferrule 7 within which their reduced necks 9 are press-fitted and rigidly held. The exterior of ferrule 7 is flush with the full-diameter portions of cups 5, and the usual cot 11 is adhesively mounted on the cylindrical outer surface thus formed.

A pair of opposed cones 13 freely slidable on shaft 1 support each roll shell for free rotation about shaft 1 by means of intervening bearing balls 15 rolling in raceways 17, 19, in cups 5 and cones 13, respectively. The bearings are shielded from entry of fibers by lint seals comprising felt washers 21 held in grooves 23 in the cones by metal washers 25.

The two roll shells are held in properly spaced relation to suit the gage of the frame in which they are to be used by an intervening spacing sleeve 27 fitting closely but slidably upon shaft 1, and by end caps 29 the inward portion of whose bore 31 is smooth and fits closely about the plain inner half of each end portion 3, while the remainder of the bore is reduced and threaded to screw upon the threads cut in the outer half of the length of end portion 3. The outward end of each end cap 29 is open, and the inward end is flanged at 33 to fit accurately within a recess 35 in the big end of adjacent cone 13. The diameter of this flange 33 is made the same as that of sleeve 27, so that all four cones of the top roll may be identical while permitting the fitting of the ends of sleeve 27 into the recesses 35 of the inward pair of cones 13. The construction, mounting, and lint-sealing of the roll shells is covered in Cotchett U. S. Patent No. 2,644,202, granted July 7, 1953.

In accordance with the invention, a spring 40 of resilient material herein of sheet metal spring stock in the form of an endless circle transversely bent as shown in solid lines in Fig. 4, surrounds shaft 1 and is confined in the recess 35 of one cone of each roll shell, preferably each inward cone 13, and is kept therein by the adjacent end of sleeve 27. Alternatively, spring 40 can be put in the outer cone 13 and retained by the flange 33 of the end cap. This spring washer thus bears against the spacer sleeve 27 as an abutment at diametrically opposite points, and against the bottom of recess 35 at diametrically opposite points 90° removed from the first. The axial dimensions of the parts composing the roll are so chosen that when both end caps 29 are screwed down tightly against the shoulders 37 at the junction of the full diameter portion of shaft 1 and each reduced end portion 3, the two springs 40 will be flattened to about the shape indicated in dotted lines at 42 in Fig. 4.

The tension thus imparted to springs 40 slides each inward cone 13 axially outward, causing its balls 15 to shift the entire roll shell outwardly until an equal pressure is set up between the balls of the outward cone 13 and its cooperating cup 5 and thence between such cone and the inward radial face of flange 33 of end cap 29. Since sleeve 27 is free to slide along shaft 1, it takes a position where the reaction of both springs 40 is equal.

Thus the bearing tension throughout the entire top roll is automatically equalized. It is predetermined within limits narrow enough for all practical purposes by control of the distance between the shoulders or abutments 37 at the opposite ends of shaft 1 during manufacture. As the bearings wear down in use, springs 40 make automatic compensation by shifting the inward cones 13 outwardly to take up any slack, thus preventing wobble of the roll shells at all times. The parts are maintained in assembled relation by screwing the end caps 29 up tight against the stops provided by shoulders 37, thus obviating the need for adjusting screws, set screws, or any other locking means. This operation is performed simply by holding one end cap and turning the other until neither will go further, a job within the ability of even the most

4

unskilled help. No amount of excessive tightening of these end caps can increase the bearing tension, to cause the roll shells to drag or bind. Unscrewing of either end cap permits complete disassembly of the roll without additional tools.

Spring 40 is efficiently shielded from being clogged and immobilized by lint, by the close sliding fit of sleeve 27 within the angular wall of recess 35, and by the extent of overhang of such recess along the surface of the sleeve. No relative rotation to enwrap the fibers of the material being drawn occurs at this point, the sleeve 27 like the shaft and cones being held stationary by the saddle of the weighting means.

While I have illustrated and described a certain form in which the invention may be embodied, I am aware that many modifications may be made therein by any person skilled in the art, without departing from the scope of the invention as expressed in the claims. Therefore, I do not wish to be limited to the particular form shown, or to the details of construction thereof, but

What I do claim is:

1. A top roll having in combination a shaft, a roll shell, opposed cones sliding on the shaft, bearing balls between the cones and the roll shell, resilient means urging one cone toward the other, means shiftable axially of the shaft to load the resilient means, and stop means on the shaft limiting the extent of shift of the loading means in the loading direction.

2. A top roll having in combination a shaft, a roll shell, opposed cones sliding on the shaft, bearing balls between the cones and the roll shell, a resilient washer urging one cone toward the other, means shiftable along the shaft to load the resilient washer, and stop means on the shaft limiting the extent of shift of the loading means in the loading direction.

3. A top roll having in combination a shaft, a roll shell, cones slidable on the shaft, bearing balls between the cones and the shell, resilient means urging one cone toward another, and an end cap holding the latter cone, the shaft having means thereon predetermining the inmost position of the end cap.

4. A top roll having in combination a shaft, a roll shell, cones slidable on the shaft, bearing balls between the cones and the shell, resilient means urging one cone toward another, and an end cap holding the latter cone on the shaft, the shaft having abutment means thereon limiting the approach of the end cap toward the resilient means.

5. A top roll having in combination a shaft having a shoulder, a roll shell, cones slidable on the shaft, bearing balls between the cones and the shell, a sleeve having its inmost position fixed by the shoulder, one of such cones positioned by such sleeve, and resilient means urging a second cone toward this cone.

6. A top roll having in combination a shaft, roll shells, cones slidable on the shaft, bearing balls between the shells and the cones, resilient means urging at least one cone along the shaft, and end caps shiftable axially of the shaft and retaining the outermost cones on the shaft, the shaft having means positively limiting the extent of shift of the end caps inwardly along the shaft.

7. A top roll having in combination a shaft having reduced end portions and shoulders at the inward limits of the reduced end portions, roll shells, cones slidably mounted on the shaft, bearing balls between the cones and the shells, members on the end portions seating against the shoulders and limiting outward movement of the cones along the shaft, and resilient means urging at least one cone toward another cone.

8. A top roll having in combination a shaft having reduced end portions and shoulders at the inward limits of the reduced end portions, roll shells, cones slidably mounted on the shaft, bearing balls between the cones and the shells, end caps screwed onto the end portions

5

and bringing up against the shoulders before taking up the slack in the bearings, and resilient means urging at least one cone into the roll shell supported by such cone.

9. A top roll having in combination a shaft having reduced end portions and shoulders at the inward limits of the reduced end portions, roll shells, cones slidably mounted on the shaft, bearing balls between the cones and the shells, end caps screwed onto the end portions and bringing up against the shoulders before taking up the slack in the bearing, a sleeve on the shaft holding the roll shells spaced apart from each other, and resilient washers on the shaft between such sleeve and the adjacent cones urging the latter apart.

10. A top roll having in combination a shaft, roll shells, cones slidably mounted on the shaft, bearing balls between the cones and the shells, end stops for the cones fixed on the shaft, the latter having means predetermining the fixed position of the stops, a sleeve slidably mounted on the shaft between the roll shells, and a spring reacting against each end of the sleeve and urging an adjacent cone outwardly along the shaft.

11. A top roll having in combination roll shells, a shaft having abutment means thereon between the roll shells, ball bearings including opposed cones in each shell, end caps screwed onto the shaft impelling the cones toward each other, the shaft limiting the approach of the end caps to the abutment means to less than the distance needed to take up the slack in the bearings, and resilient means intervening between a cone and at least one of the members comprising the end caps and the abutment means urging the cone into the roll shell.

12. A top roll having in combination a shaft, roll

6

shells, cones slidably mounted on the shaft, bearing balls between the cones and the shells, end caps screwed onto the end portions, abutment means in connection with the shaft between two of the cones, the end portions of the shaft forming stop means predetermining the inmost positions attainable by the end caps, and resilient washers on the shaft between such abutment means and the adjacent cones urging the latter apart.

13. A top roll having in combination a shaft, roll shells, cones slidably mounted on the shaft, bearing balls between the cones and the shells, end stops for the cones fixed on the shaft in positions predetermined by the end portions of the shaft, a sleeve mounted on the shaft between cones, and resilient means reacting against the end stops urging at least one of the cones toward the sleeve.

References Cited in the file of this patent

UNITED STATES PATENTS

406,740	Kellogg	July 9, 1889
1,102,547	Rockwell	July 7, 1914
1,329,504	Colman	Feb. 3, 1920
1,518,413	Ross	Dec. 9, 1924
1,923,399	Sharp	Aug. 22, 1933
2,232,473	Pulleyblank	Feb. 18, 1941
2,267,443	Cobb	Dec. 23, 1941
2,525,591	Cotchett	Oct. 10, 1950
2,644,202	Cotchett	July 7, 1953

FOREIGN PATENTS

9,131	Great Britain	of 1890
438,208	Italy	July 27, 1948