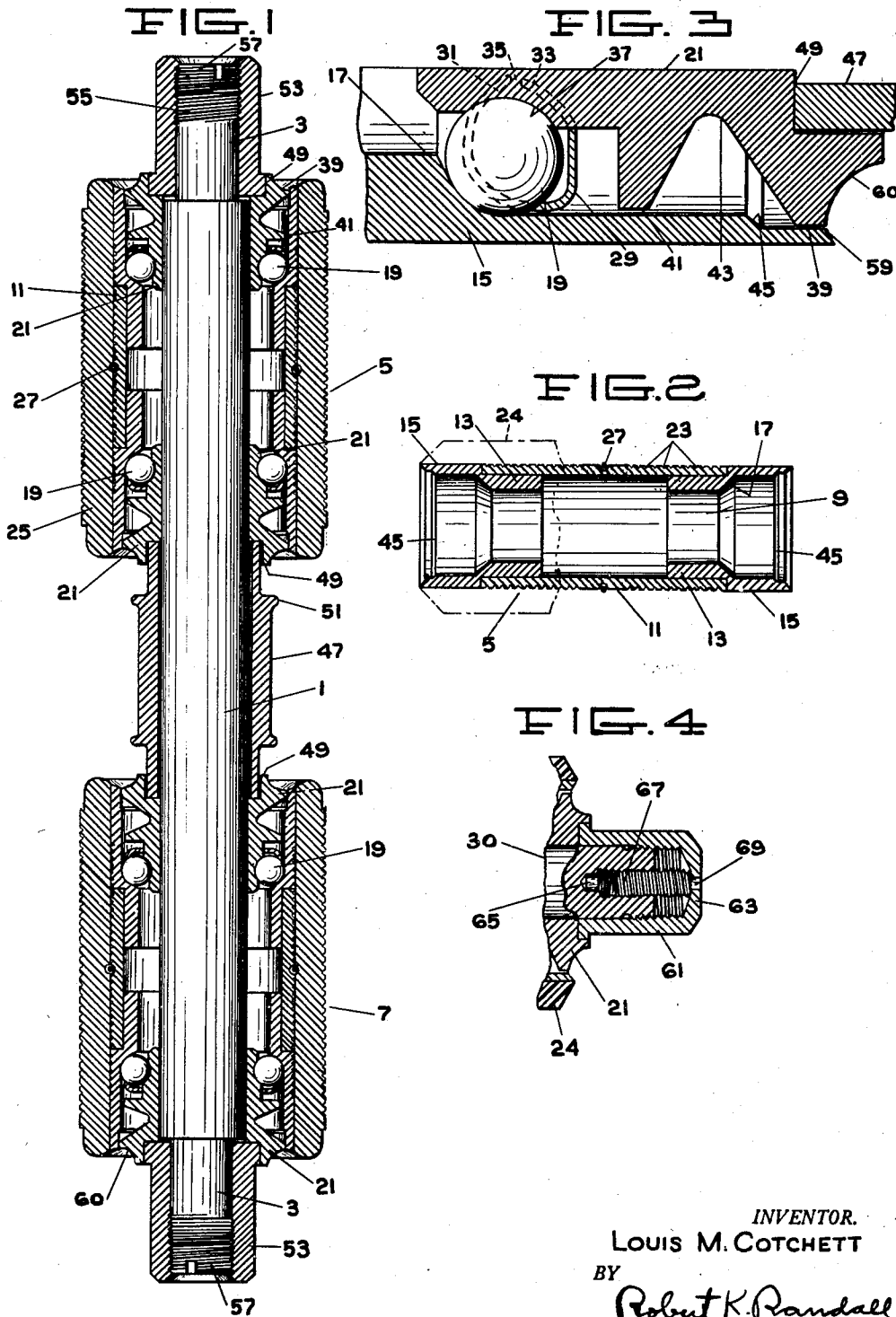


July 7, 1953

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BALL BEARING TOP ROLL

2,644,202

Filed June 8, 1949



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## UNITED STATES PATENT OFFICE

2,644,202

## BALL BEARING TOP ROLL

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Application June 8, 1949, Serial No. 97,815

35 Claims. (Cl. 19—142)

1

This invention relates to the top rolls for drawing mechanisms of the general type used in spinning, roving, and drawing frames, and is particularly concerned with top rolls of the so-called shell type.

In rolls of this character the sleeves, bosses, or shells which carry the roll covers or cots that run in contact with the roving, slivers, or other fibrous material being drafted, are mounted to revolve freely on shafts which normally remain stationary in the machine frame, and the pressure of the weighting mechanism is applied to the shafts independently of the sleeves or shells so that their rotation is not impeded by this frictional drag against which rolls of the solid type always work. Further to reduce the resistance to rotation of the shell rolls, they are often supported on their shafts by anti-friction bearings.

While these shell type top rolls with anti-friction bearings have long been known to possess valuable potential advantages through eliminating the task of lubricating as well as in quality of work over plain-bearing shell type top rolls or the more often used conventional solid type top rolls when used at the delivery end of a drawing roll system, as heretofore constructed these anti-friction top rolls have not gone into general use, primarily because their cost has been high and their life short and they have required frequent cleaning and lubrication, as compared to the other types. Also, lint and fly have been prone to work into the bearings and thus, in time, to seriously impede the rotation of the sleeves, which of course necessitates the complete disassembly of the rolls for cleaning and their re-lubrication and re-assembly, which is costly to the user in the time spent and the machine time lost thereby. Escape of the lubricant, herein as in all other types of rolls, to accumulate lint and fly and to get on the cots and the stock being drawn, has been a serious objection. The re-lubrication of ball bearings involves the complete disassembly of the roll with a material expenditure of time and effort; and while attempts have been made to attain permanent lubrication of such bearings in these top rolls, this end has never been heretofore satisfactorily attained.

The present invention aims to provide a comprehensive improvement in the structure of anti-friction top rolls which will obviate these leading drawbacks to the full realization of the admitted advantages possessed by the type.

In particular, since the high initial cost of prior types of rolls has resulted from the relative difficulty of making, finishing, and assembling

2

the numerous parts of which they are composed, a leading object of the invention is to devise a shell type top roll of which the preponderant number of component parts can be manufactured by automatic machines, and can be assembled rapidly and accurately with a minimum of time and effort.

The manner in which it is proposed to attain these and other objects is set forth hereinafter in the following specification.

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

Fig. 1 is a view mainly in longitudinal axial section of the improved roll.

Fig. 2 is a view in axial section of one of the revolving shell rolls.

Fig. 3 is a sectional view illustrating certain details of the ball bearing and lint trap construction.

Fig. 4 is a detail mainly in axial section of an alternative form of locking means for the cone-adjusting element.

Referring first to Fig. 1, the construction there shown comprises a shaft 1 which forms the main supporting element of the roll. The novel top roll construction is especially designed to enable this shaft to be made from round stock of standard commercial dimension and to be constructed in precise concentric shape, truly straight, and of the exact desired diameter, all within the closest of tolerance limits at a minimum of cost by automatic machinery, and hence the shaft has no departures from true cylindrical shape except at the location of its reduced and threaded extremities 3.

Encircling the shaft 1 are two shell rolls indicated in general at 5 and 7. They are duplicates, each of the other, consequently a detailed description of one only is necessary.

Referring to the one indicated at 5, and shown detached in Fig. 2, it will be seen that this shell roll has a passage 9 therethrough which varies in diameter at different locations, and is composed of a cylindrical tube or sleeve 11 in each end of which is fixed by a press fit the reduced portion 13 of a cup 15 having a tapered seat 17 facing outwardly toward the adjacent end of the shell roll and forming a ball race for a set of bearing balls 19, the inner race for which is provided by a cone 21 mounted on the shaft 1. The full-diameter portion of each cup 15 has its outward surface flush with the exterior surface of tube 11, which latter is serrated or roughened as indicated at 23 to facilitate the adhesive attachment of a cot 24 or roll cover directly thereto

when desired, such cot covering the full length of shell roll 5 clear to the outward ends of the cups 15. Such direct attachment of the cot is practiced when the cot is made of rubber compound or synthetic material having a long working life, and which when worn or damaged is removed by simply slitting the cot lengthwise with a knife and peeling it off. But to provide for cases where leather cots are desired or required, and to make provision for the common practice of removing such rapidly wearing cots by immersing the detachable sleeves of the solid type of roll with cots thereon in a boiling aqueous caustic solution, a supplementary shell 25 is provided fitting closely but freely upon the shell 5 and held in working position but with capacity for easy removal by an expanding split ring 27 fitting into corresponding peripheral grooves inside said shell 25 and on the outside of shell 5 at midlength thereof. The exterior of shell 25 is also serrated or roughened to give the adhesive fixing the leather thereto a better grip. Thus the common practice of eating off the old leather cots by caustic can be followed through the use of these supplementary shells while the rest of the parts of the top roll and its bearings are spared an immersion which would be harmful to the anti-friction bearings.

To provide for adequate and long-lasting or permanent lubrication of the ball bearings, the cage or retainer 29 in which the balls 19 of each set of ball bearings are mounted in spaced relation has its ball-separating tongues 31, 33, of the component sheet metal brought almost together at their extremities so that the cage forms in effect an annular tube with apertures at intervals in which the balls 19 are set. Thus constructed, the cage with its balls is packed with grease before assembly in the top roll, the grease filling the tube by access through the narrow slit 35 and around the loosely held balls, while the balls being substantially immersed in the grease transfer to the ball races an adequate amount of lubrication to take care of any rolling friction that may occur there. The tubular retainer not only retains the grease against escape to the exterior of the shell roll, but also shields the grease therein against oxidation as only a very small portion of its surface is exposed to the air while a similar shielding of the grease transferred to the ball races is performed by the cone, as will be made plain hereinafter. In all but exceptional cases the initial lubrication remains adequate for the life of the roll.

The cone 21 is equipped with lint-shielding flanges completely closing the passage through the shell roll 5, and during assembly these flanges prevent access to the balls to settle them properly into the outer race in seating the cone on the bearings. To save the time otherwise spent in manipulating the parts as by tapping, twisting, shaking, and inverting them to get a proper seating, the cone is provided near its inward extremity with a peripheral groove 37 having a radius of transverse curvature fitting the radius of the balls 19, thus incidentally broadening the bearing surface between the cone and the balls, and the cage 29 is of such dimension as to resist slightly the displacement of the balls radially outward incident to putting the inward end of the cone through the assembly of cage and balls to get the balls seated in groove 37. Thus, as both sides of groove 37 have a diameter greater than the normal radial displacement permitted to the ball bearings 19 by cage 29, this bearing assembly is first snapped into place on the cone and then the

cone introduced and seated properly within the cup 15 with the groove 37 holding the bearing assembly in accurate concentric relation and in a truly radial plane without cocking or jamming of the bearing during assembly.

To keep lint and fly out of the bearing, and to keep any vagrant grease in, the outward portion of cone 21 is formed with an outer circular flange 39 and an inner circular flange 41 with a peripheral groove 43 intervening between them. The passage 9 through shell roll 5, or more specifically the internal diameter of each cup 15 thereof, is reduced at a location just inward of its outer end, to form a shoulder, ridge, or salient 45, preferably having an inwardly beveled slope, extending around its inside surface. When the parts are assembled, as shown in Fig. 3, this shoulder 45 is located inwardly adjacent the outer flange 39 of the cone 21, which flange fits as closely as practicable within but without contact with the enlarged extremity of the cup 15.

The inner flange 41 fits closely within but without contact with the interior wall of the lesser diameter of the cup 15 and together with flange 39 defines the groove 43 of V-shape having walls disposed in oblique relation to the shaft's axis. Since the construction and fit of cone 21 on shaft 1 prevents all access of lint and fly along the shaft and passing inside the cones, the only entrance for fibers to the bearings is via the narrow crevice between the mouth of the passage through the shell rolls and the outer flange 39 of the cones. But any fibers entering at this point are immediately deflected axially inward through engagement with the shoulder 45, and thus down into the groove 43. This diminution in the diameter of the passage as the fibers travel inward toward the bearing accentuates the tendency of fibers to wrap around the axis of any relatively rotating body, and, as the wrapping becomes tighter, to move toward the smallest accessible diameter of such body. Once down in the groove 43, there is no force operative on the fibers to cause them to climb over the inner flange, since the cone 21 and all the parts thereof are stationary, and when they get down in the groove the fibers are out of reach of the only moving surface available, namely the interior of the shell, and even if engaged by the rotating shell this only tends to wrap or re-wrap them around the least available diameter, the bottom of the groove.

The result of this action of the lint trap is that intruding lint and fibers slowly accumulate into a tightly wound lap in groove 43 until it is filled full by a sealing ring of felted fibers pressing and wiping against the inside surface of the portion 15 of shell roll 5, which ring catches or excludes all subsequently entering fibers. By the same token, this sealing ring of felted fibers either absorbs or prevents the egress of any grease migrating from the ball bearings outward toward the open end of cups 15, and furthermore acts to exclude air oxydizing the grease. Incidentally, it is to accommodate the necessary parts of the cones and of the cups 15 which create this lint seal, that forms the reason for making the cups so deep.

Further to discourage the entry of fibers into the shell rolls, the extreme outward end of each cup 15 is undercut, i. e., beveled with an axially inward slant as indicated at 59, Fig. 3, in order to leave at the ends of each shell roll no part of lesser diameter on which the fibers may cling and wrap. For the same purpose, a fillet or ra-

dius 60 is formed on the exposed end of each cone 21 to join the radially extending outer face of the rim of flange 39 with the axially extending terminal portion of the cone, so as to divert enwrapping fibers away from the entrance to the shell rolls, and to avoid the formation of an angle at this junction where lint can accumulate and pile up until it reaches the crevice between such flange and the shell roll to enter thereinto.

To hold the two shell rolls of each top roll properly spaced apart on the smooth and uninterrupted surface of shaft 1 to suit the gage of the particular spinning or other frame in which they are to be used, a spacer 47 fitting closely but freely slidable on shaft 1 is provided having its extremities fitted closely but freely within the annular recess 49 in the outward ends of cones 21, and having annular ribs 51 to locate the saddle (not shown) of the pressure means accurately at midlength of the top roll.

All of the four cones 21 and all of the four cups 15, like the cups 11, of the top roll are exactly identical in every respect, and so formed that they can be turned out rapidly at minimum expense by automatic screw machines. Like sleeve 47, the cones are all freely slidable throughout the full length of shaft 1, though fitted thereto with precision concentricity since they determine the trueness of rotation of the shell rolls and the cots thereon about the axis of shaft 1, and thus the quality of the work performed by the top roll in drawing the fibers.

The cones and the intervening sleeve 47 being thus freely slidable along shaft 1, the adjustment of the bearings and of the fit of the inner cones against spacer 47 can be effected from either end of the shaft 1. For this purpose, end caps 53 are employed which in the form of Fig. 1 are sleeves having a substantially cylindrical axial passage therethrough which is threaded internally throughout half its length, the other half of such passage being reamed out beyond the depth of the threads to fit accurately over the blank portion of the reduced extremity 3 at each end of shaft 1 and thus be held exactly coaxial therewith. The outer end of each extremity 3 is threaded as indicated at 55 to engage with these internal threads. The inward end of cap 53 is flanged to fit freely but accurately within the recess 49 in the outward end of the adjacent cone 21, being sunk flush therein to avoid collecting lint. Each end cap is locked in its adjusted position by a grub screw 57 engaging with the threaded interior of the passage through the cap and tightened against the end of the reduced portion 3 of shaft 1. With a cap 53, or any equivalent stop or abutment means thus fixed on one end of shaft 1 to prevent outward sliding of the adjacent cone axially of shaft 1, the adjustment of all the bearings and of the fit of sleeve 47 to its adjacent cones 21 is easily accomplished by screwing the cap 53 at the other end of the shaft inward with the fingers until all end play between the various parts mounted on and slidable along shaft 1 is removed, and the adjustment is maintained by locking this cap 53 in the position attained by tightening grub screw 57.

The two end caps 53 are of identical construction. Though the exact concentricity of their outer surfaces with respect to the axis of shaft 1 is a critical matter, as these surfaces are used to support the assembled top roll while buffing the working surfaces of the cots into

true concentric cylindrical form, the structure of the cap makes this essential accuracy easily and cheaply attainable on automatic screw machines.

Like the shaft, cones, spacer, and end caps, the three parts of each shell roll 5, 7, and the supplemental sleeves 25 are all easily and inexpensively made on automatic screw machines or turret lathes at a single set-up therein.

The sleeves or end caps 53 provide the means whereby the top roll is supported in the cap bars or like parts of the machine in which they are used, and thus correspond to the pintles or gudgeons of the solid top roll, except that they do not revolve in the cap bars. Since various forms and dimensions of these supporting extremities are required to fit the different kinds and makes of spinning frames and the like in use in the mills, the preferred construction herein employs a cap 53 which is entirely separable from its associated cone 21, thereby enabling the cones for all sizes and forms of the improved top roll to be made identical, while modifying the shape and dimension of the caps alone to suit the particular frame in which the top rolls are to be used.

To vary the gage of the top rolls to suit the requirements of different frames, all that is necessary is to substitute longer or shorter shafts 1 and spacers 47, the rest of the parts being identical for the different gages. The same sort of change makes possible the use of longer or shorter shell rolls when required, the latter being varied in length by merely changing the length of tubes 11.

An alternative arrangement for locking the end caps in their adjusted and operative position is shown in Fig. 4. Here, the end cap 61 has an end wall 63 overhanging and substantially enclosing the end of shaft 30, which in this instance is of full diameter throughout its length, being externally threaded at each extremity as in Fig. 1. In addition, each end of the shaft is provided with an axial counterbore 65 which is internally threaded, and a machine screw 67 is screwed therein for a part of its length, the screw being provided with a socket by means of which the screw can be rotated, a hole 69 being provided in the end wall 63 for the introduction of such tool into engagement with the screw. After the cap 61 has been screwed down against its cone 21 to the extent necessary to take up end play between the parts throughout the length of the shaft, assuming that the corresponding cap at the other end of the shaft has been locked in the desired position thereon, screw 67 is backed out to bear tightly against the end wall 63 around the margin of hole 69 and thus to securely lock the cap 61 and thus maintain the rest of the parts intervening between it and the cap at the other end in adjusted working condition.

From the foregoing it will be observed that the top roll is made up of standardized elements all of which except the caged bearing balls and cots are or can be screw machine products, and that a complete range of sizes of top rolls can be produced, for example in the form of Fig. 1 with the cots applied directly to the shell rolls 5, and except for the cots, from a stock of eight different parts, with the caged bearing balls counted as a unit, only four of which (the shaft, the end caps, the spacers, and the tubes forming the midlength of the shell rolls) are made special-

ly to suit the different sizes. Because of this fact and the further fact that the assembling operations are very simple and easily and rapidly performed, the invention effects a substantial economy in the manufacture of top rolls of the shell type.

In addition, as pointed out above, the invention effectually overcomes the difficulties heretofore encountered in locking the parts of the roll assembly permanently in their adjusted relation and in preventing the entrance of lint and fly into the bearings and the escape of lubricant therefrom, as well as eliminating the recurring operation of lubricating the rolls.

While I have illustrated and described certain forms 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 forms shown, or to the details of construction thereof, but what I do claim is:

1. A top roll for fiber drawing mechanisms having in combination a shaft, a shell roll encircling said shaft, anti-friction bearings mounted on said shaft and supporting the shell roll for rotation around said shaft, a cap adjustable on and substantially enclosing one end of said shaft and cooperating with one of said bearings to adjust it, and a screw threaded into the said end of such shaft, and locking the cap in its adjusted position on the shaft.
2. A top roll according to claim 1, in which the cap protrudes beyond the end of the shell roll for engagement with an operatively fixed portion of the drawing mechanism to support the top roll therein.
3. A top roll according to claim 1, in which the screw bears against the inner end surface of the cap to lock the latter in its adjusted position.
4. A top roll according to claim 1, in which the screw bears against the inner end surface of the cap to lock the latter in its adjusted position, and the cap has an aperture for the insertion of a tool for turning the screw.
5. A top roll for fiber drawing machines having in combination a shaft, a shell roll encircling said shaft, anti-friction bearings including a cone mounted on said shaft and supporting the shell roll for rotation around said shaft, a sleeve on said shaft engaging the cone and extending beyond the end of the shaft to support the roll in the machine and shiftable along the shaft to move the cone along the shaft, and screw means engaging both the shaft and the sleeve to lock the sleeve in its desired position on the shaft.
6. A top roll for fiber drawing mechanism having in combination a shaft, a sleeve encircling such shaft, anti-friction bearings supporting such sleeve in coaxial relation to the shaft, at least one of such bearings including a cone axially adjustable on the shaft, a cap on the end of the shaft and associated with the cone to adjust the latter, and means for locking the cap in adjusted position including a screw threaded into the end of the shaft and substantially enclosed by the cap.
7. A top roll for fiber drawing mechanism having in combination a shaft, two sleeves encircling said shaft and spaced axially apart, anti-friction bearings supporting said sleeves in coaxial relationship to each other and to said shaft, one at least of said bearings including a cone axially adjustable on said shaft, a sleeve movable relatively

to such cone substantially enclosing the end of said shaft and associated with the latter cone to adjust it, and means for locking said latter sleeve in its adjusted position including screw means simultaneously engaging the shaft and the latter sleeve.

8. A top roll according to claim 7, in which the latter sleeve is threaded onto the end of the shaft.

9. A top roll for fiber drawing mechanism having in combination a shaft, two shell rolls encircling said shaft, two sets of bearing balls supporting each shell roll, cones mounted on said shaft, the shell rolls having cups cooperating with said respective cones to hold the balls, all of said cones being slidable on said shaft, a spacing sleeve slidable on said shaft and interposed between the innermost cones of the two shell rolls, members engaging with the outermost of said cones, threaded onto and substantially enclosing the opposite ends of said shaft, and screws threaded into the ends of said members and bearing on the end surfaces of the shaft whereby to cooperate with the said members and cones to lock the entire assembly in its adjusted relationship on said shaft.

10. A top roll for fiber drawing mechanism comprising a shaft, and in combination therewith elements comprising shell rolls, cones, and cone-spacing means freely slidable along such shaft, bearing balls rolling on the cones and supporting the shell rolls for rotation about the shaft, stop means on a terminal portion of the shaft limiting outward movement of the outermost cone at such end of the shaft, and means fixed on the other terminal portion of the shaft with capacity for axial adjustment thereon and restraining the entire series of these intervening elements from movement away from the said stop means.

11. A top roll for fiber drawing mechanism comprising a shaft, and in combination therewith two shell rolls, each of which has two oppositely facing cups in connection therewith, all the cups being identical, four identical cones one associated with each cup, and cone-spacing means, all these elements being freely slidable along such shaft, bearing balls occupying the several cups and rolling on the cones and supporting the shell rolls for rotation about the shaft, stop means on one end of the shaft, and retaining means on the other end of the shaft blocking movement of such elements off from the shaft and adjustable axially of the latter to take up end-play between all the said elements on the shaft.

12. A top roll for fiber drawing mechanism comprising a shaft, and in combination therewith shell rolls, members comprising cones, cone-spacing means, and bearing balls encircling the shaft, all of which members are freely slidable along the shaft, and means on each end of the shaft blocking movement of such members off from the shaft, at least one of such means being adjustable axially of the shaft to take up end-play between all the several members.

13. A top roll for fiber drawing mechanism comprising a shaft, and in combination therewith members comprising shell rolls, cones, and cone-spacing means all freely slidable along such shaft, bearing balls rolling on the cones and supporting the shell rolls for rotation about the shaft, stop means on a terminal portion of the shaft limiting outward movement of the outermost cone at such end of the shaft, and a sleeve axially movable on the shaft to bear inwardly

against the outermost cone on the other terminal portion of the shaft to remove end-play between the respective members slidable on the shaft throughout the interval between the sleeve and the stop means.

14. The combination according to claim 13 in which screw means engage both the sleeve and the shaft to fix the sleeve in adjusted position thereon.

15. A top roll for fiber drawing mechanism having in combination a shaft, shell rolls, anti-friction bearings supporting the shell rolls for relative rotation about such shaft and including a plurality of inner races all freely slidable along the shaft for the full length thereof, spacing means freely slidable along the shaft holding two of the inner races in predetermined spaced relation to fix the spacing of the shell rolls from each other, stop means at one end of the shaft arresting movement of the parts thereon off from such end, and means on the other end of the shaft adjustable axially to take up end-play between the spacing means and its adjacent inner races.

16. A shell for a top roll of the shell type comprising in combination two cups each including an outer race for bearing balls and a sleeve connecting said cups, the cups being inserted and fixed in the opposite ends of said sleeve and extending outward beyond the ends of said sleeve forming therewith a continuous cylindrical surface of uniform diameter, such surface being serrated both on the cups and on the sleeve to retain an adhesive, and each race supporting its bearing balls against thrust directed axially of the sleeve.

17. A top roll for fiber drawing mechanism having in combination a shaft, a shell roll rotating thereon, means on the shaft defining a peripheral groove located within the shell roll and outwardly of the bearing surfaces between the shell roll and shaft, and means on the interior surface of the shell roll intermediate the width of the groove deflecting fibers entering between the shell roll and the shaft down into the groove.

18. A top roll for fiber drawing mechanism having in combination a shaft, a shell roll encircling such shaft, anti-friction bearings supporting the shell roll for rotation around the shaft, and means on the shaft obstructing the entry of fibers to a bearing and having a groove lying within the shell roll, the latter having means in connection with its inside surface located adjacent and axially inward of the outward wall of such groove to divert entering fibers into the groove.

19. A top roll for fiber drawing mechanism having in combination a shaft, a shell roll encircling such shaft, anti-friction bearings supporting the shell roll for rotation around the shaft, and means on the shaft obstructing the entry of fibers to a bearing and having a groove lying within the shell roll, the latter having a portion of the inward surface defining the passage through such shell roll projecting in a direction toward the axis and into the groove.

20. A top roll for fiber drawing mechanism having in combination a shaft, a shell roll encircling such shaft, anti-friction bearings supporting the shell roll for rotation around the shaft, and bearing adjusting means slidably mounted on the shaft and projecting outwardly from one end of the shell roll having a peripheral groove located inside the shell roll and outwardly of the bearings.

21. A top roll according to claim 20, in which the internal diameter of the shell roll is reduced at a point intermediate the width of the groove in the bearing adjusting means to a dimension less than at the adjacent end of the shell roll.

22. A top roll for fiber drawing mechanism having in combination a shaft, a shell roll encircling such shaft, bearing balls supporting the shell roll for rotation around the shaft, and means operatively fixed on the shaft substantially closing the passage through the shell roll at two axially spaced locations adjacent one end of the shell roll, such means having its diameter reduced in the interval between such locations to form a peripheral groove, and having its portion defining the side of the groove nearer the end of the shell roll of greater diameter than its portion defining the other side of the groove, the shell roll having an internal shoulder located intermediate the width of the groove.

23. A top roll for fiber drawing mechanism having in combination a shaft, a shell roll encircling such shaft, bearing balls supporting the shell roll for rotation around the shaft, and a bearing member on the shaft engaged by the balls and having a peripheral groove located thereon between the adjacent end of the shell roll and the zone of engagement with the balls, the internal diameter of the shell roll being reduced intermediate the width of the groove to a dimension less than the internal diameter of the shell roll at the outward wall of the groove.

24. A top roll for fiber drawing mechanism having in combination a shaft, a shell roll encircling such shaft and rotatable thereon, and means on the shaft at both ends of the shell roll defining peripheral grooves having oblique walls and located within the shell roll, the depth of each groove being such as to concentrate the lapping-up action of lint fibers within the groove so as to create a ring of felted fibers eventually filling the groove and engaging the interior wall of the shell roll at each end thereof to prevent passage of fibers inwardly along the shaft beyond the groove.

25. A top roll for fiber drawing mechanism, having in combination a shaft, a shell roll encircling such shaft, bearing balls between the shaft and the roll, a bearing element on the shaft engaged by the bearing balls, having a flange substantially closing the passage through the roll at one end of the latter and a lint trap located inwardly of such flange in the axial direction, and a ball cage of substantially tubular cross-section having lateral apertures and holding the balls in spaced relation in a common plane, the bearing element having a ball race formed by a groove both sides of which have a diameter greater than the normal radial displacement permitted to the balls by the cage, whereby the balls are held in place in such groove during the assembling of the roll.

26. A top roll for fiber drawing mechanism having in combination a shaft, a shell roll encircling such shaft, bearing balls between the shaft and the roll, a bearing element on the shaft engaged by the balls and having a grooved portion forming a lint trap, the shell roll having a cup formed on its interior surface forming a ball race, the walls of which cup extend continuously axially beyond the balls to house both walls of the groove forming the lint trap.

27. A top roll for fiber drawing mechanism having in combination a shaft, a shell roll, bearing balls between the shaft and the shell roll, a one-

piece cage of substantially tubular section having lateral apertures and holding the balls, and a bearing element mounted on the shaft within the shell roll having means holding the cage balls from axial movement in either direction thereon, and having a portion substantially closing the passage through the shell roll adjacent the latter's end, such portion cooperating with an adjacent portion of reduced diameter on the bearing element to form a lint trap.

28. A top roll for fiber drawing mechanism comprising two shell rolls and an anti-friction support therefor comprising in combination a shaft, a spacer slidable thereon, two oppositely facing cones engaging the ends of such spacer and slidable on the shaft, two oppositely facing cones each located outwardly of the first pair toward the respective ends of the shaft and slidable on the shaft, bearing balls interposed between the shell rolls and the respective cones, and end-caps one of which is in screw-threaded and locked connection with each end of the shaft.

29. In a top roll for fiber drawing mechanism, the combination of a shaft, bearing balls, a shell roll comprising a sleeve, two tubular members fixed in the respective ends of the sleeve, each of such members having a portion extending axially outward beyond the sleeve which is of the same external diameter as the sleeve and having its internal diameter reduced at a location intermediate its length to form a ball race for the balls, and a cot adhesively affixed to the sleeve and the outwardly extending portions of the members fixed in the latter.

30. A top roll for fiber drawing mechanism having in combination a shaft, a shell roll, a cot mounted on the shell roll, anti-friction bearings in the passage through the shell roll supporting the latter rotatably on such shaft, the bearings including bearing balls and a cone having a portion substantially closing the passage through the roll and a portion of reduced diameter extending outwardly therefrom, the cone having a fillet of concave profile joining the greater diameter of the first portion to the lesser diameter of the second portion, the end of the rotating parts overhanging a portion of the fillet.

31. A top roll for fiber drawing mechanism having in combination a shaft, a sleeve encircling such shaft, anti-friction bearings supporting such sleeve in coaxial relation to such shaft, the sleeve having its outside surface roughened to facilitate adhesive attachment of a cot of resilient material thereto, and also having an annular groove, a split ring located in such groove, and a tube fitting the outside of the sleeve and held thereon by the split ring and also having its surface roughened to facilitate adhesive attachment of a cot thereto.

32. A top roll for fiber drawing mechanism comprising a shaft having mounted thereon in precisely concentric but axially slidable relation an assembly of parts including cones for bearing balls, bearing balls, cages in which the balls are assembled, shell rolls provided with cups to turn on such ball assemblies, cots on the shell rolls, and spacing means engaging certain of the cones to fix the spacing of the shell rolls from each other, the shaft being of precisely uniform concentricity and straightness throughout the length thereof, sleeves threaded on the ends of the shaft to engage with operatively fixed parts of the

drawing mechanism to support the top roll therein and adjustable along the shaft to take up end-play between the several members of the said assembly of parts by engaging with certain of the cones, and means locking the sleeves in adjusted position.

33. A top roll for fiber drawing mechanism having in combination a shaft, a pair of shell rolls rotatable thereabout, bearing balls supporting each shell roll, four inner races for such balls freely slidable along the shaft for the full length thereof and all of identical construction, spacing means slidable along the shaft separating two of such races by a fixed interval, and end-stops engaging respectively the other two inner races, at least one stop being adjustable axially of the shaft to take up end-play between the parts on the shaft.

34. A top roll for drawing mechanisms, comprising a shaft, two sleeves encircling said shaft and spaced axially apart, anti-friction bearings supporting said sleeves in coaxial relationship to each other and to said shaft, one at least of said bearings including a cone axially adjustable on said shaft, a cap substantially enclosing the end of said shaft and associated with the latter cone to adjust it, and means for locking said cap in its adjusted position including a screw threaded into the end of said shaft where it is substantially enclosed by said cap, said cap having a hole extending axially through its end wall and smaller in diameter than the screw through which a tool may be inserted to operate the screw.

35. A top roll for drawing mechanisms comprising a shaft, two sleeves encircling said shaft and spaced axially apart, anti-friction bearings supporting said sleeves in coaxial relationship to each other and to said shaft, one at least of said bearings including a cone axially adjustable on said shaft and combined with a cap for the end of said shaft, and means substantially enclosed inside of said cap but operable from a point outside of it for locking said cap to said shaft, said cap having an axial hole therethrough, smaller than said locking means, through which a tool may be inserted to operate said locking means.

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