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TOP ROLL FOR DRAFTING MECHANISM

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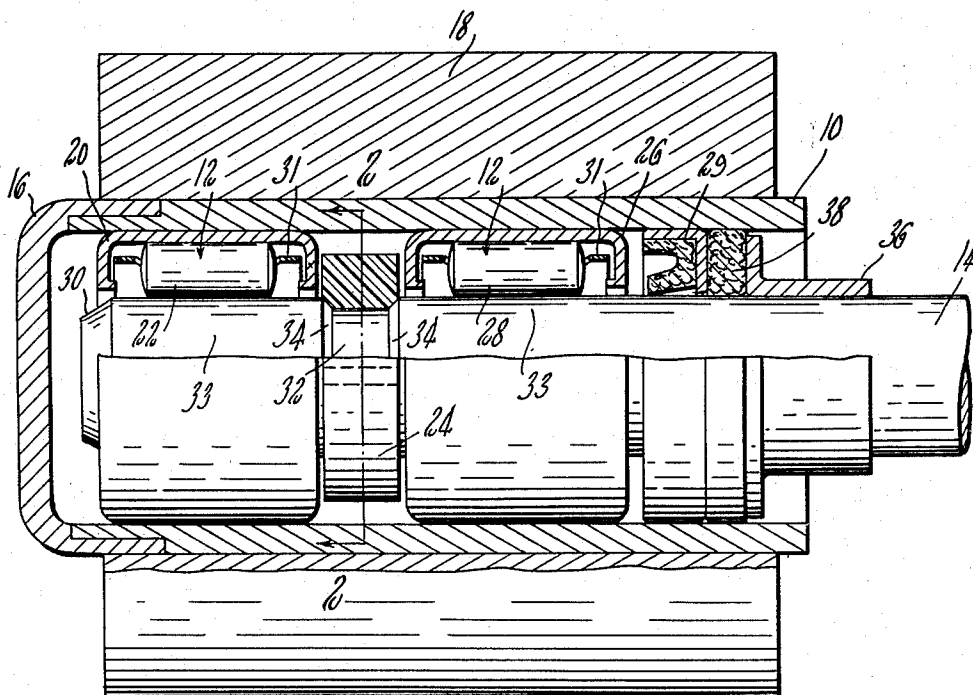


*Fig. 1.*

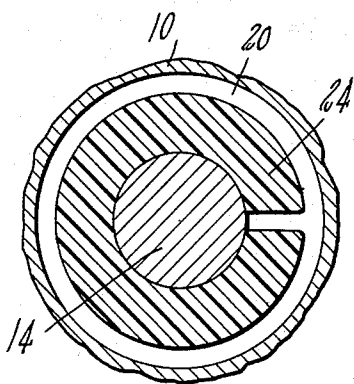


*Fig. 2.*

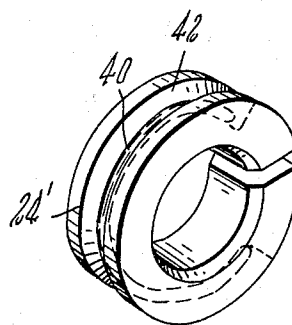


*Fig. 3.*

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## TOP ROLL FOR DRAFTING MECHANISM

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2 Claims. (Cl. 19—142)

This invention relates to drafting mechanisms of the general type used in spinning and roving frames and more especially to top rolls associated with such mechanisms. In particular, this invention relates to top rolls of the "shell" type which have an independently rotatable boss as distinguished from the solid type of top roll in which the roll is fixed to a shaft.

The typical drafting mechanism used in a spinning frame comprises several pairs of drafting rolls, each pair including a lower or bottom roll and a cooperating upper or top roll, the pairs of rolls being arranged such that they successively act on a continuous strand of sliver guided through them. In a common relationship each successive pair of rolls is revolved at a slightly higher peripheral speed than the preceding pair to provide the desired draft so that during the travel of the sliver through the rolls the fibers of which it is composed are drawn out, the sliver attenuated and the fibers brought into more nearly parallel relationship. Generally, the bottom rolls are positively driven by gearing at one end of the frame and the top rolls are revolved merely by contact with their respective bottom rolls.

Partly to improve the driving engagement and partly also to enable each pair of rolls to exert a better grip on the sliver, the top rolls are pressed firmly against the bottom rolls by means of a weighting mechanism since it is necessary to apply considerable weight to the top rolls to make them grip the sliver positively and with sufficient firmness to perform the drawing function. This is particularly true of the rolls which produce a high degree of drafting. The bearings associated with such top rolls thus are frequently heavily loaded, and it is desirable to provide bearing structures in the top rolls which minimize the frictional loading of the mechanism from this source.

Additionally, it is necessary to maintain accurate alignment between the pairs of cooperating rolls such that the drafting of the sliver is performed with the smoothness and uniformity of operation desired.

A fruitful solution of both these problems—heavy loading and alignment—is to use two sets of roller (or analogous type) bearings. However, roller bearings are not inherently resistant to axial thrust loadings, even of the magnitude encountered in drafting where the predominant loading, as described above, is radial; and a thrust bearing means must be provided. This thrust bearing should not measurably increase the frictional loading of the system.

Still another problem involves lubrication. Roller bearings, as many other types of bearings, must be lubricated periodically and it is desirable that means associated with the top rolls be provided such that lubrication may be readily accomplished. However, grease contamination of the sliver will injure the product to such an extent that it is frequently unusable. Further, lint is attracted and adheres to grease on exposed rotating members with the result that frictional loading is increased and cleaning is made more difficult and is required more frequently.

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Therefore, means must be provided to adequately seal the bearings such that the lubricating medium cannot escape. These conflicting desiderata of ease of lubrication and adequacy of sealing should not be compromised.

Accordingly, it is an object of this invention to provide a "shell" type top roll, which contributes a minimum of frictional loading to the drafting mechanism, which has excellent resistance to misalignment, and which may be heavily loaded.

A further object of the invention is to provide a small, compact top roll which may be easily removed from the shaft for periodic lubrication, maintenance, or replacement.

Still another object of the invention is to provide a top roll which includes a lubricant seal such that contamination of and injury to the drafted product from the lubricating medium is eliminated.

The advantages of the top roll structure of this invention include the incorporation of roller bearings which are capable of withstanding heavy radial loads; a shell of small diameter due in part to the use of one of the structural members as a bearing race; an excellent lubricant seal wherein the lubricating medium is enclosed and sealed within a sleeve; and a simple and unique positioning and thrust bearing means which provides sufficient resistance to axial thrust loadings of the magnitude which occur in drafting operations, this resistance being of such a magnitude that it may be overcome when a moderate amount of axial leverage is applied to the shell, thus permitting it to be easily removed from the shaft.

Other objects and advantages of the invention will be apparent from the following description of the preferred embodiment of the invention with reference to the drawing, wherein:

Fig. 1 is a side view, in partial section, of a top roll structure incorporating the preferred embodiment of the invention;

Fig. 2 is a sectional view of the top roll structure along the line 2—2 of Fig. 1; and

Fig. 3 is a perspective view of a modification of the preferred split ring bearing structure.

Referring to Fig. 1, a shell or sleeve 10 is rotatably supported by two sets of roller bearings 12 on a fixed shaft 14. The end cap 16 may be pressed, welded, or otherwise attached to the sleeve 10, or the sleeve may be formed such as to have the end cap integral therewith. Mounted over the sleeve 10 is a boss 18 of steel or appropriate material, such material being a function of the application in which the top roll is to be employed.

In assembling the components within the sleeve, the outer race 20 of the bearing set 22 is first pressed into the sleeve and located, in fixed relationship to the sleeve, in the vicinity of the end cap 16. A split ring 24, described in greater detail hereinafter, is inserted into the sleeve and then the outer race 26 of the second bearing set 28 is pressed into the sleeve and placed in fixed spaced relationship from the first bearing set 22 such that a running clearance is provided between the sides of the split ring 24 and the proximate end walls of the races 20, 26. An oil seal 29 is finally fixed in place in the sleeve in spaced relation from the adjacent wall of the second bearing set race 26. In each bearing race 20, 26 the roller bearings are maintained in spaced relationship from one another by a bearing cage or retainer ring 31. If desired, needle bearings, rather than roller bearings, may be incorporated in this device.

With reference to the shaft 14, an end 30 thereof is tapered at an angle preferably less than 45°, for example 30°. At an intermediate position on the shaft an annular groove 32 is machined therein. The walls 34 of the groove preferably slope outwardly at an angle not greater than 45° from the perpendicular. On either side of the

groove 32 are polished lands 33 of case-hardened metal adapted to act as inner races for the bearings 12.

A flanged retainer ring 36 is fixed in position on the shaft at a point beyond the groove 32 and lands 33, and a felt ring 38 is positioned adjacent the flange of the retainer ring 36. (A shoulder may be provided on the shaft 14 in lieu of the retainer ring 36 if desired in light of design requirements and manufacturing economies.)

The split ring 24, referred to above, is preferably manufactured from a resilient material which has an additional quality thrust bearing characteristic. Appropriate materials for the ring include non-metallic plastic materials such as nylon and Teflon, the former being the preferred material. The ring 24, as shown in Fig. 1 is substantially rectangular in radial cross section with the modification, however, that each corner at the inner circumference is modified to the angle equal to the complement of that angle between the respective wall 34 of the groove 32 and a plane perpendicular to the shaft axis. In other words, the ring is shaped in radial cross section such that it will mate with the groove 32. The ring 24 is split as may be seen from the sectional side elevation in Fig. 2. Thus a ring of appropriately resilient material will expand when forced over the shaft of larger diameter than its internal diameter but will contract and fit in intimate contact with the groove 32 at the point of reduced shaft diameter. Preferably, the angles on the inside edges of the ring are equal to one another, thus simplifying machining operations and assembly. However, these angles, and the mating walls 34 of the groove 32, may be adjusted as, for example, the groove wall opposite the shaft end 30 might be perpendicular to the axis of the shaft to provide a positive stop for the ring. Further, if desirable, a C-shaped wire 40 of spring steel may be placed in an annular groove 42 in the outer circumference of the ring 24', as shown in Fig. 3, to provide a force additional to the inherent resiliency of the ring material to urge the ring toward a smaller diameter.

Assembly of the top roll is accomplished by placing the sleeve 10, with the bearing sets 22, 28, the ring 24, and the oil seal 29 positioned therein, adjacent the shaft end 30, and sliding with the sleeve on to the shaft. The split ring 24 will expand and ride up over the tapered surface of the shaft end 30 and slide along the shaft until it reaches the groove 32 into which it will snap into mating and locking relationship. In such position the ring is locked against moderate amounts of axial thrust, and thereby provides a thrust bearing surface for each roller bearing set.

The lubricating medium is sealed within the sleeve 10, one end of which is closed by the end cap 16. The sealing structure at the opposite end includes the oil seal 29 which rotates with the sleeve, the felt ring 38 and the retainer ring 36 which is fastened to the shaft 14.

In this manner, as shown in Fig. 1, it is seen that an assembly of an independent top roll structure has been provided wherein the bearings are sealed so that lubri-

cant cannot escape and contamination of the drafted material from such source is eliminated. Further roller bearings, which may be heavily loaded are utilized, the shaft 14 being hardened and polished such that it may be utilized as the inner race for each bearing set, the outer race being fixedly positioned within the sleeve. Axial loads of the magnitude created on top rolls of the shell type in drafting operations are resisted by the bearing ring 24 which is positioned between the bearing races 20, 26 and locked in the annular groove in the shaft. Furthermore, the shell assembly (the boss 18, sleeve 10, bearing sets 22, 26, and oil seal 29) may be easily removed by a moderate amount of leverage applied between the end of the sleeve and the flange of the retainer ring, such leverage being adequate to force the bearing ring out of the groove thus permitting the shell assembly to be slid off the shaft.

Having thus described the preferred embodiment of the invention, it is understood that other constructions and configurations, obvious to those skilled in the art, are incorporated within the spirit of the invention as defined in the following claims.

I claim:

1. A top roll structure comprising a pair of relatively rotatable members including a shaft and a sleeve coaxial therewith, said shaft having an annular groove with outwardly sloping walls, two axially spaced sets of rolling bearings positioned between said members, one on each side of said groove, the rolling bearing elements of said bearings running directly on said shaft as a bearing race, a split ring of non-metallic resilient bearing material positioned in said groove and extending outwardly therefrom toward said other member to provide removable thrust bearing surfaces for said rolling bearings.

2. A top roll structure as claimed in claim 1 wherein said split ring has an annular groove about its periphery, a C-shaped metallic spring being positioned in said annular groove to provide a force additional to the inherent resiliency of said ring to urge said ring toward a smaller diameter.

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