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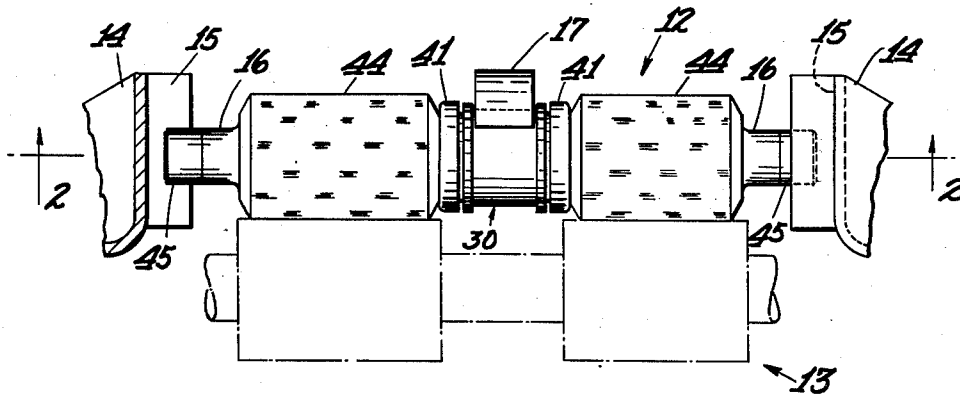
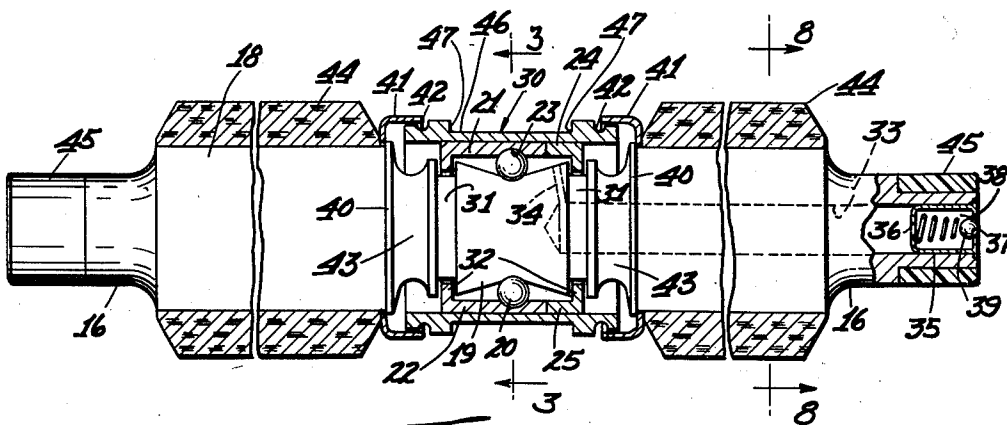
W. S. PIERCE, JR., ET AL

2,623,245

TOP ROLL AND BEARING STRUCTURE THEREFOR

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2 SHEETS--SHEET 1



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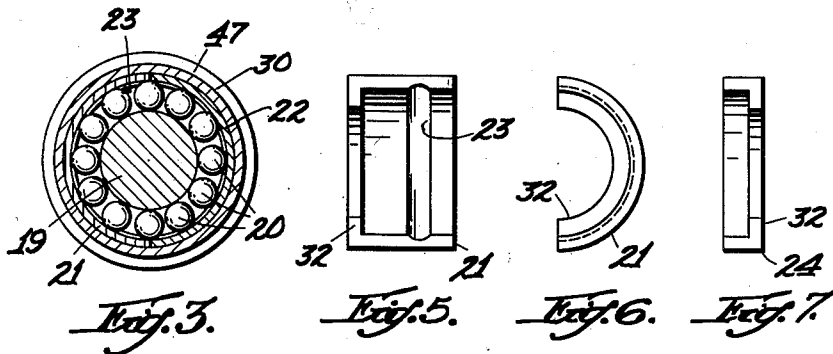
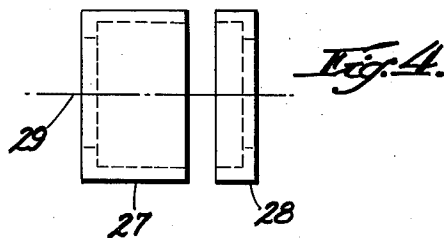
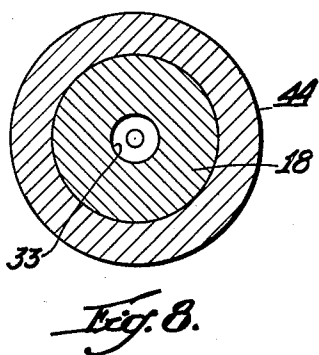
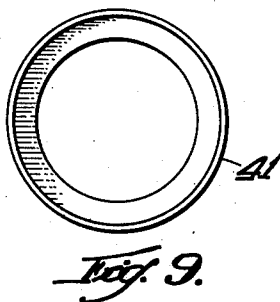
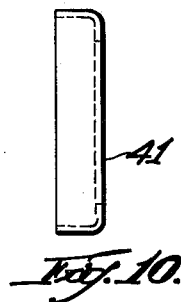
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TOP ROLL AND BEARING STRUCTURE THEREFOR

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2 SHEETS—SHEET 2



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UNITED STATES PATENT OFFICE

2,623,245

TOP ROLL AND BEARING STRUCTURE
THEREFOR

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9 Claims. (Cl. 19—142)

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The present invention relates to top rolls of the type employed in textile machinery, and more particularly to that type of top roll which cooperates with a rotatable bottom roll in stretching and reducing the size of yarn threads which are passed between such rolls.

As well known by those skilled in the art, one form of top roll is applied to a portion of a spinning frame, which provides a series of pairs of cooperating bottom rolls, between which top and bottom rolls, lengths of fibrous material, in the form of threads or slivers, are adapted to be drawn.

The lower or bottom rolls usually provide fluted or corrugated cylindrical surfaces, while the upper or top rolls provide cylindrical surfaces covered with coats of cork or leather material, with reduced neck portions therebetween. The top rolls are usually arranged in pairs, and may be maintained in position to engage the lower rolls by means of cap bars which receive the opposite end portions of each pair of rolls. Usually, the intermediate neck portion of the top roll has a saddle member applied on the top surface of the neck, for the purpose of properly loading the top roll. The fibrous slivers are delivered to the oppositely disposed top and bottom rolls, and are drawn therebetween, due to the fact that the bottom roll is positively driven.

It has been found that the saddle member, while bearing upon the rotating top roll neck, will set up friction between these two members, thus causing the opposite end portions of the top roll forcibly to engage the cap bars or seats, consequently causing wear at the points of rotative engagement, to the end that the top rolls employed heretofore were short-lived. In the past, various lubricating expedients have been employed to reduce the friction and heat set up by the saddle members. However, such lubricating expedients have not been successful for the reason that any excess lubricant delivered to the top roll will tend to work out to the cot portions of the roll, thus ultimately coating the fibrous material as the same is drawn between the top and bottom rolls. Furthermore, the presence of such free lubricant upon the rolls will enhance the tendency of the roll to collect various foreign substances such as lint, dust, or fly thereupon, with the result that the friction will be increased, and the efficiency of the roll decreased. The collection of such foreign substance upon the rolls often becomes so great that the rolls must be removed from the frames at frequent intervals for cleaning, even though the rolls, themselves, have not been appreciably worn.

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Also, in the past, many attempts have been made to construct top rolls with various types of anti-friction bearing devices, for the purpose of reducing the friction set up by the saddle members. However, such bearing devices employed in the past soon became clogged with fly, lint, and other such foreign substances, to the end that the bearings proved to be of no appreciable advantage. Furthermore, in the past, no successful means for lubricating such bearing devices was devised, and thus in practice, these anti-friction bearings were supplied with an inadequate or an excess supply of lubricant, with disastrous results in either event.

It is, therefore, a primary object of the present invention to provide a top roll having a construction in which the above noted shortcomings are eliminated.

A more specific object of the present invention is to provide a top roll device having associated therewith an anti-friction bearing which is so sealed that foreign substances cannot gain entrance therein.

A further object of this invention is to provide a top roll device with an anti-friction bearing unit so constructed that it may be readily lubricated, but at the same time having means for preventing the escape of such lubricant.

Another object of this invention is to provide a top roll device having all of the advantages as above noted, and being designed in a manner such that it may be inexpensively manufactured and serviced.

With the above and other objects in view, as will hereinafter appear, the invention comprises the devices, combinations and arrangements of parts hereinafter set forth and illustrated in the accompanying drawings of a preferred embodiment of the invention, from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

Fig. 1 represents a front elevation view of the present invention as applied to a spinning frame.

Fig. 2 represents, on an enlarged scale, a longitudinal sectional view taken substantially along the line 2—2 of Fig. 1.

Fig. 3 represents a vertical sectional view taken substantially along the line 3—3 of Fig. 2.

Fig. 4 represents a side view of a pair of bearing races which are employed in the present invention.

Fig. 5 represents a side view of a portion of one of the bearing races used in the present device.

Fig. 6 represents an end view of that element disclosed in Fig. 5.

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Fig. 7 represents a side view of another bearing race element used in the present invention.

Fig. 8 represents a vertical sectional view taken substantially along the line 8—8 of Fig. 2.

Fig. 9 represents a face view of a cup element 5 used in the present invention.

Fig. 10 represents a side view of the cup element disclosed in Fig. 9.

Referring particularly to Fig. 1, a top roll assembly, generally designated by the numeral 12 10 and incorporating the present invention therein, is shown as being applied to a portion of a spinning frame which provides a series of pairs of lower rolls which are designated generally by the numeral 13. As is usual in such installations, the upper rolls 12 are maintained in position to engage the lower rolls 13 by means of cap bars 14, 14 providing seats in the form of vertically disposed slots 15, 15 for receiving the end portions 16, 16 of the top roll assembly. An intermediate neck portion of the top roll is adapted to have a saddle bearing 17 disposed thereon for the purpose of properly loading the roll assembly. As hereinabove noted, the fibrous slivers are adapted to be drawn between the upper and lower roll assemblies 12 and 13, of which only the lower rolls 13 are positively driven.

Referring particularly to Fig. 2, the present top roll comprises a steel arbor structure 18 having intermediate its end portions a hardened trough-shaped neck 19 about which a novel split ball bearing structure is adapted to be provided. More specifically, this ball bearing unit comprises a series of balls 20, 20 which encircle the groove 19 in ball-to-ball contacting relation. In order to confine these balls about the neck 19 in this relation, there are provided a pair of hardened complementary race elements 21 and 22 (see Fig. 3). These races are identical in structure, and each is provided with one-half of an inner circumferential groove 23 which is particularly adapted for receiving the balls 20, 20. Cooperating with the races 21 and 22 is a second or auxiliary pair of hardened race elements 24 and 25 which, like the race elements 21 and 22, are similar to each other. As may be best seen in Fig. 2, all of the semicircular race elements 21, 22, 24, and 25 are adapted to be assembled together in a manner such that they form a substantially hollow cylindrical bearing-confining outer race ring which cooperates with the inner neck or race 19 in confining the bearing balls 20, 20.

Referring particularly to Figs. 4 to 7, inclusive, it is to be understood that the race elements 21, 22, 24, and 25 are initially made as a pair of hollow cylindrical structures 27 and 28 which are illustrated in Fig. 4. A second step in the forming of this composite outer bearing-retaining device is to form the groove 23 within the inner wall portion of the cylinder 27. Upon the completion of this groove 23, the cylinder 27 is then fractured lengthwise of itself along a line 29, thus forming the two race elements 21 and 22. A final step in the preparation of these race elements is to fracture the cylinder 28 lengthwise of itself along line 29, thereby to form the auxiliary race elements 24 and 25. By thus forming a pair of initial cylinders 27 and 28, the above noted groove 23 can be formed in the cylinder 27 with greater facility and accuracy than could be had if the cylinders 27 and 28 were formed as a single unit. However, the present invention also contemplates the idea of forming the race structure from a single hollow cylindrical element which is thereafter fractured once lengthwise of itself thereby

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to form two semicircular race elements rather than the four as above noted.

After the races 21, 22, 24 and 25 are assembled about the bearing balls 20, 20 in a manner as indicated in Figs. 2 and 3, a cylindrical sleeve 30 is fitted snugly over the peripheries of the race element, thereby completing the ball bearing unit. In this connection it should be understood that the greatest diameter of the arbor unit 18 is slightly less than that of the inside diameter of the sleeve 30, so that the latter element may be shifted lengthwise of the arbor for the purpose of properly positioning the sleeve in place over the various race elements.

Still referring to Fig. 2, it is to be particularly noted that the arbor 18 is provided with a pair of longitudinally spaced annular grooves 31, 31 which are disposed adjacent the neck portion 19 for the purpose of receiving therein flange portions 32, 32 of the race elements 21, 22, 24 and 25. This particular construction is designed to prevent any lubricant from escaping from the ball bearing area, and also to prevent any foreign matter from entering this area. However, sufficient clearance is provided between the inner peripheral portions of the flanges 32, 32 and the circumferential grooves 31, 31, in order to prevent excessive engagement between these elements. These flanges 32, 32 also function to stiffen their respective raceway elements which are constructed with thin wall portions so as to maintain the outside diameter of the bearing unit at a minimum figure.

Longitudinally disposed within one end portion of the arbor 18 is a bore 33 which communicates with the ball bearing area by means of a substantially radially disposed conduit 34. The outer portion of the bore 33 is provided with a lubricant valve so that the ball bearing area may have lubricant periodically fed thereto. More specifically, this valve comprises a cylinder member 35 having apertures 36 and 37 formed in the oppositely disposed end walls thereof. Disposed within the cylinder 35 is a coil spring 38 which is adapted to force a ball 39 over the aperture 37 for the purpose of preventing the egress of lubricant from the bore 33. From this, it is to be understood that although such a valve will prevent the egress of lubricant from the bore 33, it will, at the same time, permit lubricant to be forced into the cylinder 35, and ultimately into the ball bearing area by way of the conduits 33 and 34.

At either side of the neck portion of the arbor 18 there is provided an annular flange 40, 40 having an outer diameter, as hereinabove noted, slightly less than the internal diameter of the sleeve member 30. These flange portions 40, 40 are adapted as abutment members, against each of which is positioned an annular guard member 41, 41. Each of these guard members is adapted to be force-fitted over the arbor so as intimately to engage its associated flange member 40. When each of the guard elements 41, 41 is so positioned, the peripheral portion thereof overhangs a respective end portion of the sleeve member 30, thereby to seal the bearing area. Also, in corresponding relation with each of these sealing units, there is formed a circumferential groove 42 about the sleeve 30. Referring particularly to Fig. 2, it is to be understood that each of the sealing units 41, 41 has its free end portion overhanging the center portion of a respective one of the grooves 42, 42, thereby to form a roof structure over a portion of each groove. Experience has shown that such an overhanging roof structure will pre-

vent foreign matter, in the form of fly, from working its way between the slight clearance afforded between the guard elements 41, 41 and the sleeve 30. Instead, the fly will drop within the grooves 42, 42 where it will become intermatted and thereafter be thrown from the periphery of the sleeve as the same is rotated or vibrated during the operation of the top roll.

Still referring to Fig. 2, there is provided about the periphery of the arbor 18 and adjacent a respective one of the end portions of the sleeve 30, a groove 43. In the event that some fly material does work its way past each of the sealing elements 41, 41 it will be deposited within the grooves 43, 43. It is within the contemplation of the present invention that this small amount of fly will, due to the rotation of the arbor 18, tend to become intermatted and thus form an annular ring of fly. The fly, by thus forming in such a ring, will not tend to work its way into the grooves 31, 31, and in fact, this fly ring will function as a secondary seal to prevent any excess oil which may work its way around the groove 31, from passing outwardly from between the guard elements 41, 41 and the end portions of the sleeve 30. These annular rings of fly material may be readily and periodically removed from the bearing units whenever the non-metallic cots are replaced on the arbor, as will be hereinafter described.

After the above described split bearing has been properly assembled about the neck portion of the arbor 18, a pair of cots 44, 44 may then be provided upon the opposite end or roll portions of the arbor. These cots may be fabricated of cork, asbestos, or other similar material, and each of them is shaped in the form of a hollow cylinder which may be force-fitted over an end portion of the arbor. In order to insure that these cot elements will not work loose off the arbor, adhesive material may be applied between the inner cot surface and the periphery of the arbor element. The present cot elements are conventional in nature, and whenever they become worn, they may be readily removed from the arbor 18 by cutting them away from the arbor surface. Thereafter, fresh cot elements may be force-fitted in place.

Referring particularly to Figs. 1 and 2, it is to be understood that the end portions 16, 16 of the arbor are each provided with a cylindrical bearing member 45, 45 which is fabricated of a resinous synthetic material. More specifically, this material is of a conventional type which is characterized by its great porosity, and thus, the bearing elements 45, 45 may be saturated with a lubricating medium and thereafter force-fitted over the roll ends 16, 16. In this connection, it should be pointed out that such bearing elements 45, 45 could not successfully be used on top roll devices heretofore employed, for the reason that they would be short-lived, due to the high frictional forces set up on the bearings by the saddle member. However, by utilizing a ball bearing element of the present type between the saddle 17 and the roll proper, the amount of friction between the end portions of the roll and their respective bearing seats 15, 15, has been reduced to a degree that synthetic bearings, such as elements 45, 45, may be successfully employed on the roll.

As hereinabove noted, the saddle bearing 17 is adapted to rest upon the upper surface of the sleeve 30 and thus, in the present invention, the sleeve 30 has a reduced central portion 46 which is adapted to receive the saddle bearing 17, and

shoulders 47, 47 formed on the sleeve function as guides for the saddle element.

Thus, from the above, it is to be understood that the present top roll assembly is provided with an efficient anti-friction bearing unit which is sealed in a manner which precludes the possibility of any foreign matter gaining entrance into the bearing area. Furthermore, this bearing unit is provided with means whereby it may be properly lubricated without any danger of having the lubricant work its way out upon the roll cots. Those skilled in the art will readily appreciate that the novel split ball bearing structure employed in the present top roll assembly permits the bearing area to be effectively sealed in a manner which not only makes for a highly efficient seal but which also makes for inexpensive manufacture and maintenance.

We claim:

1. In a top roll of the character described, comprising, a unitary arbor having longitudinally spaced roll portions formed integrally therewith, and a reduced neck portion between the roll portions, a unitary cylindrical sleeve surrounding said neck portion and having an internal diameter greater than the diameter of the arbor roll portions, rotatable bearing elements disposed between said sleeve and the arbor neck portion, sealing means disposed at the opposite end portions of said sleeve, and cooperating with the adjacent ends of said roll portions, and a cot element surrounding each of said roll portions.

2. In a top roll of the character described, comprising, a unitary arbor having longitudinally spaced roll portions and a reduced neck portion between the roll portions, a unitary cylindrical sleeve surrounding said neck portion, rotatable bearing elements disposed between said sleeve and the arbor neck portion, means carried by said arbor and cooperating with the opposite end portions of said sleeve so as to seal over the bearing space between said sleeve and the arbor neck portion, a lubricant supply conduit formed within said arbor and leading from one end portion of said arbor to the bearing space, and a one-way acting valve associated with said conduit and disposed within said end portion of said arbor.

3. In a top roll of the character described, comprising, a unitary arbor having longitudinally spaced roll portions and a reduced neck portion between the roll portions, an outer race ring having an internal diameter less than the outer diameter of the arbor roll portions, rotatable bearing elements disposed between said outer race ring and the arbor neck portion, sealing means disposed at the opposite end portions of said outer race ring, and cot elements surrounding each of the arbor roll portions.

4. In a top roll of the character described, comprising, a unitary arbor having longitudinally spaced roll portions and a reduced neck portion between the roll portions, a pair of semicircular elements disposed together so as to form an outer race ring surrounding the arbor neck portion, rotatable bearing elements disposed between said arbor and said outer race ring, a cylindrical sleeve surrounding said race ring, and means disposed between the opposite end portions of said sleeve and said arbor for sealing over the area between said sleeve and said arbor.

5. A bearing structure, comprising, a solid arbor having an annular ball groove at its middle portion, and integrally formed flanges on either side thereof, a pair of semicircular elements disposed together so as to form an outer race ring

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surrounding the grooved portion of said arbor, with each element of said race ring being provided about its inner surface with a continuous semicircular ball groove, a plurality of balls disposed between said race ring and said arbor and within said two ball grooves, a cylindrical sleeve surrounding said race ring to hold said elements together, and means disposed between the opposite end portions of said sleeve and the flanges on said arbor for sealing over the area between said sleeve and said arbor.

6. A bearing structure, comprising, a solid arbor having an annular ball groove at its middle portion, and integrally formed flanges on either side thereof, an outer race ring surrounding the grooved portion of said arbor, said outer race ring being formed from a pair of hollow cylindrical elements which have been fractured longitudinally of themselves thereby forming four semicircular elements, an inwardly extending flange formed about each of the opposite end portions of said outer race ring and being received within a respective one of a pair of annular grooves formed around said arbor on opposite sides of said ball groove, said race ring being provided about its inner surface with a continuous annular ball groove, a plurality of balls disposed between said race ring and said arbor and within said two ball grooves, a cylindrical sleeve surrounding said race ring thereby to hold said four elements in their proper positions, and means disposed between the opposite end portions of said sleeve and the flanges on said arbor for sealing over the area between said sleeve and said arbor.

7. A bearing structure, comprising, a solid arbor having spaced flanges on either side of a central portion, a pair of thin semicircular elements disposed in opposite relation so as to form an outer race ring surrounding said central portion of said arbor, an inwardly extending stiffening flange formed about each of the opposed elements of said outer race ring, each flange being received within an annular groove formed around said arbor, said race ring being provided about its inner surface with a continuous annular ball groove, a plurality of balls disposed between said race ring and said arbor and within said ball groove, a cylindrical sleeve surrounding said race ring, and means disposed between the opposite end portions of said sleeve and the flanges on said arbor for sealing over the area between said sleeve and said arbor.

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8. A bearing structure comprising a solid arbor having spaced grooves on either side of a central portion, a pair of thin semicircular elements disposed in opposite relation so as to form an outer race ring surrounding said central portion of said arbor, an inwardly extending semiannular stiffening flange formed about each of the opposed elements of said ring, each flange being received in one of said grooves, rotatable bearing elements disposed between said arbor and said race ring, and a cylindrical sleeve surrounding said ring to hold said elements together within said grooves with their flanges in abutting relation.

9. A top roll mechanism comprising in combination a pair of slotted guides mounted in spaced relation, a unitary arbor extending between said guides and providing reduced end portions and longitudinally spaced roll portions with a reduced neck portion therebetween, an outer race ring surrounding said neck portion, rotatable bearing elements disposed between said neck portion and said outer race ring, a pressure exerting member cooperating with said outer race ring, and bearing sleeves mounted on said reduced end portions of said arbor, and turnable therewith, with each bearing sleeve being composed of lubricant impregnated material the outside of which is freely received in one of said slotted guides.

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