Jan. 24, 1956 H. A. HOPKINS 2,731,678

TOP ROLL

Filed Sept. 29, 1953

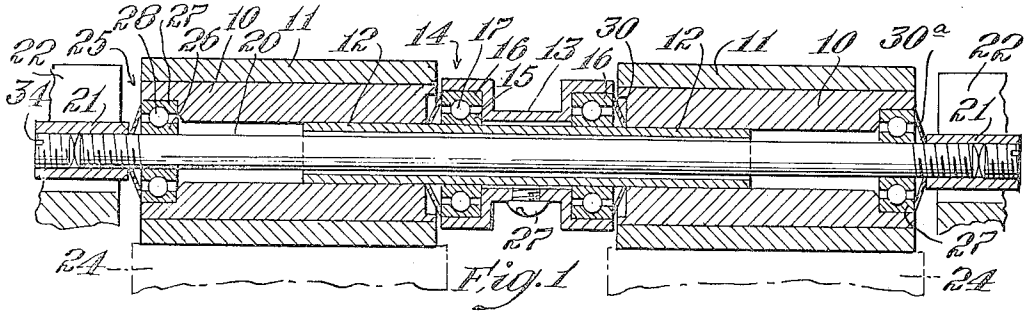


Fig. 1

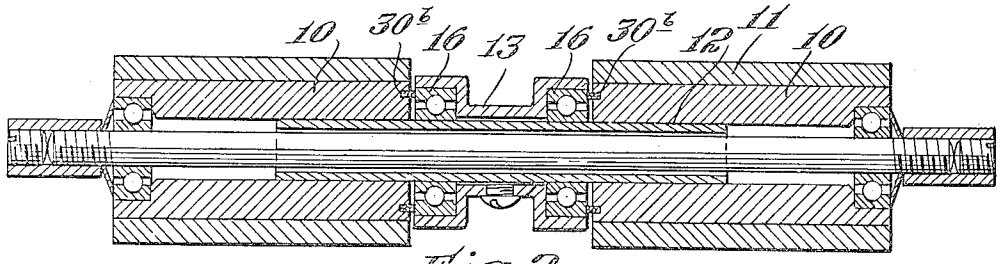


Fig. 2

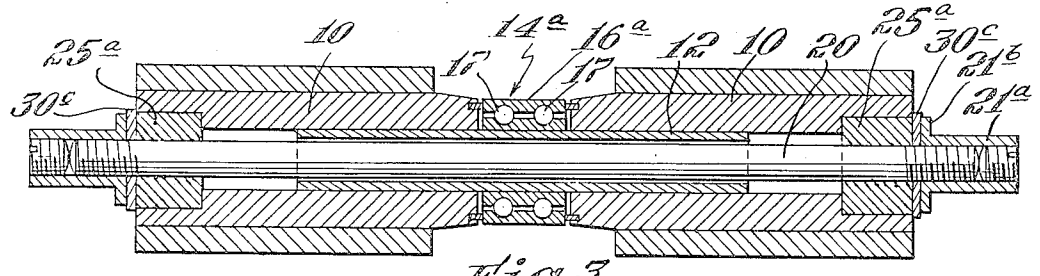


Fig. 3

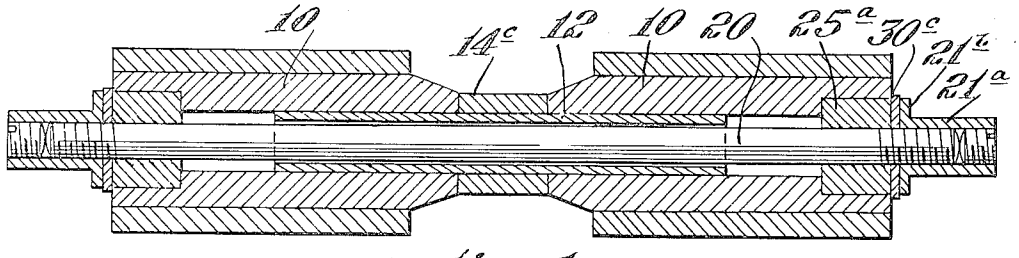


Fig. 4

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2,731,678

TOP ROLL

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7 Claims. (Cl. 19—142)

This invention relates to top rolls for textile drawing-mechanisms such as spinning frames or roving frames. Such top rolls are conventionally in pairs, and have some provision between the two rolls of the pair for engagement by a saddle or weight hook which forces the pair of top rolls down against the corresponding bottom rolls. At each outer end of the pair of rolls there is some provision for engagement with slotted guides which usually form parts of the cap bars of the frame.

The older so-called "solid" type of top roll had certain disadvantages which have resulted in its being displaced to a large extent by shell rolls, each independently rotatable upon anti-friction bearings, the whole being assembled about a central shaft which need not rotate. The non-rotation of this central shaft is an advantage because the outer ends of this shaft, non-rotating, can be guided in the slotted guides of the cap bars with little wear.

In such rolls, as generally constructed, the loading pressure is applied to the two rolls through anti-friction bearings, and so far as the structure of the top roll assembly determines the relation between the axes of its two rolls, this relation is determined by these same bearings through which the loading pressure is received by the two rolls. That is, these same bearings that apply the load form a link in the mechanical connection between the two rolls of the pair. Some radial play is necessary in each of these bearings to permit easy running, and as a consequence, the rolls are not accurately fixed in axial alignment but are capable of tilting to some extent relative to each other and are capable of skewing to some extent relative to each other. This ability to tilt and skew becomes more pronounced as the bearings wear, and with worn bearings marked unevenness in pressure occurs along the length of the nip between each top roll and the corresponding bottom roll.

Moreover, in some types of these rolls where each of the two rolls receives its loading pressure or the main part of its loading pressure near its inner end, and there is even a slight freedom for relative tilting between the two rolls, each roll will initially tend to press hardest against the bottom roll near its inner end, even before much wear on the bearings has taken place. When the two top rolls of a pair are capable of skewing relative to each other, the drag exerted by the textile material upon the top rolls will skew each of them relative to the corresponding bottom roll so that the axis of a top roll does not lie in a common plane with the axis of the corresponding bottom roll. This again introduces variations in pressure along the nip of the rolls.

On the other hand, it is desirable that the pressure be constant at all points along the nip, so that the material will be uniformly acted on at all places as it is shifted back and forth along the nip.

In general the present invention aims to permit the employment of desirable forms of bearings and to have a non-rotating central shaft, which is an advantageous feature, but to fix the axes of the two rolls of a pair

coaxial independently of any bearings upon which the rolls turn, and more especially independently of any bearing applying loading pressure, and maintain the two rolls in accurate axial alignment both initially and also when the bearings have become worn.

In another aspect, the invention recognizes that the bearings are bound to wear and arranges the elements of the top roll assembly in such a manner that wear of the bearings will not permit tilting or skewing of the two rolls relative to each other.

It is common practice to seal the bearings of the top rolls against entry of dirt or lint or loss of lubricant by sealing elements which press radially. Wear of the bearing in such cases naturally tends to create an opening between a sealing element and one of the parts intended to be engaged by the sealing element. A preferred feature of the present invention is the arrangement of the sealing elements so that they press axially and their sealing contact is not disturbed by wear of the bearings.

A further object of the invention is to facilitate reconditioning of the top roll when the bearings finally need to be changed.

Other objects and advantages of the invention will be apparent from this specification and its accompanying drawings in which the invention is explained by description and illustration of certain preferred forms thereof.

In the accompanying drawings:

Figs. 1, 2 and 3 are vertical longitudinal sectional views of three forms of top rolls.

Referring to Fig. 1, the top roll there shown includes two shells **10**, each having a suitable covering **11** and each fast with a forced fit upon a steel tube **12**. The two shells, therefore, turn together and are accurately coaxial.

A stirrup **13** between the two shells, has a depressed central portion for receiving the conventional saddle or weight hook (not shown). Stirrup **13** everywhere clears the tube **12** and bears thereon through two bearings **14**, each having inner and outer races **15** and **16** separated by balls **17** or other similar rolling anti-friction elements such as rollers or the like. The stirrup, its associated bearings, and the tube **12**, which extends into each shell, thus cooperate to load each shell uniformly. Although the bearings **14** wear, the accurate coaxial relation between the two shells is maintained.

A steel shaft **20** extends centrally through the assemblage and beyond the outer ends of the two rolls. The diameter of shaft **20** is chosen sufficiently smaller than the internal diameter of tube **12** so that even though the shaft varies somewhat from the specified diameter or is slightly bent (either of which may occur with commercial cold rolled steel shafting), the shaft will not make contact with the rotating tube **12**.

The outer ends of shaft **20** may be received within internally threaded bushings **21** which are adapted to fit in slotted guides for the top rolls, such as those slotted guides afforded by the cap bars of the spinning frame, such guides being diagrammatically indicated at **22** in Fig. 1. The axis of central shaft **20** is thus substantially parallel with that of the cooperating bottom rolls diagrammatically shown at **24**.

Threaded plugs **34** may be fitted into the ends of the bushings **21** and assist in locking the bushings in place.

Between the outer end of each roll and the central shaft **20** there is provided a bearing **25**, each such bearing including inner and outer races **26** and **27** separated by balls **28** or other similar rolling anti-friction elements such as rollers or the like.

It will be observed that neither the central shaft **20** nor the bearings **25** receive any of the loading pressure. These elements, however, maintain the assemblage in

alignment with the axes of the bottom rolls. The bearings **25** may be expected to have a very long life because they are not subject to the loading pressure.

The two roll shells **10** are fixed to each other by the tube **12** independently of any of the bearings, and, most important, independently of the bearings **14** that apply the loading force. Wear of these bearings, therefore, does not allow the roll shells to tilt or skew relative to each other. In operation there are no substantial forces applied to the shaft **20** in such manner as to tend to bend the shaft, and whether the shaft is true or not the two roll shells will be held in accurate alignment by the tube **12**.

The tube **12** extends well into each roll shell, preferably, as shown, to the region of the middle thereof or beyond, and the fit between tube **12** and each shell is, as indicated above, a forced fit. It will accordingly be apparent that pressure will be substantially uniform throughout the length of the nip between each top roll and the corresponding bottom roll.

It will usually be desirable to provide an opening in the stirrup, shown as closed by screw **27**, through which opening a lubricant can be supplied to the interior of the stirrup accessible to the bearings **14**.

For sealing each of the bearings **14** a flexible plastic sealing element **30** of conical form is provided between the inner end face of the shell **10** and the outer face of the outer race **16** of the bearing. This conical sealing element is under compression axially of the assemblage and so presses axially against the shell and race. Radial wear of the bearing, therefore, does not create a space betwen the sealing element and either the shell or the bearing race, or substantially impair the sealing action of the sealing element. Similar conical sealing elements **30a** are provided between the inner face of each bushing **21** and the outer face of the outer race **27** of the adjacent end bearing, and these sealing elements are likewise under axial compression, and their sealing action, is substantially unimpaired by radial wear of the end bearings.

In the modified forms of rolls of Figs. **2** and **3** corresponding parts are designated by the same reference characters as in Fig. 1 or by similar reference characters.

In the roll of Fig. 2 the conical sealing elements **30** of Fig. 1 are replaced by rings **30b** of felt or other compressible material fitted into recesses in the roll shells and pressing axially, under compression, against the outer race of the bearing.

Fig. 3 represents a simplification of the device of Figs. 1 and 2 but operates in the same manner. In Fig. 3 the element referred to as the stirrup **13** of Fig. 1 is omitted and a double ball or roller bearing **14a** takes the place of the two separated bearings **14** of Fig. 1. In the device of Fig. 3 the saddle or weight hook can engage directly with the outer race **16a** of the bearing.

Also in Fig. 3 each outer bearing **25a** between the shell and the central shaft is formed of oil-impregnated bronze bearing metal or other self-lubricating bearing metal, fast in the roll shell **10**. In this case the bushing **21a** is formed with a flange **21b** which holds a felt washer **30c** axially compressed against the end face of the bearing.

It will be seen from the foregoing that the several illustrated embodiments each make use of a rigid body comprised of the two shells and the connecting tube, and with this rigid body acted upon at three points, namely, positioned at its two end bearings in such manner as to prevent the body as a whole from skewing relative to the bottom rolls, and loaded at the middle, but with the load transmitted to both shells in such manner that neither individual shell can tilt or skew.

In each form of roll shown, replacement of the bearings does not entail spoiling either the shaft, the shells, the tube or the bushings, all of which parts can be saved and reassembled with new bearings.

I claim:

1. A top roll for textile machines comprising two axially aligned, spaced shells, a central shaft on which the shells are adapted to rotate, a tube fitted rigidly into both shells, replaceable load-applying bearing structure in the space between the shells for transmitting loading force to the tube, said bearing structure including rolling anti-friction elements, inner rotating race structure for the rolling elements, said inner race structure fitting the tube and turning therewith, and outer, normally non-rotating structure, and bearing sealing elements of compressible material positioned between each shell and said outer normally non-rotating structure and under compression between the shell and said outer normally non-rotating structure in a direction axially of the roll so as to press axially against the shell and said outer normally non-rotating structure.

2. A top-roll for textile machines comprising two axially aligned, spaced shells, a central shaft on which the shells are adapted to rotate, a tube fitted rigidly into both shells, replaceable load-applying bearing structure in the space between the shells for transmitting loading force to the tube, said bearing structure including rolling anti-friction elements inner rotating race structure for the rolling elements, said inner race structure fitting the tube and turning therewith, and outer, normally non-rotating structure, and conically-shaped bearing sealing elements of compressible material positioned between each shell and said outer normally non-rotating structure and under compression between the shell and said outer normally non-rotating structure in a direction axially of the roll so as to press axially against the shell and said outer normally non-rotating structure.

3. A top roll for textile machines comprising two axially aligned, spaced shells, a central shaft on which the shells are adapted to rotate, a tube fitted rigidly into both shells, replaceable load-applying bearing structure in the space between the shells for transmitting loading force to the tube, said bearing structure including spaced sets of rolling anti-friction elements, inner rotating race structure for the rolling elements, said inner race structure fitting the tube and turning therewith, and outer, normally non-rotating structure including a stirrup having a depressed middle portion between the sets of rolling elements, for reception of a load-applying saddle, and bearing sealing elements of compressible material positioned betwen each shell and said outer normally non-rotating structure and under compression between the shell and said outer normally non-rotating structure in a direction axially of the roll so as to press axially against the shell and said outer normally non-rotating structure.

4. In a top roll adapted for engagement with guides at its ends, the combination of two spaced shells, a tube connecting said shells and rigidly fitting in said shells throughout a substantial portion of the length of each of said shells, replaceable load-applying bearing structure in the space between the shells, said bearing structure including rolling anti-friction elements and inner race structure for the rolling elements, said inner race structure fitting the tube and turning therewith, a non-rotating shaft extending through the tube and shells out of contact therewith, the outer end portions of said shells being recessed, removable bearings in said recessed end portions of the shells and removably engaging the respective shell and said shaft, said last-named bearings being of the type including rolling anti-friction elements, and bushings at the ends of said shaft for engagement with said guides to maintain the axis of the top roll parallel to the axis of a cooperating bottom roll.

5. In a top roll adapted for engagement with guides at its ends, the combination of two spaced shells, a tube connecting said shells and rigidly fitting in said shells throughout a substantial portion of the length of each of said shells, replaceable load-applying bearing structure in the

space between the shells, said bearing structure including rolling anti-friction elements and inner race structure for the rolling elements, said inner race structure fitting the tube and turning therewith, a non-rotating shaft extending through the tube and shells out of contact therewith, said tube being of substantially uniform internal diameter substantially throughout its length, the outer end portions of said shells being recessed, removable bearings in said recessed end portions of the shells and removably engaging the respective shell and said shaft independently of said tube and outwardly beyond the respective outer end of said tube, said last-named bearings being of the type including rolling anti-friction elements, and bushings at the ends of said shaft for engagement with said guides to maintain the axis of the top roll parallel to the axis of a cooperating bottom roll.

6. In a top roll adapted for engagement with guides at its ends, the combination of two spaced shells, a tube removably connecting said shells and rigidly fitting in said shells throughout a substantial portion of the length of each of said shells, replaceable load-applying bearing structure in the space between the shells, said bearing structure including rolling anti-friction elements and inner race structure for the rolling elements, said inner race structure fitting the tube and turning therewith, a non-rotating shaft extending through the tube and shells out of contact therewith, and removable bearing structure in the outer end portions of the shells and removably engaging the respective shell and said shaft independently of said tube and outwardly beyond the respective outer end of said tube, said tube being of substantially uniform internal diameter substantially throughout its length and being of substantially uniform external diameter where it fits in said two shells and where it is engaged by said inner race structure of said load-applying bearing structure.

7. In a top roll adapted for engagement with guides at its ends, the combination of two spaced shells, a tube connecting said shells and rigidly fitting in said shells throughout a substantial portion of the length of each of said shells, replaceable load-applying bearing structure in the space between the shells, said bearing structure including rolling anti-friction elements and inner race structure for the rolling elements, said inner race structure fitting the tube and turning therewith, said tube being of substantially uniform exterior diameter substantially throughout its length, a non-rotating shaft extending through the tube and shells out of contact therewith, the outer end portions of said shells being recessed, removable bearings in said recessed end portions of the shells and removably engaging the respective shell and said shaft, said last-named bearings being of the type including rolling anti-friction elements, and bushings at the ends of said shaft for engagement with said guides to maintain the axis of the top roll parallel to the axis of a cooperating bottom roll.

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