UPPER ROLLER FOR SPINNING MACHINE DRAWING MECHANISMS

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The present invention relates to an upper roller for drawing mechanisms in spinning machines, wherein the cylindrical drafting roller casings which carry a resilient covering are relatively fixed, and in which the faces of rolling contact bearings arranged on the spindle.

Such upper rollers have already been known for a long time. Spinning machine manufacturers require such upper rollers that in addition to operating satisfactorily they are not only to have a very long working life but more particularly they should also be simple and thus inexpensive in construction, since very large numbers of such upper rollers are required on each single spinning machine. It is true that there are upper rollers on the market which operate satisfactorily, but they are so constructed that they require a large number of processing steps and, more particularly, a considerable outlay on removing material by cutting. Naturally, this greatly adds to the cost of these upper rollers and thus also disadvantageously influences the overall cost of the spinning machines.

The object of the invention is to provide an upper roller which, although it can accept at least the same amount of load, is much simpler in construction than known upper rollers, so that production is simplified and therefore its costs can be kept low. According to the invention, this object is achieved in that:

(a) The rolling contact bearings are provided with one or more, and preferably two, rows of rolling elements which, in order to take up axial pressure, abut against collars or rims on the spindle and on the outer race;

(b) The said collars are formed of separate parts which are rigidly connected to the spindle and/or the outer races, and

(c) The spindle carrying the rolling contact bearings is of constant diameter over its entire length except for annular grooves cut into it or projections shaped without cutting for the purpose of fixing the collars or rims.

The essential advantage of this upper roller as compared with known constructions is that the spindle carrying the rolling contact bearings has a uniform diameter substantially over its entire length. If such a spindle is compared with known spindles, it will be noted that it dispenses with very considerable outlay on machining. Whereas the known spindles are provided with a plurality of shoulders and projections, the surfaces on which the rolling elements abut having to be machined by grinding, the spindle for the upper roller according to the present invention, owing to its uniform diameter, may be gratifyingly simple in a manner. The spindle deviates from this uniform outer diameter only at a few points, at which either annular grooves are cut into it or projections are formed on it without involving cutting. These deviations from the per se uniform outer diameter may readily be produced in a single working operation. The grooves or projections produced in this way are used for fixing the collars or rims for the abutment of the rolling elements, which are formed by separate parts arranged on the spindle after the processing of the spindle is completed.

The collars or rims subsequently arranged on the spindle may be formed by synthetic plastic material parts. This results in a considerable simplification in production and a considerable lowering in cost, since these synthetic plastic material parts can be produced in simple molds by injection molding. They may be fixed on the spindle, for example, by providing their bores with projections which engage in the previously produced grooves in the spindle. If the spindle is provided with projections shaped without cutting, the bores of the synthetic plastic material parts may be provided with recesses into which the projections on the spindle engage. There are fundamentally two possible ways of arranging the synthetic plastic material parts on the finished spindle.

In one case they can be subsequently fitted on to the spindle and arranged with their bore projections recesses cooperating with the grooves in or projections on the spindle. This is readily possible since the synthetic plastic material parts are so resilient that when they are pushed on to the spindle they can readily expand slightly in diameter. If the collars have projections within their bores for engaging with grooves in the spindle, it is expedient to construct the individual grooves in the spindle and the projections in the bores of the associated synthetic plastic material parts so that they are of increasing width from the ends of the spindle towards the center. In this way, it is easily possible to prevent a synthetic plastic material part which is to be arranged near the center of the spindle from snapping into the very first groove in the spindle. The first groove would be so narrow in width that the fairly broad projection in the bore of the collar could not enter it. This projection cannot in fact snap into a groove until it reaches the one intended for it.

The second and per se neater way of arranging the collars on the spindle consists in injection-molding them directly on the spindle when they are produced. With this method, the spindle forms a part of the injection molding apparatus, in which the cavities which are provided for forming the collars are situated at places where the spindle comprises grooves or projections. The outer diameters of the parts forming the collars may be so adapted to the components surrounding them as to form sealing gaps. This makes it possible in a simple manner to seal the bearings satisfactorily without requiring special parts for the purpose.

A further improved sealing effect is obtained if the synthetic plastic material parts forming the collars are bounded at their ends remote from the interior of the bearing by an L-shaped sheet metal disc which is pressed on to the spindle. Since in this construction the sealing element consisting of plastic material, which is integral with the collar, is shielded at its outer end by a sheet metal disc, damage to the synthetic plastic material is prevented when during the operation of the drawing mechanism the operator has to remove tangled fibers from the spindle. Since, in practice, hook-shaped tools are used for this work, it might be possible for the sealing elements to be damaged unless they were protected by a metal part. In addition, the free limb of this L-shaped sheet metal disc, the outer
diameter of which is adapted to the component surrounding it so as to form a sealing gap, acts in practice as a fiber-cutting device which prevents fibers being drawn into the bearing while the machine is running.

Whereas hitherto only synthetic plastic material parts have been used for fixing on the spindle, it should now be pointed out that the collars constructed as synthetic plastic material parts and fixed in the outer race may also be provided on their outer peripheries with a plurality of stud-like projections which are snapped into appropriate recesses in the outer race. This allows the production of the outer race also to be substantially simplified according to the present invention. Substantially all that is required for this purpose is a smooth sleeve in which the necessary abutment collars for the rolling elements can be subsequently arranged. More particularly, this construction makes it possible to use as the outer race of the rolling contact bearing a sleeve drawn from sheet metal, which is particularly simple to manufacture.

It should also be pointed out that according to the invention it is also possible for a further synthetic plastic material part to be fixed in the center of length of the spindle in the same way as the collars, this part being used for holding the upper roller on the associated loading arm of the drawing mechanism, and its outer configuration being suitably adapted to the particular form of loading arm which is used.

Additional embodiments of the invention are illustrated, by way of example, in the accompanying drawings; in which FIGURES 1 to 6 show axial sectional views of various constructions of upper rollers constructed in accordance with the invention.

FIG. 1 is an axial sectional view of one embodiment of upper roller having flanged retaining collars on the spindle for the bearings; FIG. 2 is an axial sectional view of an upper sectional roller similar to that of FIG. 1 wherein the retaining collar has a separate flange; FIG. 3 is an axial sectional view of an upper roller similar to that in FIG. 2 wherein the spindle protrudes entirely through the bearing housings; FIG. 4 is an axial sectional view of an upper roller similar to that in FIG. 1, having raised annular molding rings instead of annular indentations; FIG. 5 is an axial cross sectional view of an upper roller having ball bearings instead of roller bearings; FIG. 6a is a partial axial sectional view of an upper roller showing the bearing with a single row of elongated rollers instead of double rows of short rollers; FIG. 6b is a partial axial sectional view of an upper roller similar to FIG. 6a with the collar means; FIG. 7 is a perspective view of the cage and double roller bearings of the embodiment shown in FIGS. 1, 2, 3 and 4; FIG. 8 is a perspective view of the embodiment shown in FIG. 5, with parts cut away to show the bearing assembly; FIG. 9 is a perspective view of the embodiment shown in FIGS. 6a and 6b showing a single row of roller bearings, with parts cut away to show the bearing assembly.

The upper roller shown in FIG. 1 comprises a spindle 1 which has a uniform outer diameter over its entire length except for spaced annular grooves 2, 3 and 4 formed in the spindle by cutting in a single working operation. The ends of the spindle 1 are constructed as raceways for spaced sets of rollers 5 which are adapted to abut at their outer ends respectively to the collar 6 and 7 formed respectively with projections 8 and 9 engaging respectively in the grooves 2 and 3 in the spindle 1, the collars thereby being retained in the axial direction. The outer raceway for the rollers 5 is formed by a sleeve 10 drawn for example from sheet metal. A central collar 11 is subsequently inserted between the two rows of rollers in the said outer race 10 and has a plurality of projections 12 which are distributed uniformly over the periphery and engage in corresponding recesses in the race 10. The rollers 5 are guided in a comb-type cage 13. The roller bearing thus comprises a journal for the spindle 1, the rollers 5, the cage 13 and the outer race 10. In the axial direction, the bearing is retained by the outer race 10 which is fitted onto the spindle and the collar 11 in the race 10. A cylindrical casing sleeve 14 of the drawing roller is fitted onto the race 16 in known manner, the casing sleeve being made of metal and carrying a resilient covering 15. The casing sleeve 14 is fixed on the outer race 10 of the roller bearing by tongues 16 which are integral with the outer race 10 and engage in an annular groove in the casing sleeve 14, which latter is closed at its outer end by an end wall 17. At its inner end, on the other hand, the sleeve 14 is open. Therefore, the roller bearing must be sealed at the open end of the sleeve 14 against the escape of lubricant and also to prevent the entry of dirt. This sealing effect is obtained in a simple manner by providing the collar 7 fixed on the spindle 1 with, for example, two radially-directed flanges 18 and 19, the outer diameters of which are so adapted to the components surrounding them i.e., the outer race 10 and the sleeve 14, as to form sealing gaps at these points. The central portion of the spindle 1 may be provided with a part 20 of synthetic plastic material having an annular projection 21 which engages in the groove 4 in the spindle 1. The synthetic plastic material part 20 is used to fix the upper roller in the associated loading arm. In the right-hand half of FIG. 1 a similar bearing is illustrated as in the left-hand half, with the sole difference that in the case of the right-hand bearing the casing sleeve 14 with the resilient covering 15 has been omitted.

The upper roller shown in FIG. 2 differs only in minor details from that shown in FIG. 1. In the case of FIG. 2, the left-hand half of the bearing is shown with the casing sleeve 14 fitted, whereas in the right-hand half the casing sleeve has been removed. The only difference as compared with the construction shown in FIG. 1 is that the flange 19, which was integral with the collar 7 in FIG. 1, is no longer provided on collar 7' of FIG. 2. In place of the collar use is made of an L-shaped sheet metal ring 22 which is pressed on to the spindle 1 and the outer diameter of which is so adapted to the casing sleeve 14 as to form a sealing gap in that region. Because the ring 22 is made of sheet metal, there is no danger of the synthetic plastic material collar 7' being damaged when fibers, which can readily tangle on the spindle 1 during operation, are being removed. The metal ring 22 together with the casing sleeve 14, which latter is also made of metal, forms a so-called "fiber cutter" which cuts up incoming fibers and thus prevents them being drawn into the roller bearing.

The upper roller shown in FIG. 3, in contrast to those shown in FIGS. 1 and 2, is of a constructional form which is not held in the middle of the spindle but, on the contrary, at the ends of the spindle. For this purpose, the spindle 1' must project at both ends with studs 23 beyond the casing sleeve. The studs 23 are also of the same diameter as the entire spindle 1'. This upper roller is in any case different from that shown in FIG. 2 only inasmuch as the casing sleeve 14 at its outer side is not closed by a closed end wall 17 as in FIGS. 1 and 2 but only by an annular flange 24 which is adapted to allow the studs 23 of the spindle 1' pass through. This construction makes it necessary also to seal the roller bearing at the outer side, which was not necessary in the case of the constructional forms previously described with reference to FIGS. 1 and 2 owing to the closed end wall 17 of the casing sleeve 14. In order to achieve this sealing effect in the simplest possible way, in this case, as is shown in FIG. 3, the collar 6' is provided with a radially-outwardly directed flange 25, and flange 22 is provided with collar 7', which form sealing gaps with the casing sleeve 14.
The upper roller construction shown in FIG. 4 corresponds in every way in its fundamental layout to that shown in FIG. 1, except for the difference that only the collar 7 in the various embodiments is shown in FIG. 1, whereas in FIG. 4 the collar 7 is axially fixed on the spindle 1 by having a projection 8 engaging an annular groove 9. On the other hand, the collar 7 and also the part 20 of synthetic plastic material is fixed by projections produced on the spindle 1 without the use of cutting, such projections being shown in FIG. 4 as knurled projections 26 and 27. These projections, produced without cutting, engage in corresponding recesses in the collars 7 and the part 20 of synthetic plastic material parts to be injection molded directly on to the spindle 1 when they are being produced, whereas the collar 6 may be subsequently snapped into the groove 2 covered by the roller bearing contact bearing is assembled.

In FIG. 7, the rollers and cage are shown for the embodiments of FIGS. 1, 2, 3 and 4 described above. The double row of rollers 5 fit into the comb-type cage 13. In the construction shown in FIG. 5 and FIG. 8, the roller bearing, which in the previous constructional forms consisted of two rows of roller bearing, consists of a two-row ball bearing. The balls 28 run between rollers 6 and 7 as in the case of the embodiments previously described, these collars being fixed on the spindle 1 by engagement in annular grooves 2 and 3, and in intermediate collar 11 which has projections 12 engaging in recesses in the outer sleeve 10. In this case the bearing is constructed as a cageless bearing, with the balls in each row substantially contiguous with one another.

FIGS. 6, 5 and 9 show upper roller constructions wherein the rolling contact bearings are formed of single row cylindrical roller bearings. FIG. 6a shows a constructional form wherein the cylindrical rollers 29 as in the embodiment shown in FIG. 1 abut against collars 6 and 7 which are fixed in annular grooves 2 and 3 in the spindle 1. In the outer race 10, the rollers 29 abut at one end against a flange 30 integral with the race 10, whereas at the other, open end of the race a flange 31 has been subsequently inserted, being held in position by bent-over tabs 32.

In FIG. 6b, on the other hand, a constructional form is shown which differs from that which has just been described above simply in that the subsequently inserted flange 31 is formed of a ring 33 of synthetic plastic material having projections 34 which engage in corresponding recesses in the race 10. In the various constructional forms described above, there has not been in every case a further description of parts which have already been discussed earlier. The drawings show that in the constructional forms last described with reference to FIGS. 5 and 6 these parts have not been modified relatively to those described above.

While various specific embodiments of the invention have been described for the sake of illustration and to enable persons skilled in the art to understand and practice the invention, it will be understood that there is no intention to limit the invention thereto, and that various changes and modifications may be made without departing from the spirit of the disclosure and the scope of the appended claims.

We claim:

1. An upper roller for drawing mechanisms of spinning machines comprising a spindle of substantially constant diameter over the entire length thereof, a bearing assembly mounted on each said spindle, each said bearing assembly comprising a row of rolling contact bearings around said spindle of substantially constant diameter whose surfaces act as an inner race, an outer sleeve member surrounding and being in contact with said bearings, two annular collars mounted at spaced locations along said spindle and each being adjacent an end of said outer sleeve member, the end collars being partially within said outer sleeve member, the end collars being in abutting relationship with the rolling contact bearings, annular means on the spindle and cooperating annular means on the end collars to fix the end collars to the spindle, a casing sleeve surrounding and being in contact with said outer sleeve member and a resilient cover around said casing sleeve.

2. An upper roller for drawing mechanisms of spinning machines comprising: a spindle of substantially constant diameter over the entire length thereof, a bearing assembly mounted on each end of said spindle, each said bearing assembly comprising two spaced rows of rolling contact bearings around said spindle, an outer sleeve member surrounding and being in contact with said bearings, two annular collars mounted at spaced locations along said spindle and each being adjacent an end of said outer sleeve member, and at least one of the end collars being partially within said outer sleeve member, a third collar mounted within said outer sleeve member and being axially spaced between said rows of bearings, the end collars being in abutting relationship with the rolling contact bearings, annular means on the spindle and cooperating annular means on the end collars to fix the end collars to the spindle, means on the outer sleeve member and the third collar to retain these elements relative to each other, a casing sleeve surrounding and being in contact with said outer sleeve member, and a resilient cover around said casing sleeve.

3. An upper roller as claimed in claim 2, wherein said rolling contact bearings are rollers.

4. An upper roller as claimed in claim 2, wherein said collars are of plastic material.

5. An upper roller as claimed in claim 4, wherein said annular means comprises annular grooves and said cooperating annular means comprises projections within the bores of the end collars.

6. An upper roller as claimed in claim 4, wherein said annular means comprises an annular groove on the inside wall of one of said end collars and the cooperating annular means comprises a knurled projection.

7. An upper roller as claimed in claim 4, comprising in addition a sheet metal collar on said spindle adjacent the outer face of one of said end collars, said one end collar having an annular recess on said outer face at the bore thereof, said metal collar having an annular tubular lip at the bore thereof engaging in said annular recess of said collar.

8. An upper roller as claimed in claim 4, wherein said means used to retain the outer sleeve member and the third collar comprises a series of projections on the surface of the third collar and a series of openings in the surface of the outer sleeve member which receive said third collar projections therein.

9. An upper roller as claimed in claim 2, wherein the collars comprise flanges, said flanges forming sealing gaps between themselves and said outer sleeve member and said casing sleeve.

10. An upper roller as claimed in claim 2, comprising a plastic sleeve fixed substantially at the mid-point of said spindle, for holding said upper roller on an associated loading arm of said spinning machine.

11. An upper roller as claimed in claim 10, wherein said spindle comprises an annular groove substantially at the mid-point thereof, and said plastic sleeve comprises an annular projection in the bore thereof adapted to fit in said groove.

12. An upper roller as claimed in claim 10, wherein said spindle comprises an annular ring affixed substantially at the mid-point thereof, and said sleeve comprises an annular recess in the bore thereof adapted to fit over said annular ring.

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