May 31, 1927. 1,630,712

A. MEDER

TEXTILE SPINDLE

Filed June 20, 1919

Fig. 1.

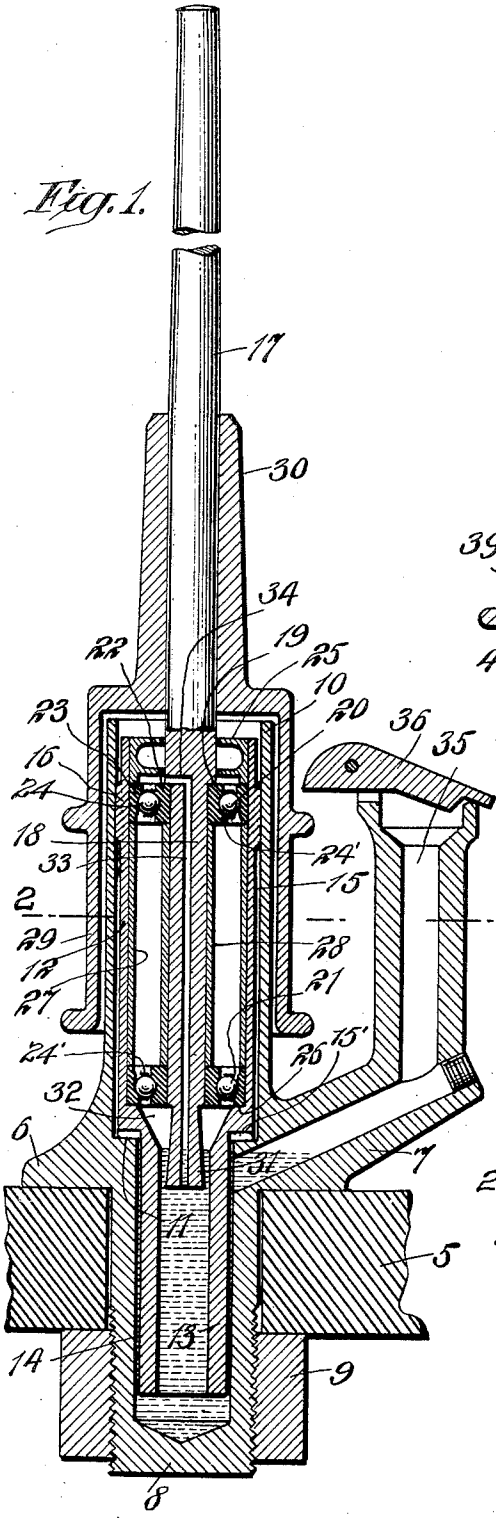


Fig. 3

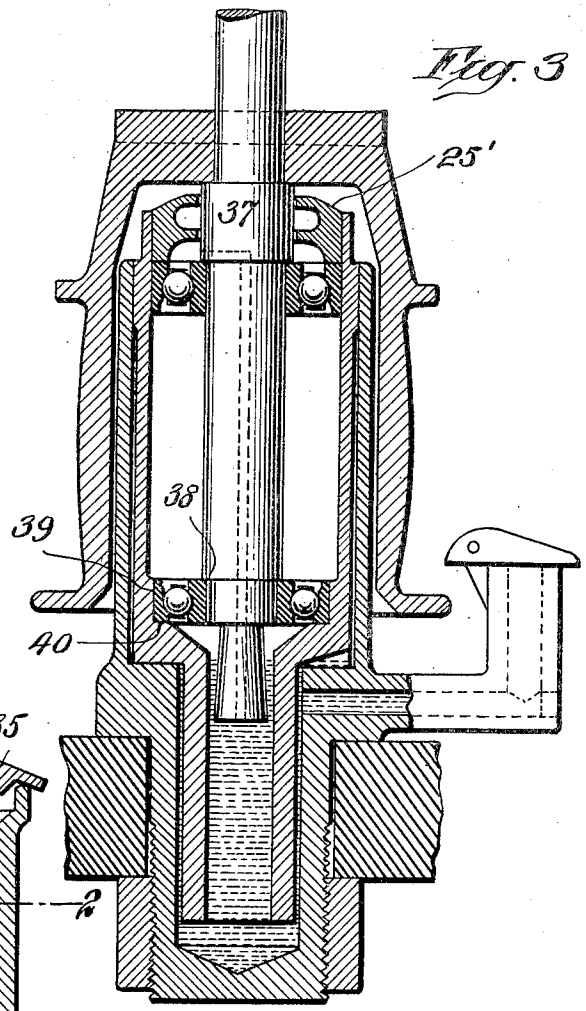
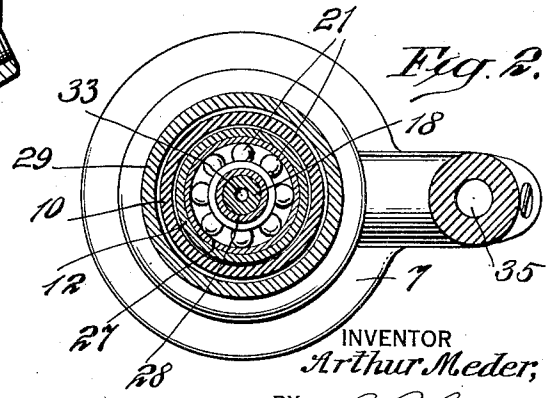


Fig. 2.



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TEXTILE SPINDLE.

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This invention relates to textile spindles, and more particularly to cotton spinning spindles.

It is the primary object of the present improvements to provide a textile spindle in which a relatively short live spindle, in contrast to a long spindle heretofore used, whereby the length of the supporting bolster may be correspondingly reduced and the spindle rotated at relatively high speeds and with a minimum of friction.

It is a more particular object of the invention to provide a cotton spinning spindle having a relatively short bolster mounted in a suitable support on the rail, a live spindle extending within the bolster, a whirl fixed to the spindle, and improved means for maintaining a continuous circulation of lubricant between the spaced bearings and between the bolster and its support.

The invention also provides an improved lubricating means for the bearings, which includes a part formed on the lower end of the live spindle and acting in the rotation of the spindle to force the lubricant in one direction and between the bolster and its support, and means carried by the spindle for also conducting the lubricant upwardly to the upper ball bearing and distributing the same by the action of centrifugal force upon the parts of the said bearing.

It is also a further general object of my invention to provide a textile spindle as above characterized, the several parts of which are compactly arranged and so assembled as to reduce the possibility of relative vibration to a minimum.

With the above and other objects in view, the invention consists in the improved construction, combination and relative arrangement of the several parts as will be hereinafter more fully described and subsequently incorporated in the subjoined claims.

In the accompanying drawings, wherein I have illustrated several practical embodiments of my invention and in which similar reference characters designate corresponding parts throughout the several views:

Figure 1 is a vertical sectional view of a live cotton spinning spindle constructed in accordance with one embodiment of the invention;

Figure 2 is a horizontal section taken on the line 2—2 of Figure 1; and

Figure 3 is a vertical sectional view illustrating an alternative form of the invention.

Referring in detail to the drawing and more particularly to Figures 1 and 2 thereof, 5 designates the rail of a textile spinning machine in which the spindle bolster support 6 is mounted. As herein shown, this support includes a base portion 7 having a short downwardly extending tubular shank 8 which is disposed through an opening in the rail 5. This shank is exteriorly threaded to receive a clamping nut 9 whereby the bolster support is rigidly secured in position upon the rail 5. The support is also formed with an upwardly extending tubular portion 10 which is of appreciably larger internal diameter than the bore of the shank 8 to thereby provide the annular shoulder indicated at 11.

The bolster 12 which is arranged within the support 6, is formed with a reduced lower end portion 13 extending into the bore of the shank 8, said reduced portion of the bolster having an external diameter which is slightly less than the diameter of the bore to thereby provide the space indicated at 14 which receives an oil film, as will be hereinafter more fully explained. The upper relatively large body portion of the bolster 12 is also spaced slightly from the inner surface of the tubular portion 10 of the support as shown at 15, with the exception of a narrow annular section 16 of the bolster wall which is slightly increased in thickness to afford a bearing engagement of this portion of the bolster with the wall of the tubular portion 10 of the support. The enlarged portion 12 of the bolster which rests upon the shoulder 11 has channels or recesses 15′ in its end face, which afford communication between the spaces 14 and 15.

The spindle proper indicated at 17 extends downwardly through the upper portion of the bolster 12 and is formed with a lower end section 18 of relatively small diameter whereby an annular shoulder 19 is provided upon the spindle. Ball bearings designated generally by the numerals 20 and 21 are interposed between the upper and lower ends of the reduced section 18 of the spindle and the wall of the bolster 12. Each of these bearings includes inner and outer race rings 22 and 23 respectively between which the bearing balls 24 are dis-

posed and held in assembled relation within the ball retaining cage 24'. By reducing the lower end portion of the spindle, I am enabled to provide bearings of a comparatively large size. An end cap 25 is fitted within the upper end of the bolster 12 and bears upon the outer race ring 23 of the upper bearing. The outer race ring of the lower bearing 21 is seated upon an internal annular shoulder 26 formed in the bolster 12. These outer race rings of the two bearings are held in properly spaced relation by means of a sleeve 27 which is fitted within the upper tubular portion of the bolster. A similar spacing sleeve 28 surrounds the reduced portion 18 of the spindle and extends between the inner race rings 22.

The whirl 29 surrounds the upwardly extending tubular portion 10 of the bolster support in spaced relation thereto and is formed with the upwardly extending shank portion 30 within which the spindle 17 is fixed. It will be noted that the bearings 20 and 21 are located respectively above and below the center line of the belt pull.

The reduced portion 18 of the spindle at its lower end terminates in the downwardly extending tapering shank 31. This shank extension gradually increases in diameter from the portion 18 of the spindle to its lower end and projects below the annular inclined or flaring section of the bore of the bolster indicated at 32 and through which the lubricant is adapted to flow downwardly and collect within the tubular shank 8 of the bolster support and within the bore of the lower section of the bolster.

The reduced lower end of the spindle is also formed with an axially extending bore 33 which opens upon the end face of the terminal extension 31 of the spindle and at its upper end is laterally extended as shown at 34 and opens upon the periphery of the spindle at a point between the upper bearing 20 and the end cap 25.

The lubricating oil is initially supplied to the tubular shank 8 of the bolster support through a suitable feed inlet 35 extending upwardly from the base 7 of the support, said inlet having the usual pivotally mounted closure cap or plate 36, one end of which extends over the upper belt flange on the whirl 29 to prevent the upward movement of the whirl and spindle from their operative positions.

In the operation of the improved textile spindle as above described, as the spindle is rotated at a relatively high speed, the centrifugal force sets up a feeding action through the duct or bore 33 so that the oil will be drawn upwardly from the tubular lower end of the bolster and thrown outwardly through the laterally disposed upper end 34 of said bore upon the parts of the upper bearing 20. The excess oil will flow downwardly through this upper bearing 20 and upon the parts of the lower bearing 21, the unconsumed oil being thus returned to the body of lubricant contained within the tubular lower end of the bolster which in effect constitutes a lubricant containing reservoir. In the rotation of the spindle, the downwardly extending terminal portion 31 which projects below the lower bearing 21 and is submerged in the body of lubricating oil, owing to its gradually increasing diameter, counteracts the tendency of the oil to rise in the space 32 so that the displaced oil will enter the lower end of the duct 33 and thereby facilitate the movement of the oil upwardly by capillary attraction through said duct to its discharge end 34. It is desirable that the lower bearing 21 shall not run in a body of oil, and that only sufficient oil shall be supplied to this bearing as well as to the upper bearing to insure their free and unretarded operation. Accordingly I have formed the downwardly projecting end of the spindle which extends below the bearing 21 and into the body of oil in the manner above described, so that the space 32 will not be filled with the oil by the tendency of centrifugal force to cause the oil level to rise, as would be the case if the peripheral face of this end of the spindle extended in parallel relation to the spindle axis. Also, the oil thrown upwardly would be retained or held in the space 32 by centrifugal force and an air space would form below the end of the spindle so that the upward movement of the oil through the bore 33 would be intermittent. In some cases such intermittent action might be desirable, and can be produced by lowering the level of the lubricating oil with respect to the lower end face of the spindle. After the oil above the extremity of the spindle has been discharged through the bore 33 upon the upper bearing, the suction or pumping action will cease until the normal level of the oil is restored by the downward flow of the distributed oil through the bearings and into the lower end of the bolster. The primary purpose, however, of the reduced lower end 31 of the spindle is to direct the oil draining through the lower bearing 21 back into the reservoir. It will be observed that this lower end of the spindle is in the form of a truncated cone, and gradually increases in diameter to its extremity. Thus any oil which comes within the range of the spindle end and becomes attached thereto by surface attraction will naturally follow the path prescribed by centrifugal force caused by the increase in diameter of the conical surface, which, in this instance, will be downwardly. Therefore, by the combination of surface attraction of the oil for the steel, and the centrifugal force produced by this surface under rotation, as long as the force of surface attraction is

greater than the centrifugal force, the oil film on such surface will adhere to the spindle, and under the action of centrifugal force, will travel to the larger end of the cone, instead of being thrown radially and outwardly into the space 32. Secondly, the same combination of forces acts to prevent the rising of the oil from the reservoir into the space 32, when it is whipped or agitated by the spindle end rotating in the oil body. The tubular shank 8 serves as a dashpot in which the reduced lower end of the bolster oscillates and the oil film is drawn upwardly by capillary attraction through the recesses 15′ and into the space 15 between the upper portion of the bolster and the wall 10 of the support. This oil film subserves the purpose of a cushion and has a stabilizing influence upon the bolster and its spindle, counteracting the tendency of the spindle and bolster to oscillate within the support should the load upon the spindle become unbalanced, by reason of slight mechanical imperfections, or from other causes. The annular peripheral portion 16 of the bolster, effectively obviates the possibility of the lubricating oil finding its way upwardly above the bolster and between the inner surface of the whirl and the outer surface of the tubular portion 10 of the bolster support.

In Fig. 3 of the drawings I have illustrated an alternative embodiment of the invention wherein the sleeves 27 and 28 are dispensed with and the upper and lower bearings are retained in their upper positions in connection with the spindle by means of the end cap 25′. In this construction, the spindle is formed with an annular flange 37 which extends between the upper end wall of the whirl and the inner race ring of the upper bearing. The end cap is fitted within the upper end of the bolster around this flange and bears upon the outer race ring. In this case, it will be noted that the spindle extending through the bolster is of the same diameter as the upper portion of the spindle upon which the yarn is wound. Adjacent to its lower end, the spindle is provided with an annular shoulder 38 against which the inner race ring of the lower bearing is seated. The outer race ring has a tight mechanical fit within the reduced portion 39 of the bolster and is engaged upon the annular shoulder 40 therein in a similar manner to the mounting of the lower bearing in the form of my invention previously described. It is to be noted, however, that in this case the upper bearing 20 is somewhat larger than the lower bearing 21. In this modified construction, the spindle is provided with the same means for circulating the oil between the upper and lower bearings which I have above described in detail.

In each embodiment of my improved spindle as above described, it will be observed that instead of a relatively long live spindle and bolster therefor as is usually provided in cotton spinning spindles, and which generally extends a considerable distance below the rail 5, I have provided a relatively short bolster and bolster support together with a short live spindle. At the same time, however, by reason of the mounting of the bolster and the system of lubrication, I am enabled to obtain the desired cushioning effect which tends to maintain the spindle in a perpendicular position and counteract the tendency of the spindle and bolster to oscillate with respect to the support.

From the above description considered in connection with the accompanying drawings, it is believed that the construction, relative arrangement of the several parts, and the manner of operation of my improved textile spindle will be fully understood. By the provision of the upper and lower ball bearings arranged above and below the center of the whirl, mounted and arranged as above explained, it is possible to utilize bearings of comparatively large size and thereby materially increase the life of the spindle. The spindle may be operated at very high speeds due to the comparatively large sizes of the ball bearings employed and owing to the continuous circulation of lubricant between the parts of the spaced bearings, friction is reduced to a minimum. However, when necessary, these bearings can be readily replaced. This may be done by simply lifting the spindle 17 and the whirl, after having first shifted the safety latch 36 out of its obstructing position, whereupon the bolster with the bearings will also be removed from the supports 6. The dust cap 25 can then be removed and access had to the interior of the bolster for the purpose of renewing the bearings. It will of course be apparent that the spindle and the whirl may be made in many different sizes and of course the size of the bearings will be increased or decreased accordingly.

I have illustrated in the accompanying drawings and above described what I believe to be very practical embodiments of my improved spindle, but it will be understood that the invention is nevertheless susceptible of many modifications, and I accordingly reserve the privilege of adopting all such legitimate changes as may be fairly embodied within the spirit and scope of the invention as claimed.

I claim:

1. In a textile spindle, a support having a lubricant well, a bolster fitted in said support and having an elongated hollow lower portion with open lower end projecting down into the well having the wall of such lower portion spaced a slight distance from

the wall of the well to receive a film of lubricant, the well wall and the wall of such lower portion being substantially parallel throughout the space therebetween being of approximately equal width at all times, and a spindle rotatably supported in said lower portion of the bolster and projecting into the lubricant body in the well, said projecting end of the spindle being of conical form with the base directed downwardly so that upon rotation of the spindle the lubricant is forced by capillary attraction and centrifugal force downward into the space between the well wall and the lower portion of the bolster.

2. In combination, a support having a well in its lower portion to receive liquid lubricant, a bolster fitted within the support and being spaced slightly therefrom, the space communicating with the lubricant well, a spindle rotatably fitted in the bolster and having its lower end dipping in the lubricant and acting on rotation to prevent raising of the level of the lubricant and aiding the movement of the lubricant by capillary attraction into the space between the bolster and the support, and bearings between the spindle and bolster, said spindle having a duct therein opening into the oil well and above the bearings and adapted to receive lubricant when the spindle is rotated and to deliver the lubricant above the bearings.

3. In a textile spindle, a support, a bolster mounted within the support and oscillatably movable with respect thereto, a spindle rotatably mounted within the bolster, the lower end of the bolster and the support being adapted to contain a lubricating oil, said spindle having means at its lower end submerged in the oil and acting in conjunction with the bolster wall during the rotation of the spindle to prevent raising of the level of lubricant within the bolster, the oil being drawn upwardly by capillary attraction between the bolster and the wall of the support and thereby providing an oil film for the purpose of cushioning the oscillating movements of the bolster, and a whirl fixed to the spindle.

4. In a textile spindle, a support, a bolster mounted within the support and oscillatably movable with respect thereto, said bolster having a bore provided with a contracted portion, a spindle rotatably mounted within the bolster and having a reduced end portion projecting into the contracted portion of said bore and gradually increasing in diameter to the extremity of the spindle, said end portion of the spindle acting during the rotation of the spindle to prevent rising of the lubricant in said bore, the oil being drawn upwardly by capillary attraction between the bolster and the wall of the support and thereby providing an oil film for the purpose of cushioning the oscillating movements of the bolster, and a whirl fixed to said spindle.

5. In a textile spindle, a support, a tubular bolster oscillatably mounted within the support, the lower end of the bolster and the support being adapted to contain a lubricating oil, a spindle rotatably mounted within the bolster, upper and lower ball bearings interposed between the wall of the bolster and the spindle, spacing sleeves extending between said bearings and maintaining the same in spaced relation, said spindle extending below the lower bearing into the lubricating oil and having means for automatically maintaining a circulation of the lubricating fluid between the upper and lower ball bearings during the rotation of the spindle, and a whirl fixed to said spindle.

6. In a textile spindle, a support, a bolster oscillatably mounted upon the support and having a reduced lower end portion, a spindle rotatably mounted in the bolster, spaced anti-friction bearings for the spindle mounted within the upper and lower ends of the relatively large upper portion of the bolster, and said spindle terminating at its lower end in the upper end of the reduced portion of the bolster and adjacent to the lower bearing, said spindle end acting in rotation to draw the body of lubricant away from the lower bearing and to aid the movement of such lubricant by capillary attraction between the bolster and support.

7. In a textile spindle, a support, a bolster oscillatably mounted upon the support and having a reduced lower end portion, a spindle rotatably mounted in the bolster, anti-friction bearings for the spindle mounted within the upper and lower ends of the relatively large upper portion of the bolster, said lower end portion of the bolster adapted to contain a lubricating oil and the spindle having a terminal portion of gradually increasing diameter projecting below the lower bearing and into the oil, said spindle also having an oil distributing duct into which the oil is drawn by centrifugal action in the rotation of the spindle for distribution to said bearings.

In testimony that I claim the foregoing as my invention, I have signed my name.

ARTHUR MEDER.