July 3, 1934. L. W. SCHAAFF 1,965,471

THREAD GUIDE AND TENSION EQUALIZER FOR SPINNING MACHINES

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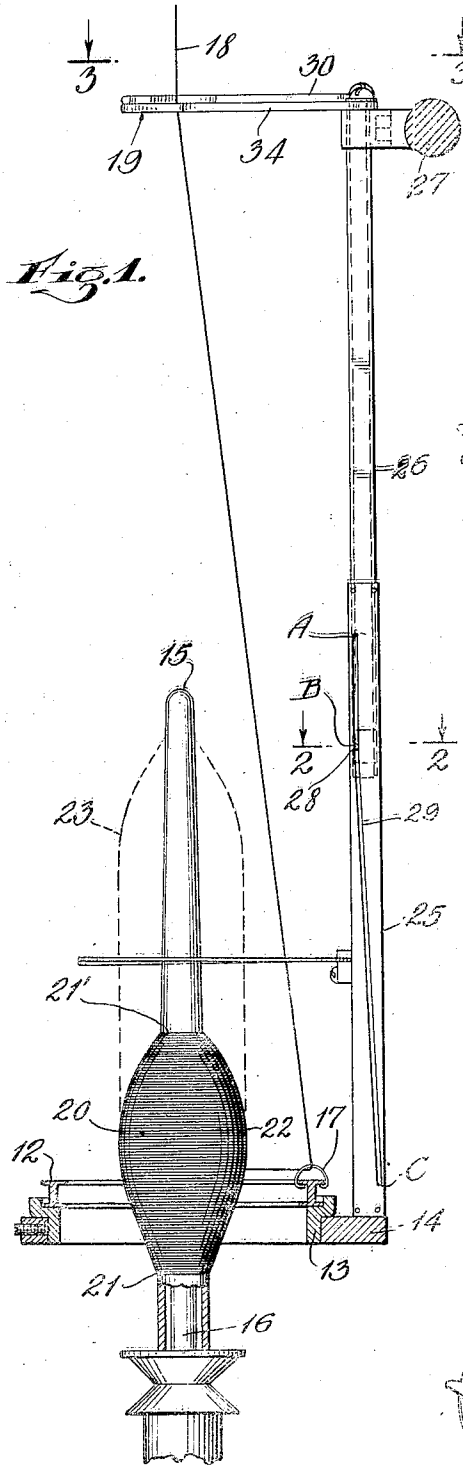


Fig. 1.

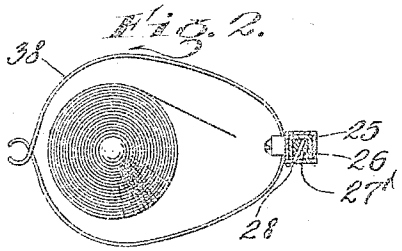


Fig. 2.

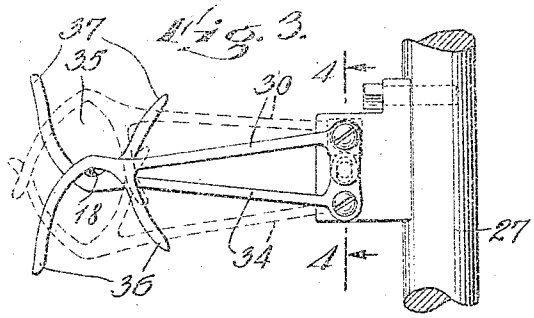


Fig. 3.

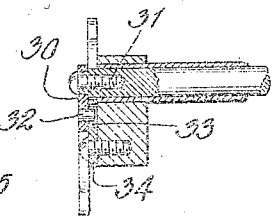


Fig. 4.

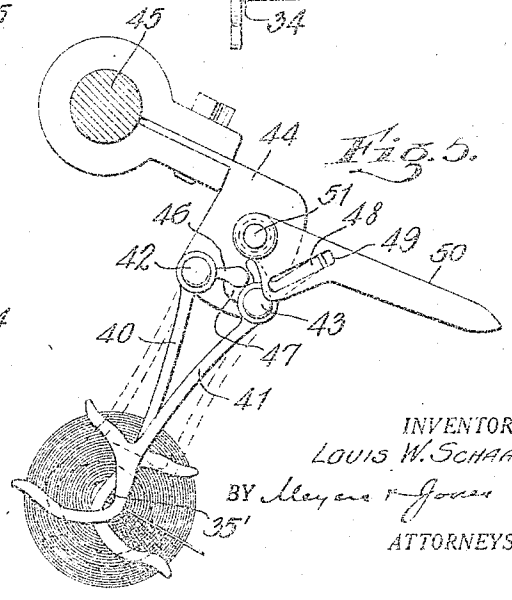


Fig. 5.

INVENTOR.
LOUIS W. SCHAAFF
BY Meyer & Jones
ATTORNEYS.

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Fig. 6.

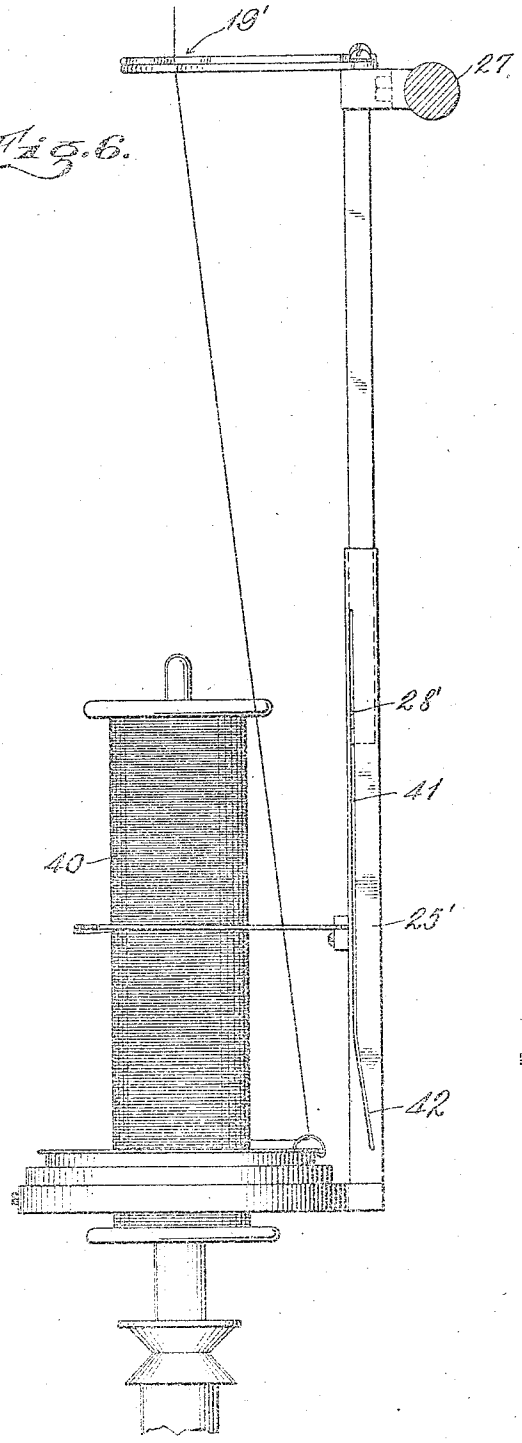
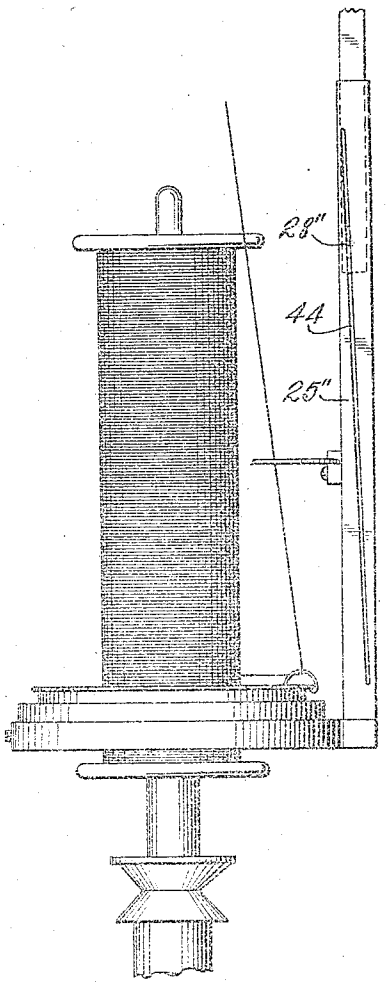


Fig. 7.



INVENTOR.
LOUIS W. SCHAAFF
BY Meyer & Gore
ATTORNEYS.

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Fig. 8.

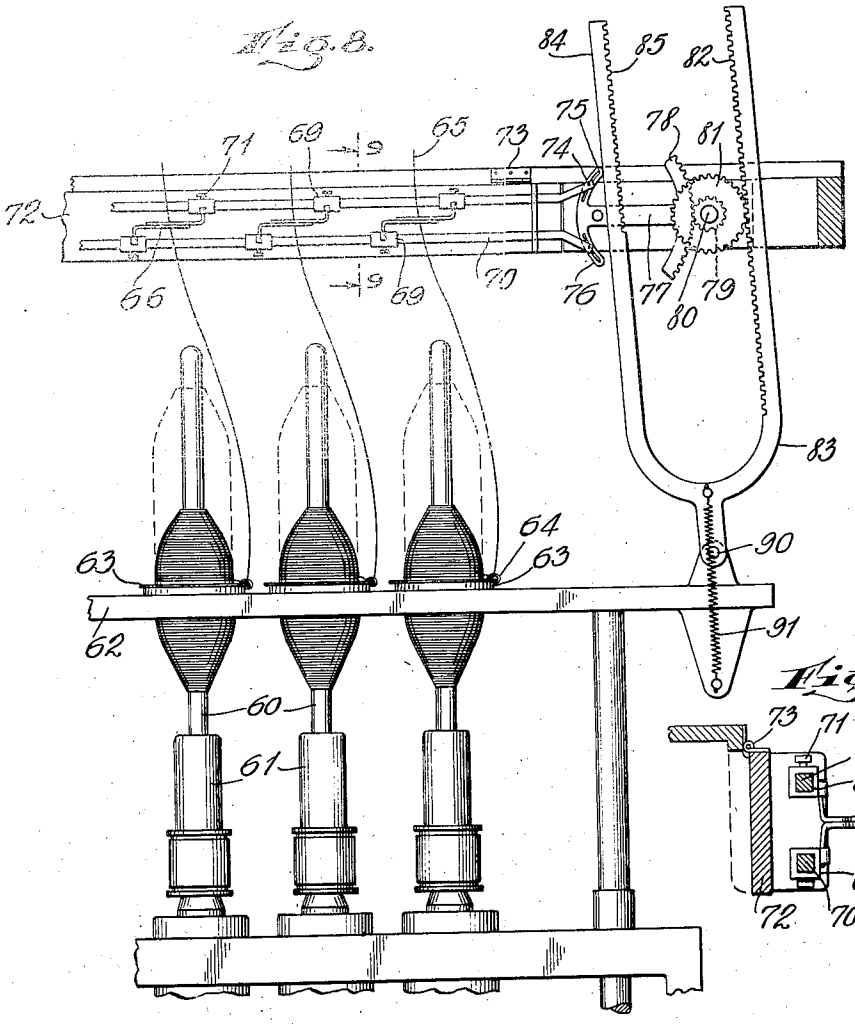


Fig. 9.

Fig. 10.

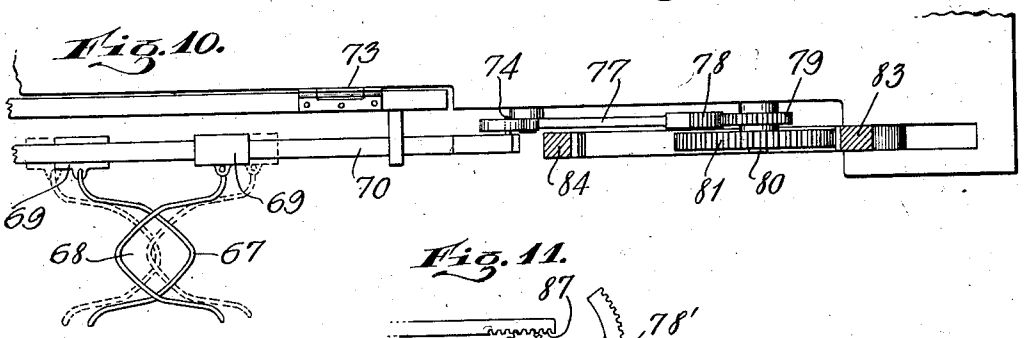
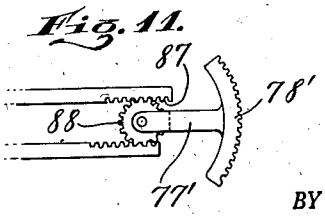


Fig. 11.



INVENTOR.
LOUIS W. SCHAAFF
BY Meyers & Jones
ATTORNEYS.

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THREAD GUIDE AND TENSION EQUALIZER FOR SPINNING MACHINES

Louis W. Schaaff, Weehawken, N. J.

Application June 10, 1931, Serial No. 543,450

15 Claims. (Cl. 118—9)

My invention relates to means for equalizing the tension on thread or yarn and is especially adapted to spinning machines of the type employing spindles which rotate within rings movable on a rail along the spindles, and in which the thread or yarn passes from the creel through a thread guide above the spindles and through travelers on the rings.

Machines of the above type are widely used in spinning various kinds of threads and yarns such, for example, as cotton, wool, silk, etc., and the traveler regulates the twist imparted to yarn or thread wound on to the bobbin by lagging behind the spindle in speed due to the pull of the thread or yarn on the traveler. The thread or yarn being pulled through the traveler and through the thread guide is subjected to varying degrees of tension due to the constantly changing relative positions of the parts constituting the spinning means as the ring rail moves up and down along the spindle and as the diameter of the bobbin being built up changes. In fact there is inevitably more tension on the thread at certain points along the ring rail traverse than at other points, and frequently the tension approaches undesirable slackness at certain points and becomes so great at other points as to exceed the limit which the thread or yarn can stand at other points. These unstable tension conditions of necessity affect the uniformity of the twist in the yarn and therefore make for inferior quality in the spun material.

If, for instance, the spindle speed is adjusted to the limit of tension which the thread will bear at the wide diameter of the bobbin then it will be found that the thread will break at the narrow diameter, and if the spindle speed is adjusted to the limit of tension which the thread will bear at the narrow diameter then there will be too great a slack in the tension at the wider diameters.

Various proposals and efforts have been made to overcome the foregoing conditions, but all such proposals and efforts have accepted the conditions as irremediable and have been of such form as to decrease production capacity without materially improving the character of the finished material and bobbin. For example, in one instance the speed of the spindle is slowed down and increased alternately during production of a bobbin, thereby materially decreasing the output per machine unit. These variations in spindle speed are also accomplished by expensive machinery. In another instance the weight of the traveler is increased or diminished necessitating a copious supply of various sized travelers. Under either arrangement or combination thereof the desired equalizing of tension on the thread or yarn at all stages of the operation to give the threads or yarn uniform twists throughout the bobbin and to produce a compact evenly laid bobbin is not attained although the production or output per machine unit is reduced.

I have found that the variation in tension can be controlled through the medium of the thread or yarn guide and that when thread or yarn is guided through a relatively large loop a high degree of tension on the thread or yarn prevails whereas when the thread or yarn is guided through a small loop a low tension on the thread or yarn prevails, and by regulating the size of the thread guide loop with respect to the character and strength of the thread or yarn being spun, and the character and dimension of the bobbin being made the tension on the thread can be equalized through the whole spinning operation without slowing down the machinery at any time and without the necessity of change in weight of travelers.

An important object of my invention is to provide means for equalizing the tension on thread or yarn during spinning thereof on bobbins at a maximum constant speed and eliminating the present necessity for a large stock of travelers of various weights.

Another object of my invention is to provide a mechanism and a method for spinning yarns on bobbins with equalized tension throughout all diameters of the bobbin to impart a uniform twist to the thread and to obtain a more compact and evenly wound bobbin.

Another object of the invention is to provide apparatus of the above character in which the thread guides are collectively and individually adjustable.

Another object of the invention is to provide apparatus of the above character in which the thread guides are collectively reversible to opposite limits during the spinning of certain bobbins.

Another object of the invention is to provide mechanism of the above character which can be readily installed on existing spinning machinery.

Other objects and advantages of the invention will become apparent during the course of the following detail description of the accompanying drawings in which

Fig. 1 is a side elevation partly in section of a ring spinning frame upon which a cotton bobbin is shown as partly formed and with my invention applied thereto;

Fig. 2 is a sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a top plan view looking in the direction of line 3—3 of Fig. 1;

Fig. 4 is a detail sectional view on the line 4—4 of Fig. 3;

Fig. 5 is a view similar to Fig. 3 showing a modification of the invention wherein the same is manually operable;

Fig. 6 is a side elevation similar to Fig. 1 showing a silk bobbin being wound and with my invention applied in slightly modfied form;

Fig. 7 is a view similar to Fig. 6 showing another modification;

Fig. 8 is a front elevation of a fragment of a ring spinning machine showing the invention applied thereto for collective operation with a plurality of bobbins and illustrating means for shifting the thread guides to opposite limits during the process of spinning a cotton bobbin;

Fig. 9 is a detail sectional view on the line 9—9 of Fig. 8;

Fig. 10 is an enlarged detail fragmentary top plan view of the apparatus shown in Fig. 8;

Fig. 11 is a detail fragmentary view of a modification of the means for moving the thread guide rods in opposite directions.

Referring to Figs. 1–4 the numeral 12 indicates the traveler ring mounted on the rail 13, secured to the frame 14, and movable upwardly and downwardly therewith along the spindle or quill 15 which is rotatably mounted on the shaft 16. The apparatus for rotating the shaft 16 and for moving the ring rail and frame 14 up and down is not shown, it being understood that the same may be of any type now generally in use. The traveler 17 is loosely mounted on the ring 12 and the yarn 18 runs to the quill 15 through the traveler 17 and thread guide 19 from a creel not shown. The bobbin 20 in Fig. 1 is typical of one type of cotton bobbin wherein the thread starts adjacent the bottom of the quill 15 as at 21 and gradually builds up in steps to a larger diameter 22 which is carried upwardly as shown in dotted lines to point 23 where the bobbin again tapers in to the upper portion of the quill 15. As has been mentioned, the tension on the thread at the point 21 is quite different from that at the point 22 due to difference in diameter as well as different positions of the traveler relative to the thread guide when at the respective points. For the purpose of equalizing this tension without varying the speed of the spindle and/or weight of the traveler, I have provided the novel thread guide 19 and means for operating the guide comprising an outer elongated sleeve 25 secured to the frame 14 for movement therewith and an inner sleeve 26 fixedly secured to the support 27 at its top and telescoping within the sleeve 25 at its bottom. The sleeves 25 and 26 are preferably angular in formation and have sliding telescoping non-rotating engagement with each other. Within the sleeve 26 is mounted a rod 27′ carrying the pin 28 which engages in the cam slot 29 in the sleeve 25. The rod 27′ has rotary reciprocating movement within the sleeve 26 and at its upper end is fixedly secured to an arm 30 of the thread guide by means of the screw 31. Arm 30 carries a pin 32 which operates within a slot 33 in the arm 34 of the thread guide so that as the arm 30 is turned by the rod 27′, the pin 32 will move arm 34 to and from arm 30 to vary the size of opening 35.

The opening 35 is formed by the overlapping of oppositely facing pairs of prongs or extensions 36 and 37 on the arms 30 and 34, the prongs being of sufficient length and relatively positioned to afford a variable opening as shown in Fig. 3, it being understood that the prongs may be readily moved apart to permit insertion of the thread or yarn therebetween.

The opening 35 is varied automatically in the following manner. Referring to Fig. 1, it will be noted that the pin 28 is in the slot 29 at a point where the slot begins to extend transversely across the sleeve 25 to a point C adjacent the bottom, and the bobbin has been built up from a narrow diameter 21 to its widest diameter 22 and is building towards the top from the widest to the narrowest. The sleeve 25 has been moving up and down with the frame 14 so that the slot 29 has been engaging the pin 28 between points A and B, during which time the traveler 17 has been remote from guide 19 and the tension on the thread or yarn has been at a minimum so that the arms 30 and 34 have been maintained substantially in the dotted line position of Fig. 3 with the opening 35 large. As the frame and traveler move up the tension increases if the thread guide opening is unchanged, but as the traveler and frame move up the sleeve 25 also moves up and the slot 29 engages the pin 28 which gradually moves across the sleeve turning the rod 27′ and closing the opening 35 by moving the arms 30 and 34 toward each other until the prongs 36 and 37 are in the full line position of Fig. 3 when the pin is adjacent point C and traveler 17 is opposite the top of the bobbin. The ballooning guard 38 can be mounted on the sleeve 25 for movement therewith, and an efficient and economical guard can be formed of two resilient curved arms as shown in Figs. 1, and 2, the arms overlapping at their outer ends so as to provide a loop which can be readily opened for insertion of the thread.

Referring to Fig. 5, I have shown the arms 40 and 41 of the thread guide as pivoted at 42 and 43 respectively to the bracket 44 carried by the support 45. The arm 40 has a projection 46 which engages in the fork 47 carried by the arm 41 and from which extends the lug 48 for engagement in the slot 49 of the lever 50 which is pivoted to the bracket at 51. Under this construction and arrangement, the arms 40 and 41 may be moved relative to each other to vary the size of the opening 35′ to either the full line position or the dotted line position or in intermediate positions by movement of the lever 50. This device may be used in spinning yarn to equalize tension on respective or individual spindles at various stages of the spinning operation to equalize tension either with respect to the diameter of the bobbin or the position of the traveler relative to the guide or both.

Referring to Figs. 6 and 7 it will be noted that the bobbin 40 is of constant dimension from top to bottom. In the formation of this bobbin, as in the case of other bobbins, the tension on the thread increases as the traveler moves upwardly and is the greatest when the traveler is at the highest point of its movement at which point the angle of the thread between the thread guide 19 and the traveler 17 is increased. I propose in connection with this type of bobbin to have the slot 41 extending in a straight line along the sleeve 25′ to engage the pin 28′ during the winding of the thread on the lower portion of the bobbin, but adjacent the lower end of the sleeve and beginning at a point corresponding to a point adjacent the top of the bobbin, the slot is inclined as at 42, so that as the pin moves thereacross the

jaws of the thread guide 19' will be closed as described in connection with Figs. 1–4.

In Fig. 7 the slot 44 is inclined in a straight line across the casing 25'' so that the pin 28'' will be moved in the slot to cause the rod to which it is attached as in Fig. 1, to gradually and progressively open and close the jaws of the thread guide during the entire movement of the ring frame relative to the bobbin. It will be noted that the pin is adjacent the top of the slot, while the traveler is adjacent the bottom of the bobbin at which time the jaws of the thread guide are in open position providing a comparatively large loop, and it will be understood that as the ring frame moves up along the bobbin, the pin is disposed in the lower portion of the slot and the jaws will be moved toward each other to diminish the loop in the thread guide.

It is possible to have the slotted sleeve stationary and the telescoping sleeve and pin carrying rod moved by the frame to operate the jaws of the thread guide, in the embodiments of the invention utilizing such parts.

The preferred form of the invention is exhibited in Figs. 8–11 wherein the numeral 60 indicates the spindles mounted in bolster bearings 61 and extending up through the ring rail 62 which carries the rings 63 with the followers 64 thereon. The yarn 65 is threaded through the follower and up through the guides 66, which comprise arms 67 formed to overlap and provide loops 68 for the reception of the yarn 65 and fixedly secured to supports 69 slidably mounted on spaced parallel rod 70. The supports 69 may be frictionally engageable with the rod 70 and may further be provided with set screws 71 extending through a wall thereof for engagement with the rods 70 to hold the respective arms 67 in predetermined relative positions. It will be noted that each support 69 for cooperating arms 67 is mounted on an opposite rod 70 and the rods are carried by supporting frame 72 hingedly supported as at 73 to a supporting surface so that the frame and guides may be swung upwardly to permit free removal of the bobbins.

In Fig. 8, I have shown the rods 70 offset at their ends and each provided with a pin 74 engageable in slots 75 in oppositely disposed arms 76 on the rocking lever 77 which has at its other end a toothed segment 78 meshing with a spur gear 79 carried by shaft 80 to which is connected a spur gear 81 meshing with the teeth 82 on the operating rack bar 83. The rack bar 83 has a second arm 84 which has gear teeth 85 provided on its inner face from its approximate center to its outer end and confronting the teeth 82. The rocking lever 77 will simultaneously move the rods 70 in opposite directions.

In Fig. 11 I have shown a modification wherein the rods 70' are provided with teeth 87 and the rocking lever 77' has the toothed segment 78' and a gear wheel 88 meshing with the teeth 87 to move the rods 70' in opposite directions.

The operation of the embodiment shown in Fig. 8 is as follows. Assuming that the bobbins to be built up on the spindles are of the same character as described in connection with Fig. 1 wherein it starts at the narrow diameter and builds up to a wider diameter which is carried to a point adjacent the top of the spindle, as shown in dotted lines, the rack bar 83 is shifted on its pivot 90 so that the teeth 85 will mesh with the teeth of the spur gear 81 while the teeth 82 will be out of mesh, it being understood that the tension of the spring 91 will hold the rack bar in position while the parts are operating. When the yarn or thread is initially fed through the follower 64 the frame 62 is at its lowest position and the uppermost of the teeth 85 will be engaging the gear 81 and the arms 67 of the thread guide will be in open position. As the frame 62 moves up the teeth 85 will mesh with the teeth on the gear 81 in synchronism with the movements of the frame 62 so that as the bobbin is built up to its widest diameter the thread guide opening will be gradually increased and diminished in size due to the opposite movements of the rods 70 imparted by the rack arms 77 through the medium of the segment 78 and the pin and slot connection 74, 76. When the bobbin has been built approximately to the stage shown in Fig. 8 the rack bar 83 is shifted so that the teeth 82 will mesh with the gear 81 to impart thereto an opposite movement which results in reversing the relative movements of the bars 70 so that the opening and closing of the thread guide will be reversed as the bobbin is built from the widest to the narrowest.

It will be understood that the result would be exactly the same if the arrangement shown in Fig. 11 was employed instead of that shown in Fig. 8.

In Fig. 10 I have shown in dotted lines the relative position of the thread guide arms when the critical point of tension on the thread or yarn is reached which will be at the narrowest diameter and/or at the nearest approach of the traveler to the thread guide.

As has been mentioned the relative positions of the arms of the thread guides can be individually adjusted in accordance with the necessities or conditions existing in respect to the individual spindles, and it will be obvious from the foregoing that the thread guides are collectively operable by the mechanism and in the manner above described.

While I have shown the arms of the thread guide as being substantially V-shaped it is possible to have these arms bent in a continuous curve with no angles and to so form them, if desired, that the opening formed therebetween will be substantially circular instead of angular in all relative positions. The arms are preferably formed of metal such as a stiff and highly polished wire but they can be formed of any suitable material and be of any relative shape or size. In fact the invention is susceptible to so many variations and alterations that it would be impracticable to endeavor to illustrate them all in this application.

The important feature of the invention is the adjustability of the thread guide opening and closing during the spinning operation either manually or automatically to compensate for the differences in tension at various relative positions of the parts. It should be apparent from the foregoing that whereas under existing conditions the thread has a constant centrifugal motion between the traveler and the thread guide and revolves with centrifugal motion within the thread guides that in the practice of my invention the centrifugal motion of the thread within the thread guide can be progressively diminished and finally prevented at the critical point either with respect to the diameter of the bobbin or of the relative positions of the traveler or thread guide or both. In fact the opening can be so reduced as to restrict the thread to a strictly turning motion about its own axis.

I claim:

1. A thread and yarn guide for spinning machines comprising a pair of arms forming a loop through which the thread or yarn runs and movable with respect to each other to vary the size of the loop during a spinning operation, said arms being supported above the spindle of the machine.

2. A thread and yarn guide for spinning machines comprising a pair of arms above the spindle forming a loop through which the thread or yarn is passed, and means for moving said arms to vary the size of the loop during a spinning operation.

3. A thread or yarn guide for spinning machines comprising overlapping spaced members above the spindle providing an opening through which the thread or yarn passes, and means for moving said members during a spinning operation to various relative overlapping positions to vary the size of the opening.

4. In combination with thread and yarn spinning mechanism including a rotary spindle and a spinning ring frame movable along said spindle, a guide above said spindle providing an opening through which the thread and yarn passes, and means for varying the size of the opening in synchronism with the movements of said frame during a spinning operation.

5. In combination with thread and yarn spinning mechanism including a rotary spindle and a spinning ring frame movable along said spindle, a guide above the spindle providing an opening through which the thread and yarn passes, and means for varying the size of the opening during a spinning operation, said means being operable by movement of the frame.

6. In combination with thread and yarn spinning mechanism including a rotary spindle and a spinning ring frame movable along said spindle, a guide above the spindle having an opening through which the thread and yarn passes, and means for varying the size of the opening, said means being manually operable at any stage during the spinning operation.

7. In combination with thread or yarn spinning mechanism including a plurality of spindles and a spinning ring frame movable along said spindles, a plurality of thread and yarn guides having openings for passage of the thread or yarn and arranged one above each spindle, and means for collectively varying the size of the openings in synchronism with movements of the frame during a spinning operation.

8. In combination with thread or yarn spinning mechanism including a plurality of spindles and a spinning ring frame movable along said spindles, a plurality of thread and yarn guides arranged one for each spindle above the spindles, and having openings to receive the thread or yarn while the yarn is being spun, and means for collectively varying the size of the openings in said guides during a spinning operation.

9. In combination with thread or yarn spinning mechanism including a plurality of spindles and a spinning ring frame movable along said spindles, a plurality of thread and yarn guides arranged one for each spindle above the spindles and having openings to receive the thread or yarn, said guides being individually adjustable to vary the size of the openings, and means for collectively varying the size of said openings in the guides during a spinning operation.

10. The structure of claim 9 wherein the means for collectively varying the size of the openings is operated by movement of said frame.

11. The method of equalizing tension on thread or yarn during spinning thereof on a bobbin which comprises permitting the thread to have a predetermined maximum limit of centrifugal motion at a given point above the bobbin and changing said motion during the course of spinning at certain points on the bobbin to a turning motion of the thread on its own axis at said point by varying the amount of said motion within a guide for the thread located above the bobbin

12. In combination with thread or yarn spinning mechanism including a rotary spindle and a spinning ring frame movable along said spindle, a pair of oppositely movable rods, a plurality of thread or yarn guides arranged one above each spindle, each guide comprising a pair of overlapping members formed to provide an opening through which the thread passes and connected to the rods, and means operable by movements of the ring frame for moving said rods in opposite directions to vary the sizes of the openings during a spinning operation.

13. In combination with thread or yarn spinning mechanism including a rotary spindle and a spinning ring frame movable along said spindle, a pair of oppositely movable rods, a plurality of thread or yarn guides arranged one above each spindle, each guide comprising a pair of overlapping members formed to provide an opening through which the thread or yarn passes and connected to the rods for movement in opposite directions to vary the sizes of the openings, and means for moving said rods comprising a connection between the rods and the ring frame.

14. The structure of claim 13 wherein means is provided for reversing the relative movements of the rods.

15. In combination with thread or yarn spinning mechanism including a rotary spindle and a spinning ring frame movable along said spindle, a thread or yarn guide above the spindle and comprising a pair of arms having overlapping portions forming a loop through which the thread passes, a support for said arms, cam means for moving said arms to vary the size of said loop, said cam means being actuated by movements of the ring frame along said spindle to vary the size of said loops during the spinning operation in accordance with different positions of the frame relative to the spindle.

LOUIS W. SCHAAFF.