Feb. 27, 1962 W. LENK 3,022,623

THREAD TWISTING APPARATUS

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FIG. 1

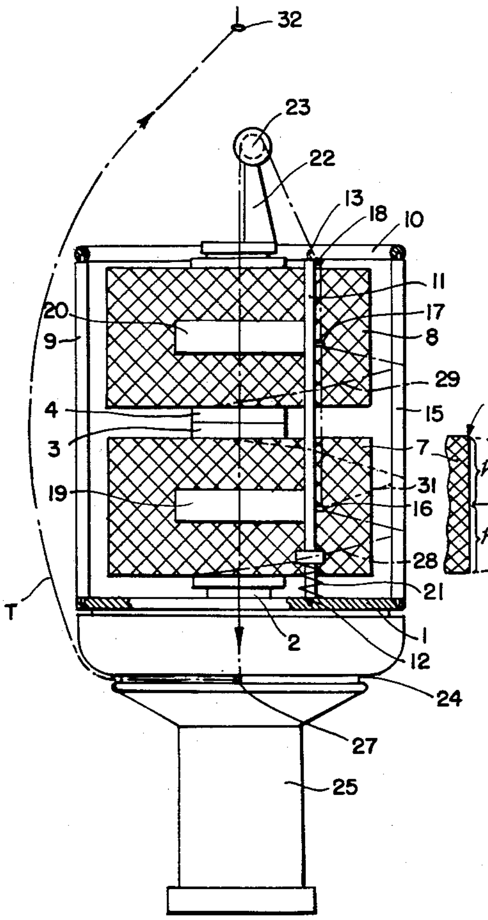
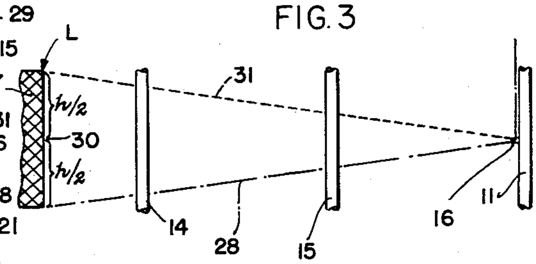


FIG. 3



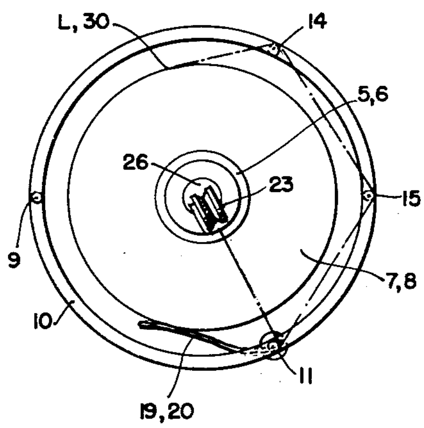


FIG. 2

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FIG. 4

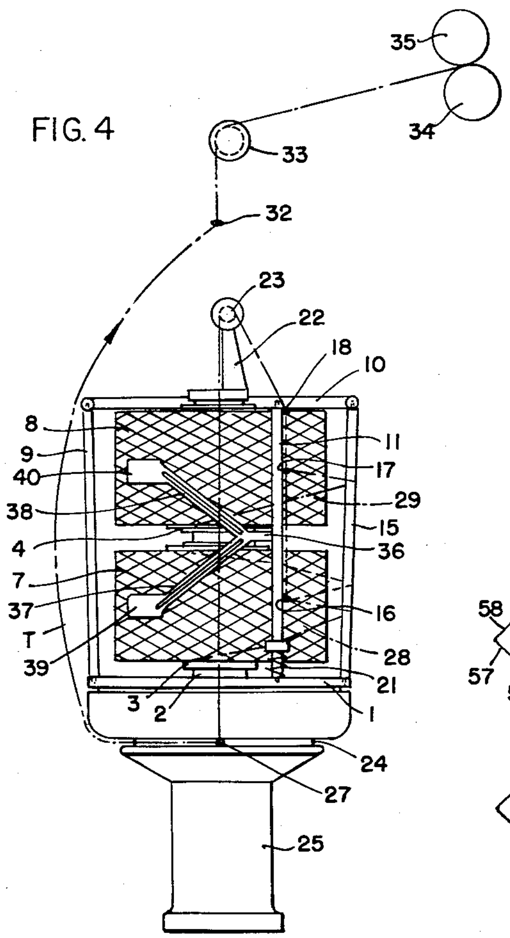


FIG. 5

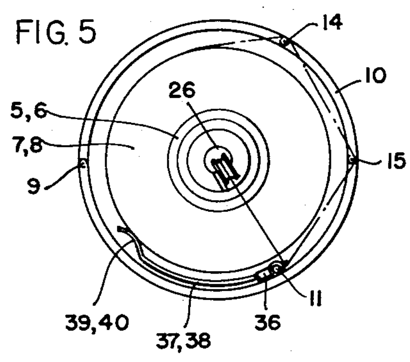


FIG. 6

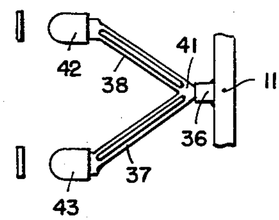


FIG. 7

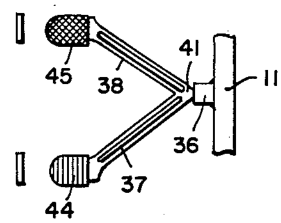


FIG. 8

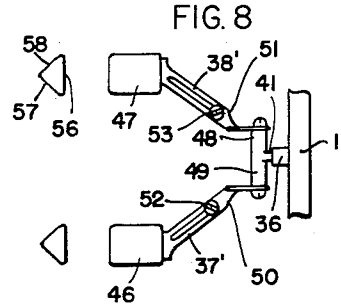
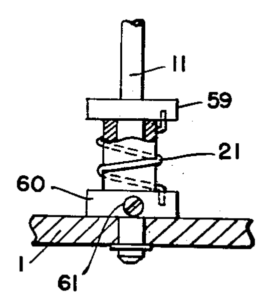


FIG. 9



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THREAD TWISTING APPARATUS

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10 Claims. (Cl. 57—58.83)

This invention relates to thread twisting apparatus, and more particularly, to an improved apparatus or device for drawing off and twisting equal lengths of thread from a pair of bobbins or feed spools which are superimposed and rotate on the same axis. The improvement of the invention is especially advantageous in combination with the so-called double twist twisting machine, sometimes referred to as a multiple twist or two-for-one twisting machine.

In the usual textile apparatus for twisting two threads together, e.g. in a double twist twisting machine, it has been a common practice to draw the threads from a single bobbin or feed spool thread package and then feed the combined threads directly into the twisting device. In this process, however, it is essential that the threads first be wound upon the single feed spool with as equal and uniform a tension as possible. Otherwise, it is impossible to draw off the threads with equal lengths and proper alignment for twisting. This preliminary step of prewinding the feed spool is both time consuming and difficult to achieve, especially in the commercial handling of a large volume of thread.

In order to avoid the prewinding step, it has been proposed that two feed spools be employed instead of the single prewound spool, and that these two spools be mounted on a common spool carrier for free and independent rotation on the same spindle. The threads drawn off separately from each bobbin or spool are then joined in preparation for twisting. In this case, the problem is essentially one of drawing the individual threads from each spool at a constant and mutually uniform rate of speed such that the lengths of thread are equal throughout the drawing off and twisting operations. With unequal thread lengths, the longer thread tends to turn or loop around the shorter thread during twisting so as to give an imperfect product as evidenced by an excess of thread in the form of a twisted loop, also referred to as a corkscrew or tangle. Thus, if the thread lengths are not accurately controlled in some fashion, there is a very undesirable formation of a slack thread and the resulting product is a ribby or knotted yarn.

In the development of the present invention it was found that in the process of drawing the individual threads from each bobbin to a fixed point acting as a thread guide member, the bobbins tend to rotate at different speeds, i.e. to run ahead or lag behind one another. This tendency cannot be entirely avoided even if the bobbins have exactly the same diameter because the rotating speed of the individual bobbin does not remain uniform.

Upon further investigation it was found that the non-uniform rotation of each bobbin and their non-synchronized rotation with resulting differences in thread length is due primarily to the fact that the thread take-off point on each bobbin follows a locus on a surface line of the bobbin parallel to and relatively stationary with respect to the bobbin axis. Thus, in the original winding of the bobbin, the thread traverses the bobbin along its axis and reciprocates from one end to the other. Likewise, if the thread is then drawn off to a relatively fixed point, the thread reciprocally traverses the bobbin from one end to the other, and the point at which the thread is lifted or withdrawn from the outer thread wound surface follows the same linear path, referred to as the thread take-off locus.

In drawing off the thread to a fixed guide member, such as an eyelet or the like, located intermediate the ends of the bobbin, the thread path passes through or defines a thread run-off or traversing triangle having a base corresponding to the thread take-off locus and an apex corresponding to the fixed guide member. The opposite sides of the triangle are determined by the thread path at the outermost ends of the thread traversing movement on the bobbin. It will be readily observed that if the fixed guide member is located only a short distance from the outer peripheral surface of the bobbin, the thread path between the take-off point and the guide member will be quite short when the thread is perpendicular to the take-off locus or base of the run-off triangle and quite long when the thread reaches the ends of the bobbin. This difference in thread length between the take-off point and the guide member naturally causes the rotational speed of the bobbin to change even though the thread is drawn off at a constant rate. By working with two bobbins and drawing a thread from each bobbin at the same rate, the rotational speed of the bobbins will be different unless the traversing motion of the thread is identical in both cases besides employing bobbins with the same diameter. However, this method of operating is not feasible, and in any event, would require a very careful prewinding of each of the bobbins as in the case of the single bobbin.

One object of this invention is to provide an improvement in thread twisting apparatus wherein equal lengths of thread can be drawn off from two bobbins and then joined for twisting.

Another object of the invention is to provide improved apparatus for drawing off and twisting equal lengths of thread which are unwound from two bobbins independently rotating on the same axis, especially in combination with a double twist twisting machine.

Another object of the invention is to avoid a preliminary bobbin winding step by means of apparatus which will compensate for differences in bobbin diameter and the tendency for the bobbins to rotate at variable and different speeds.

Still another object of the invention is to provide an improved thread twisting apparatus which can be employed to draw off and twist equal lengths of threads having different physical or dimensional characteristics.

Yet another object of the invention is to provide a relatively compact thread twisting apparatus, especially a double twist twisting machine, readily adapted to commercial applications and capable of handling a large volume of thread.

Another object is to provide thread twisting apparatus capable of producing a uniformly twisted thread or yarn product free of tangles, knots, slack threads and the like.

The foregoing and other important objects, advantages and functions of the invention will become more apparent in view of the following description which, taken in conjunction with the accompanying drawings, discloses the preferred features of the invention.

In the drawings:

FIG. 1 is a side elevation and partly schematic view with portions cut away of a double twist twisting machine in combination with the improvement of the invention;

FIG. 2 is a top plan view of the bobbin holding device shown in FIG. 1;

FIG. 3 is a roll out view of the thread path and its associated guide members from the thread take-off locus on one of said bobbins to a fixed guide element at the apex of the thread run-off triangle;

FIG. 4 is a side elevational view corresponding to the twisting apparatus disclosed in FIG. 1, but illustrating a different braking mechanism;

FIG. 5 is a top plan view of the bobbin holding device shown in FIG. 4;

FIGS. 6, 7 and 8 are side elevational views illustrating various braking elements in accordance with the invention; and

FIG. 9 is an enlarged view of an adjustable spring tensioned shaft or tube adapted to urge a braking element against the bobbins.

The same numerals are employed to designate similar parts in the various figures of the drawings. It will be understood that the bobbin holder or frame need not be mounted in a vertical position as might otherwise be suggested by the drawings.

The above-mentioned objects are achieved in accordance with the present invention by providing in combination with a thread twisting apparatus for drawing off and twisting equal lengths of thread from a pair of superimposed or adjacently mounted bobbins independently rotating on a common axis, thread run-off guide means for each bobbin including a relatively fixed guide element at the apex of the thread run-off triangle, and a plurality of thread guide rods mounted substantially parallel to the bobbin axis at spaced intervals between the thread take-off locus of the bobbin and the apex guide element. The thread guide rods are adapted to engage the thread in runing contact, i.e. in the running direction of the thread as it is drawn off, and also in traversing contact, i.e. in a reciprocal movement of the thread along the elongated surface of the rod. Together with the apex guide element, the guide rods are also adapted to maintain the thread adjacent to but out of contact with the outer peripheral surface of the bobbin, e.g. at a relatively short distance of preferably not more than about one-half the radius of the fully wound bobbin. In addition the distance of the thread path from the take-off locus, over the rods to the apex should be at least about twice, preferably at least three times, the height of the bobbin. In the same combination of a thread twisting apparatus, particularly of the type referred to as a double twist twisting machine, it is highly advantageous to include a braking means adapted to resiliently engage a peripheral surface of each of the bobbins, i.e. with means to urge a separate or combined braking surface for frictional engagement against the bobbins. Such braking means combined with the thread guide means of the invention are effective to provied a uniform rate of rotation for the bobbins whereby equal thread lengths can be drawn off and twisted. Also, the braking means can be designed for adjustment to bobbins of different diameters and the frictional surface and/or braking pressure can be advantageously adapted to threads having different physical or dimensional characteristics. These features falling within the scope and purpose of the present invention are more fully explained hreinafter.

In constructing the apparatus of the present invention, a principal problem was to avoid the variable rate of rotation of the bobbins caused by drawing the thread from the take-off locus directly to an apex guide element situated very close to the bobbin. As noted above, this arrangement of the apex with a constant drawing off speed of the thread results in a very uneven bobbin rotation because of an extremely large variation in the length of thread between the take-off point and the apex during the traversing motion of the thread as it unwinds from the bobbin.

It was first recognized that this problem could be avoided if the apex were placed at a great distance from the bobbin i.e. in a direction perpendicular to the bobbin axis as indicated by FIG. 3, disregarding the guide rods shown therein and assuming that this figure is a simple elevational view rather than a roll out view. However, such an arrangement would require a very large operational space which would be especially undesirable in commercial operations requiring a large thread volume

and a large number of paired bobbins. Also, this arrangement would be impossible with a double twist twisting device, because the rotating thread balloon around the bobbins sharply circumscribes the distance at which the apex guide element can be spaced from the bobbin. Therefore, the arrangement and construction of the apex guide element and thread guide rods of this invention are especialy useful in a double twist twisting device because these guide means can all be located within the boundary defined by the rotating balloon.

The term "bobbin" is employed herein to describe a thread wound spool, i.e. both the spool and its thread package which is unwound or drawn off in the usual fashion during the thread twisting operation. The term "thread" is employed herein to include various fiber forms including yarns, strings, tows, a monofilament, filament bundles and the like. The fibers may be natural, artificial or synthetic, and the thread may be composed of continuous filaments or staple fibers.

Referring now to the drawings, FIG. 1 illustrates a double twist twisting machine as a particularly preferred embodiment of the invention, shown partly in schematic form with certain conventional portions omitted. In this machine a stationary frame is provided by spool carrier **1** and various elements connected thereto. The spool carrier **1** is maintained in a stationary position in a conventional manner, e.g. by means of an eccentric weight located on one side of the carrier while inclining the machine from the vertical position shown. A stationary spool carrier can also be achieved by mounting one or more magnets around the carrier at a sufficient distance therefrom to permit passage of the ballooning thread T. These magnets are placed opposite other magnets in or on the spool carrier itself, and the attraction between opposing magnets holds the carrier in place. Since these means of holding the carrier stationary have become quite standard in the art, the drawings have been simplified to avoid showing the corresponding elements of the apparatus.

A hollow spindle **2** extends above the spool carrier **1** and carries rotatably thereon two separate hollow spool-receiving holders **3** and **4** which fit tightly into two bobbin spools **5** and **6** which in turn respectively carry thread packages **7** and **8**. The bobbins are wound such that the spools must rotate on the spindle as the thread is drawn therefrom and such that the thread reciprocally traverses the bobbin from one end to the other.

A stable basket frame is completed by the side support **9** connecting the spool carrier **1** to the upper ring **10**. As further members of this protective basket frame, located outside the circumference of the bobbins or thread packages **7** and **8** there is mounted around the same axis as the spindle and substantially parallel thereto a turnable rod or tubular carrier **11** seated at either end for rotation on its axis, for example by the prong or pin **12** to the spool carrier **1** and by prong **13** to the upper ring **10**, and in addition, the thread guide bars or rods **14** and **15**, likewise arranged to rotate or turn about their axis by means of a prong or pin at either end.

On the tubular carrier **11**, there is connected or mounted in a relatively fixed position a series of thread guide elements in the form of eyelets or hooks **16**, **17** and **18**, and there is also mounted two friction straps or shoes **19** and **20**.

The tubular carrier or rod **11** is arranged adjacent the periphery of the thread packages **7** and **8** such that the eyelets **16** and **17**, positioned intermediately the height of the bobbins, are situated at a distance from the middle take-off point **30** of the thread locus L of more than three times the height *h* of the thread package or bobbins **7** and **8**. This arrangement is most clearly shown by the roll out view of FIG. 3, but can also be traced on the thread path in FIG. 2.

Furthermore, the tubular carrier **11** is spring urged to rotate the brake flanges **19** and **20** by means of a torsion spring **21** against the thread packages **7** and **8**. However, if desired, the brake flanges can be pivotally rather than fixedly mounted on the tubular carrier, and each flange can then be spring urged by means of its own torsion spring, coil spring, leaf spring or the like. It is preferable to provide an adjustable spring tension, e.g. as hereinafter discussed with respect to FIG. 9, and various means can be adopted for this purpose within the scope of the invention.

At the upper end of the spool carrier **1** and attached to the spindle **2** by means of an extension or carrying arm **22** is a thread guide roller **23**. The lower portion of the double twist twisting device is constructed in the usual manner so as to provide a reserve disc **24** which rotates together with the operatively driven whorl **25**. The spindle **2** is likewise designed in the usual manner with a hollow core **26** and a passageway or opening **27** leading to the reserve disc **24**.

During operation, the combined threads T are drawn off individually and laterally from each bobbin **7** and **8**, as indicated by the broken lines **28** and **29**, and in running and traversing contact over the thread guide rods **14** and **15**. As illustrated in FIGS. 1 and 3, the traverse position of threads on the bobbins are at their lower extremity on the thread locus L, the upper extremity of the traverse position of the thread on bobbin **7** being indicated by dotted line **31**. The individual threads are then led through the substantially fixed apex eyelets **16** and **17**, the threads being joined at the upper eyelet **17**. From this point, the threads are conducted in common through eyelet **18**, over the roller **23** around the upper end of the spool carrier and downwardly through the hollow core **26** of spindle **2**, and the combined threads are then drawn outwardly onto the reserve disc **24**, all in the conventional manner of a double twist twisting machine. The thread as it emerges from the reserve disc **24** is led outwardly in a rotating balloon T around the end of the bobbins, through an eyelet or similar guide means **32**, over a preliminary draw-off roll **33** and onto a take-up reel or draw-off rolls **34** and **35**. These latter rolls represent the point at which drawing or unwinding of the threads from the bobbins originates. In operation, these rolls are operated to obtain a substantially uniform drawing-off speed. The two friction straps **19** and **20** bear with the same pressure against the thread wound circumference of the bobbins **7** and **8** and are generally sufficient to synchronize the rotational spread of bobbins having approximately the same diameter with the aid of the thread guiding means of the invention.

Because the thread guide eyelets **16** and **17** are located at a substantially extended distance from the thread take-off locus L, the resulting thread path forms an extended run-off triangle as defined by the base L and apex **16** in FIG. 3. In this extended triangle, there is only a slight variation of the thread length between the locus L and the apex **16** as the thread take-off point reciprocates on or traverses the bobbin **7**. Accordingly, with a uniform thread running speed imparted by draw rolls **34** and **35**, the rotational speed of the bobbins is maintained substantially equal, especially with the aid of the braking forces applied by straps **19** and **20**. The usual differences in thread tension and length between the two twisted threads is thus diminished to such an extent that even the very finest threads and yarns can be twisted without difficulty.

With reference to FIGS. 4 and 5, the double twist-twisting machine and thread guiding means of the present invention are reproduced substantially as disclosed in FIGS. 1–3. However, the braking means illustrated here represent an especially preferred embodiment or feature of the invention, with other alternative embodiments being illustrated in FIGS. 6–8.

In these embodiments, the tubular carrier or rod **11** has attached thereto and at right angles and about midway between the ends of each bobbin, a swinging arm or shaft **36** adapted to pivotally receive a U-shaped, V-shaped or Y-shaped yoke with two oppositely disposed arms **37** and **38**. The pin or yoke handle **41** at the base of the yoke is seated to turn in the swinging arm **36**. At the free ends of the arms and in a position to frictionally engage a peripheral or circumferential surface of the bobbins **7** and **8**, there are mounted, preferably in removable or interchangeable fashion, a pair of brake shoes or arcuate shaped braking surfaces **39** and **40**.

The tubular carrier **11** is pretensioned by means of a torsion spring **21** and is caused to rotate or spring urged about its own axis together with arm **36**, thereby pressing the brake shoes **39** and **40** inwardly against or along a circumferential surface area of the two bobbins. The pivot linkage or pivotal joint formed by yoke-handle or pin **41** and arm **36**, assures that both brake shoes will engage their respective bobbins regardless of minor differences in the diameters of the bobbins.

In FIGS. 4 and 5, the brake shoes **39** and **40** are represented as merely extensions of the yoke arms **37** and **38** and are given a flat arcuate shape, the surface contacting the bobbin being relatively smooth.

In FIG. 6, the brake shoes **42** and **43** are shown in side elevation exposing the bobbin engaging surfaces of the shoes, which in this case are relatively flat smooth surfaces. The brake shoes are preferably adapted to be interchanged on the free ends of the yoke arms **37** and **38**. In this way, brake shoes having a rough, uneven, ribbed or cross-hatched surface can be exchanged to obtain a smaller or greater frictional effect, e.g. as illustrated by brake shoes **44** and **45** in FIG. 7.

Likewise, it is possible to mount a rotatable ball or roller as a brake shoe on each of the opposed yoke arms, and these rotating braking elements can be further provided with magnetic or similar means to inhibit their free revolution and thereby provide an adjustable frictional or bearing force against the bobbins. It is also advantageous to employ a roller means as disclosed in my copending application, Serial No. 859,943, filed December 16, 1959, the disclosure of which is incorporated herein by reference thereto. Such adjustable and brake compensating devices are especially useful when drawing off and twisting threads of different origin or different thickness or surface texture. Thus, synthetic threads and natural threads, each of a different filament diameter can be twisted together and subsequently processed to give special effects. Where the brake shoes have a high degree of adjustment or a compensating roller or rollers are employed, these elements alone are usually sufficient to draw off and twist substantially equal thread lengths, even without the thread guiding means forming an extended run-off triangle according to the present invention. In these cases, for example, the thread can be drawn directly from the bobbin **7** or **8** to the guide eyelets **16** and **17** without engaging any other thread guiding means. The thread path otherwise remains the same.

An especially preferred braking means in accordance with this invention is illustrated in FIG. 8. The spring urged carrier tube **11** again has a swinging arm **36** fixed thereto, but the yoke connecting pin **41** seated to turn in the arms **36** has two laterally extending legs **48** and **49** so as to provide a T-shaped base for the yoke. The brake shoes **46** and **47** are mounted at the free ends of oppositely disposed slotted arms **37'** and **38'**, and these arms in turn are adjustably connected to the T-shaped base legs **48** and **49** by means of wing flanges **50** and **51**. With respect to each brake shoe, the slot of the brake shoe arm is engaged for adjustment of its length by a tightening screw or nut and bolt combination **52** and **53** connecting said arm to one wing of the flange. At the same time the other wing of the flange is adjustably mounted by means of a tightening screw **54** and **55** received by the legs **48** and **49** of the yoke base. This construction permits the brake shoes **46** and **47** to be adjusted to any position with reference to the circumferential surfaces of the bobbins, and further permits a different leverage or pressure on each bobbin even though the swinging arm **36** is urged inwardly with a single spring tension.

In FIG. 8, the brake shoes are shaped as a 3-sided or triangular prism as indicated in the end view thereof and are mounted for adjustable rotation at the ends of the arms 37′ and 38′. In this way, each of the three braking surfaces **56, 57** and **58** can be given a different surface texture or degree of roughness, thereby permitting a different selection of frictional forces as a braking surface applied to each bobbin. In combination with the adjustable positions of the brake shoes, with respect to the spindle or bobbin axis as discussed in the preceding paragraph, the further provision of 3-sided brake shoes permits a wide variation in frictional forces. This embodiment is therefore especially useful where there is a great difference in bobbin diameters or where entirely different types of thread are employed on each bobbin, because these differences can be readily equalized with adjustment of the brake contact pressure or frictional effect on the bobbins.

In order to provide different spring tensions on the carrier tube **11**, the spring device shown in the enlarged view of FIG. 9 is particularly suitable. The spring **21** is seated at one end in the annular flange **59** of tube **11** and at its other end in the adjusting ring or collar **60** which is free to rotate about the tube **11** and which can be clamped in any predetermined position by means of the adjustment screw **61**. A scale can be marked on the ring **60** to provide a measurement for the required tension values.

It is also possible to provide an adjustable tensioning means in the form of a draw or coil spring secured at one end to a lever arm protruding from the end of tube **11** above or below the base plate carrier **1** and secured at the other end by means of a hook on the spring attached in any one of a series of holes in the base plate **1**. Other spring tension means will be readily apparent to one skilled in the art without departing from the spirit and scope of the present invention.

This invention is not limited to a double twist twisting machine or to a device containing only two bobbins. Other thread twisting apparatus with two or more feed spools or bobbins can be readily adapted to the principles herein disclosed, it being understood that at least two bobbins are employed and at least two threads of equal length are twisted together. Thus, the invention can be readily adapted to the so-called ring-twisting type of machine or to other thread twisting devices by extending the spindle to receive more than two bobbins or by a parallel series of pairs of bobbins interconnected to accomplish the same functions. For example, by adding a turntable linking arm between the swinging arms **36** of two of the thread twisting devices, each with a pair of bobbins, the number of bobbins can be increased to four, and the leverage ratio between the various brake shoes can be readily adjusted for all required contact pressures. In this case, it is helpful to connect the swinging arm **36** to the tube **11** such that this arm can be adjusted to different positions along the length of the tube.

In essence, the present invention gives improved combinations and sub-combinations of apparatus in thread twisting devices, whereby equal thread lengths can be withdrawn and twisted from two or more bobbins to give a uniformly twisted product. A prewinding of the feed bobbins can be completely avoided, and the necessary apparatus can be contained in a minimum space for large commercial volumes of thread. The apparatus of the invention is particularly advantageous in combination with double twist twisting machines because it can be contained within the rotating thread balloon. The invention is also highly advantageous for textile twisting devices working with dissimilar thread or yarn materials and various bobbin sizes.

The invention is hereby claimed as follows:

1. In combination with a thread twisting apparatus for drawing off and twisting equal lengths of thread from a pair of superimposed bobbins independently rotating on a common axis, thread run-off guide means for each bobbin comprising a relatively fixed guide element at the apex of a thread run-off triangle, and a plurality of straight thread guide rods mounted substantially parallel to the bobbin axis and parallel to each other at spaced intervals between the thread take-off locus of said bobbin and said apex guide element, said rods being adapted to engage said thread in running and traversing contact thereover and together with said apex guide element to maintain the thread adjacent to but out of contact with the outer peripheral surface of said bobbin, the distance of the thread path from said take-off locus, over said rods to said apex guide element being at least twice the height of the bobbin.

2. In a thread twisting apparatus for drawing off and twisting equal lengths of thread from a pair of superimposed bobbins independently rotating on the same axis, the improvement which comprises: a spindle upon which said bobbins are rotatably mounted; a stationary frame having oppositely disposed supports at the ends of the superimposed bobbins; means to hold said supports in a stationary position for rotation of said bobbins therebetween; and thread guide means defining a separate thread path for each of said bobbins from the thread take-off locus of the bobbins, through a relatively fixed apex situated intermediately the ends of the bobbin and to a common point at which the threads from each bobbin are joined in preparation for twisting, said thread guide means including a guide element corresponding to said apex and a plurality of straight thread guide rods mounted at either end to said supports substantially parallel to the spindle axis and parallel to each other at spaced intervals around the periphery of said bobbins between said thread take-off locus and said apex guide element, said rods being adapted to receive the thread from each bobbin in running and traversing contact thereover and together with said apex guide element to maintain the thread adjacent to and at a relatively short distance from the outer peripheral surface of said bobbins, the distance of each thread path from said thread take-off locus, over said rods to said apex guide element being at least twice the height of the corresponding bobbin.

3. An improved thread twisting apparatus as claimed in claim 2 wherein said thread guide rods are substantially cylindrical and free to rotate on their longitudinal axis.

4. An improved thread twisting apparatus as claimed in claim 2 provided with braking means connected to said frame and including means to resiliently urge a braking surface against a peripheral surface of each of said bobbins.

5. An improved thread twisting apparatus as claimed in claim 4 wherein said braking means comprises a yoke having two oppositely disposed arms pivotally mounted by means of a common shaft of said yoke, said shaft being arranged transversely to said spindle axis on said stationary frame for swinging movement in a plane approximately perpendicular to the spindle axis, a brake shoe mounted on each of said arms, and means to resiliently urge said shaft toward said bobbins for frictional engagement of said brake shoes thereagainst.

6. An improved thread twisting apparatus as claimed in claim 5 wherein said brake shoes are removably mounted on said arms, whereby brake shoes with a different degree of surface roughness are interchangeable thereon.

7. An improved thread twisting apparatus as claimed in claim 5 wherein said yoke contains means for adjusting and securing the relative distance of said brake shoes from

said spindle for adaptation to bobbins having substantially different diameters.

8. In a double twist twisting machine, the improvement which comprises: a hollow spindle; means to receive two bobbins in a position adjacent each other for independent rotation of said bobbins around the axis of said spindle; a stationary frame having oppositely disposed supports at the ends of the adjacent bobbins; means to hold said supports in a stationary position for rotation of said bobbins therebetween; and thread guide means to lead a thread outwardly from each bobbin as said thread unwinds from the thread take-off locus of the bobbin, to further lead said thread from each bobbin through a relatively fixed apex situated intermediately the ends of the bobbin and to a common guide member where said threads are joined prior to twisting, and to lead the joined threads around one end of said bobbins, through said hollow spindle and then outwardly in a rotating balloon around the other end of said bobbins whereby a twist is imparted to said threads, said thread guide means including a guide element corresponding to said apex and a plurality of thread guide rods mounted at either end to said supports substantially parallel to the spindle axis at spaced intervals around the periphery of said bobbins between said thread take-off locus and said apex guide element, said rods being adapted to receive the thread from each bobbin in running and traversing contact thereover and together with said apex guide element to maintain the thread adjacent to and at a relatively short distance from the outer peripheral surface of said bobbins and within the boundary defined by said rotating balloon, the distance of each thread path from said thread take-off locus, over said rods to said apex guide element being at least twice the height of the corresponding bobbin.

9. An improved thread twisting apparatus as claimed in claim 8 wherein said thread guide rods are substantially cylindrical and free to rotate on their longitudinal axis.

10. An improved thread twisting apparatus as claimed in claim 8 provided with braking means connected to said frame and including means to resiliently urge a braking surface against a peripheral surface of each of said bobbins.

References Cited in the file of this patent

UNITED STATES PATENTS

1,995,533	Bochmann et al.	Mar. 26, 1935
2,504,020	Hanson	Apr. 11, 1950
2,699,032	Landolt	Jan. 11, 1955

FOREIGN PATENTS

594,542	Germany	Mar. 19, 1934

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,022,623 February 27, 1962

Wilhelm Lenk

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 47, for "provied" read -- provide --; line 55, for "hreinafter" read -- hereinafter --; column 7, line 57, for "turntable" read -- turnable --.

Signed and sealed this 24th day of July 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents