Dec. 1, 1953 C. B. KINGSBURY 2,660,856

BALLOON GUARD

Filed Sept. 29, 1949

3 Sheets-Sheet 1

Fig. 1.

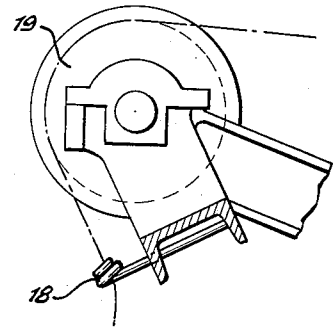
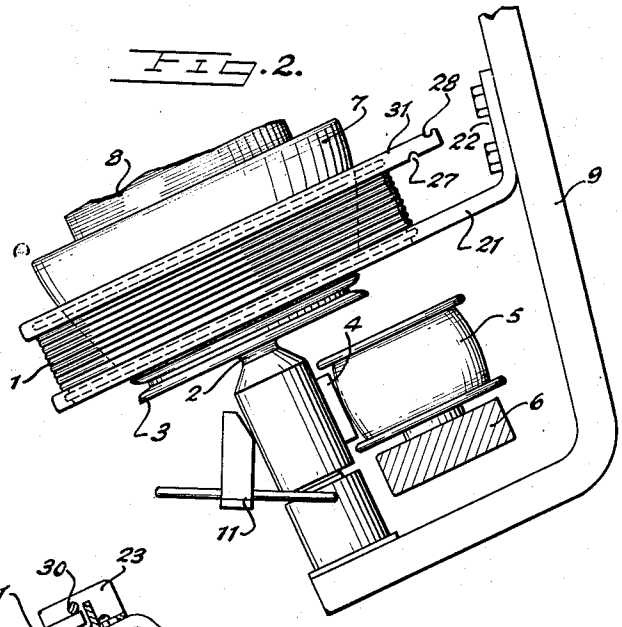


Fig. 2.



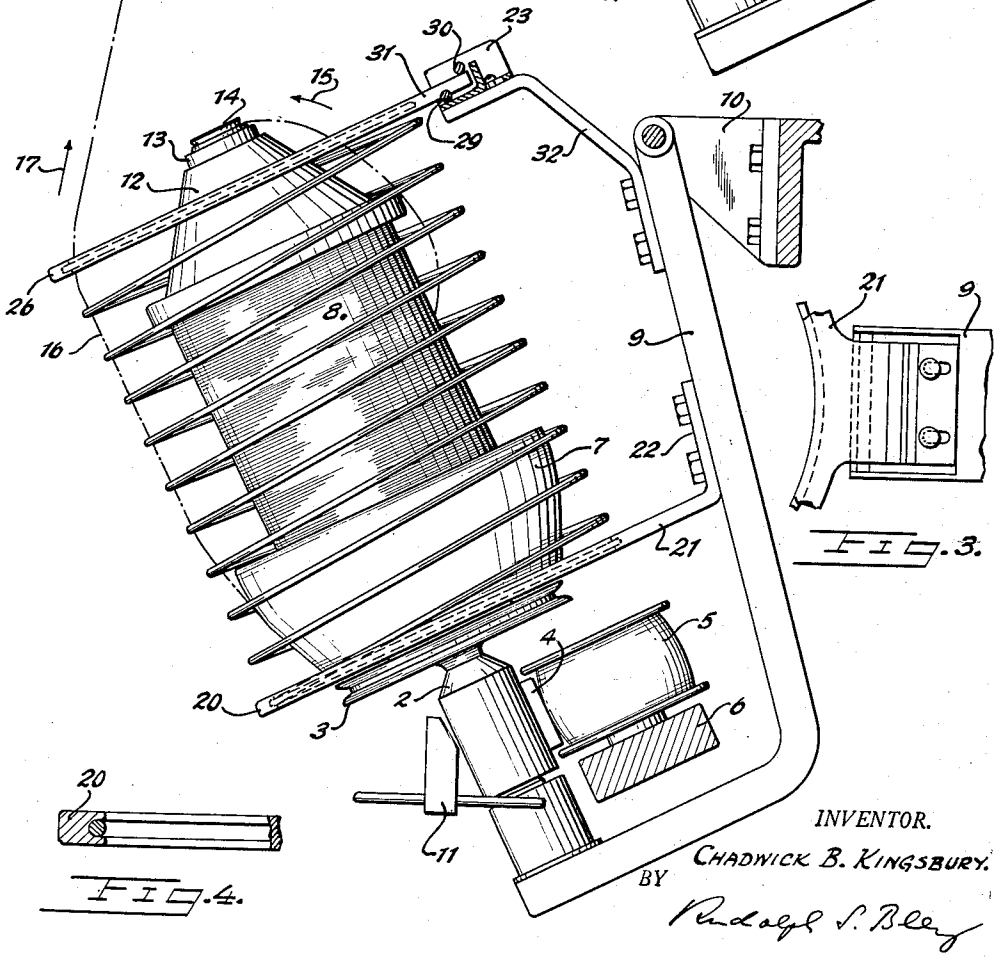


Fig. 3.

Fig. 4.

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Fig. 5.

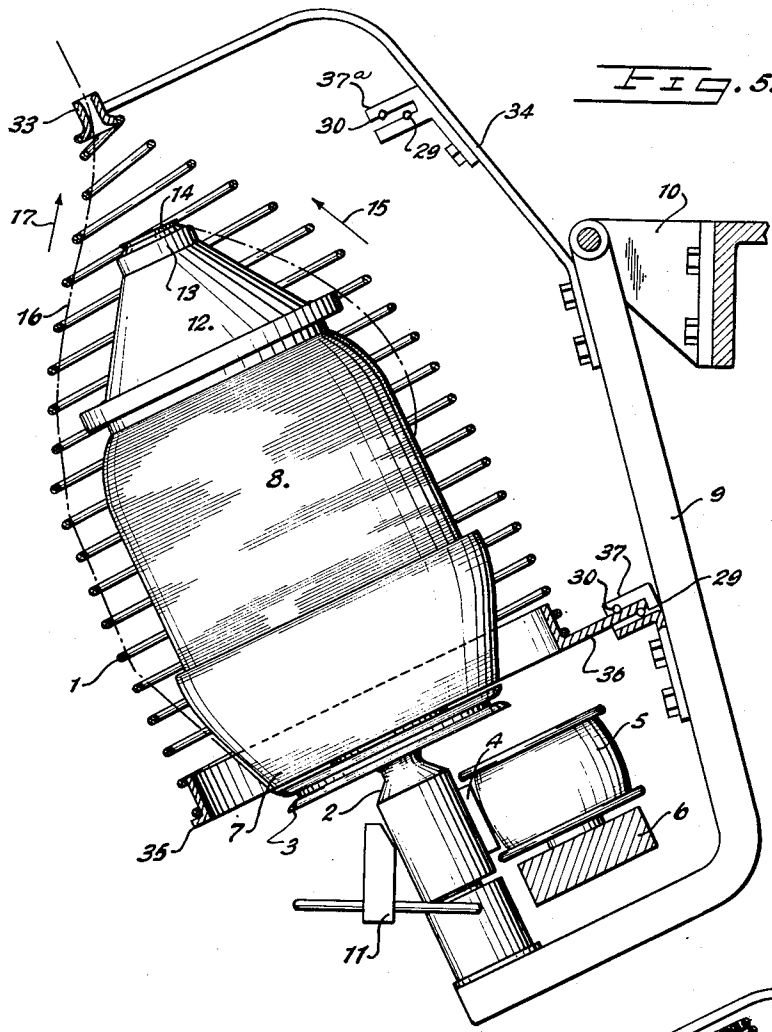
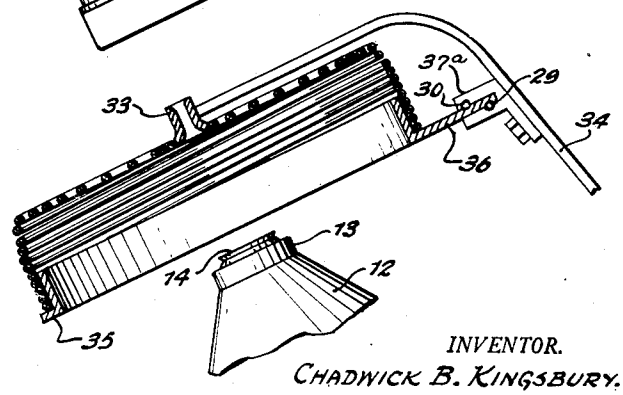


Fig. 6.



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Fig. 7.

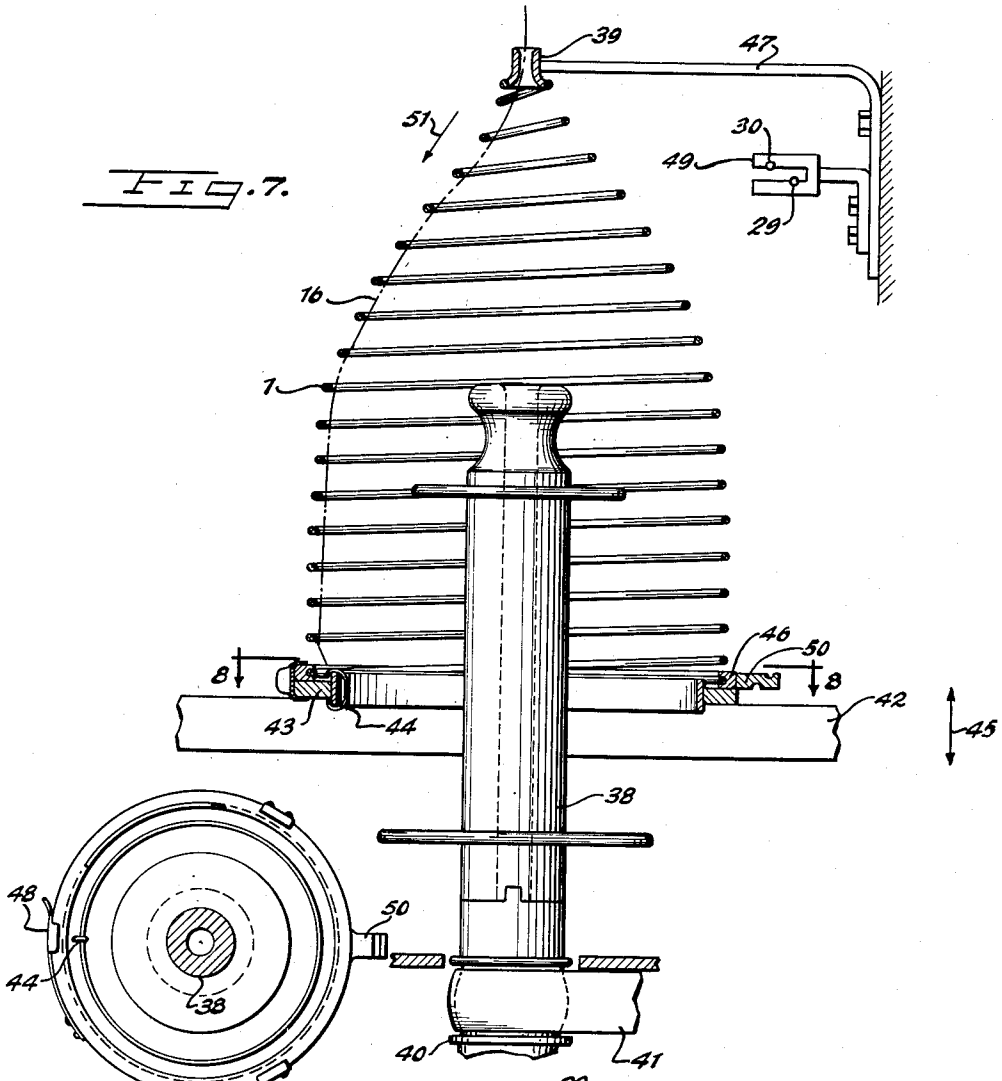


Fig. 8.

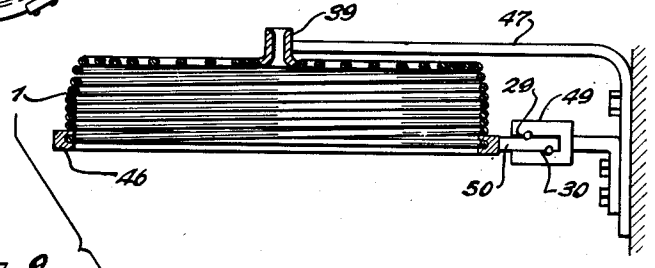


Fig. 9.



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2,660,856

BALLOON GUARD

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Application September 29, 1949, Serial No. 118,646

13 Claims. (Cl. 57—108)

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This invention relates to improvements in twisting machines and more particularly to twisting devices wherein the thread or yarn undergoing twisting forms a so-called balloon, around, and in spaced relation to the yarn package.

One object of the invention is to provide an improved guard for the thread balloon adapted at the same time to permit constant visual inspection of the balloon.

Another object is to provide a balloon guard which, in addition to enclosing and protecting the balloon, is also adapted by the shape, arrangement and action of its structural parts, not only to increase or decrease the yarn tension exerted by the balloon but also to control the twist concentration in specific areas of the yarn without affecting the final twist as a whole.

A further object is to provide a balloon guard of collapsible form adapted for use on textile machines of any type where a thread balloon is produced and to mount the guard in such fashion on the textile machine so as to permit free access to the operating parts of the machine when the guard is collapsed and retracted from the zone of operations and also permit quick resetting of the guard into its operative position.

An additional object is so to constitute the collapsible guard that, when in collapsed form, it will occupy an irreducible minimum of space and lie substantially outside the zone of servicing operations conducted on the spindle or the like with which it is associated, without necessitating its removal from the machine.

Although the invention is applicable to textile devices where the thread, yarn, or the like forms a balloon during its travel, it is particularly suited for twisting spindles, and its construction and use will be described by way of a non-limiting embodimental example as applied to such a spindle.

In the operation of certain types of twisting spindles, especially double twist spindles, the spindle per se revolves but the yarn package from which the yarn is drawn does not. The yarn that is to be twisted is withdrawn from a stationary package carried by the spindle, passes downwardly through the hollow center of the spindle, emerges from a port in a storage wheel at the lower end and then passes outwardly around, upwardly, in spaced relation to the spindle in the form of a so-called "balloon," the twisted thread then passing to a suitable take-up device to form the finished package. The size of the balloon depends upon a number of factors such as the rotational speed of the spindle, the speed of

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thread take-up at the package and upon the denier of the thread undergoing twisting.

Inasmuch as the yarn or thread balloon whirls around the spindle the balloon, when extended to its maximum, will strike against any obstruction it encounters, for example against the balloons produced by adjacent spindles. For this reason it is customary to place partitions or separators between the spindles, the balloon of each spindle thus being, in effect, housed in an enclosure closed on three sides and open at the front, top, and bottom. An enclosure or compartment constituted of such partitions or walls however protects the balloon only on three sides. Inasmuch as the balloon constitutes a means, supplementary to tensioning devices associated with the spindle, for controlling the tension of the yarn, frictional contact of the balloon with any object would obviously influence the action of the balloon in its tension-controlling action. If the frictional contact of the balloon with extraneous objects could be properly controlled, it could be used as an additional tension control means. The balloon however strikes the flat walls of the enclosure in substantially tangential fashion, that is, merely at one point, and such contact is insufficient to exert any useful effect on the tension-controlling properties of the balloon. In addition, it is inconvenient and time-consuming to dismantle such enclosures during servicing operations.

Attempts have also been made to provide rigid balloon guards of various configurations and to mount these on moving members of the twisting or other machine, e. g. the ring rail, so as to have the guard move up and down with the latter while protecting the balloon. An embodiment of such a guard constituted as a rigid conical wire cage is disclosed for example in German Patent No. 169,170 of 1906 to Weber et al., in which case however it is used in combination with a ring traveler about which the yarn is draped in multiple snubbing fashion, the purpose of the guard being to limit the centrifugal pull exerted on the thread so as to prevent undesirable oscillatory movements of the thread.

In these prior art proposals however the rigid guard must be removed bodily when servicing operations are conducted on the spindle. In addition the temporary storing of a large number of such rigid guards, when removed from the machines, is very inconvenient and time-wasting, and they are easily damaged during handling and storage.

In accordance with the invention, a collapsible guard is provided made of resilient material coiled

so as to produce a balloon-encompassing enclosure of suitable configuration which normally tends to assume a collapsed condition but which can be stretched out and locked in extended condition for use as a rigid guard until it is desired to remove it from the zone of operations as by unlocking and collapsing the same, the guard therefore remaining on the machine.

In another embodiment the same type of guard is adapted to serve as a flexible guard with one end permanently attached to a stationary portion of the machine and with the other end detachably locked to a vertically reciprocating part of said machine thus providing a guard that expands and contracts in accordance with the moving part of the machine, such guard being also adapted to be collapsed at any time and locked in collapsed condition as a flat, condensed structure away from the zone of operations, without stopping the mcahine.

Several embodiments of the collapsible guard of the invention are illustrated by way of example in the accompanying drawing, where

Fig. 1 is a side elevation of a twisting spindle provided with a cylindrically shaped downwardly collapsible balloon guard of the type that does not expand and contract during operation of the spindle, the guard being shown locked in extended, operative condition.

Fig. 2 shows the balloon guard of Fig. 1 in collapsed inoperative condition, retracted from the zone of operation.

Fig. 3 shows a detail of a support for holding the balloon guard of Fig. 1 in place.

Fig. 4 is a cross-section through another portion of the support.

Fig. 5 shows a twisting spindle provided with an upwardly collapsible balloon guard of the type that also does not expand and contract during operation of the spindle, the guard being shaped substantially like the balloon and being shown locked in extended, operative position.

Fig. 6 shows the balloon guard of Fig. 5 locked in collapsed inoperative position, retracted from the zone of operation.

Fig. 7 shows a collapsible balloon guard of the type which flexes or expands and contracts during operation, the same being shown applied to a ring twister spindle.

Fig. 8 is a view partly in section taken on line 8—8 of Fig. 7 showing means for locking the guard to the ring rail of the twister.

Fig. 9 depicts the balloon guard of Fig. 8 locked in collapsed, inoperative position with respect to the spindle.

Referring to the drawing, the balloon guard in all of the figures is constituted as a collapsible structure composed of helical convolutions of resilient material, preferably spring steel, although it may also be made of any resilient synthetic resin or springy plastic. In the embodiments used for illustrating the invention, the material of which the convolutions are formed is shown as of round cross-section, but resilient convolutions of flat or other cross section may also be used. These convolutions are generally designated 1 in the several views .

Referring in detail to the drawing, the balloon guard in Figs. 1 to 6 inclusive is shown applied to a conventional two-for-one twister spindle. The latter consists, as usual, of the spindle per se, 2, the gathering wheel 3, drive belt 4, and idler pulley 5 mounted on support rail 6. Above the gathering wheel 3 is disposed the bowl 7 which serves as a support for the supply package 8 from

which the yarn to be twisted is drawn, said package in this type of twister being caused to remain substantially stationary with respect to the spindle (except for occasional gyratory movements) by counterbalancing means (not shown) within the spindle. The spindle is supported on a right-angled arm 9 pivotally carried by a bracket 10 attached to the machine. The numeral 11 designates a braking device. A member 12 of frusto-conical shape surmounts the yarn package 8 and carries a top member 13 on the upper surface of which reposes a tension controlling weight 14. A passage extends centrally through the interior of the spindle and communicates with radially directed passages in the gathering wheel 3 that terminates in ports (not indicated) through one of which the yarn issues. The yarn drawn from supply package 8 passes in the direction of arrow 15 beneath the tensioning weight 14, down through the central passage in the spindle and emerges from the aforesaid port in the gathering wheel 3 and then forms the yarn balloon which is indicated in the figures, as if stroboscopically viewed or frozen in space, by the line marked 16. The yarn proceeds, as indicated by arrow 17, to the guide eye 18 (Fig. 1) and thence to the take-up device 19.

In Fig. 1 the balloon guard is of the type that does not flex up and down during operation of the spindle, that is, once the guard is extended so as to encompass the spindle, it remains in that condition until deliberately allowed to collapse. As shown in Figs. 1 and 2 it is of the downwardly collapsible type. The guard is supported at its lower end, in spaced reation to the spinde, by a ring-like member 20 which terminates in the portion 21 carried by the bracket 9 as at 22. The upper end of the guard is detachably retained by a suitable locking device. In the embodiment shown a suitable arrangement for the purpose comprises a block 23 provided with a lateral opening for inserting a lug 31 of a ring 26, that carries the upper terminal convolution of the guard. The lug 31 is provided with notches 27, 28 (Fig. 2) for engaging with locking means such as rods or balls 29, 30 housed inside the block 23. In lieu of ring 26 the topmost terminal convolution itself may be bent-off laterally and provided with notches. The locking device 23 is carried by an arm 32 attached to the upper end of the spindle-supporting bracket 9. It is apparent that when the lug 31 of the ring 26 (or the bent-off end of the notched terminal convolution per se) is inserted into block 23 it will act as a lever with fulcrum at 29, operated by the weight of the guard and the springy pull exerted by the latter when in extended position. Obviously any other suitable means may be used for locking the guard in extended position. It is also apparent that the guard can be instantly released from the position shown in Fig. 1 so as to cause it to collapse downwardly to the position shown in Fig. 2 in which latter position it is completely out of the zone of any servicing operations conducted on the supply package and the upper portion of the spindle. When drawn out into extended position, (Fig. 1), the guard encompasses the spindle in spaced relation thereto and shields the yarn balloon from injury.

Figs. 5 and 6 show an embodiment of the same guard wherein, however, the latter is collapsible in an upward direction. In this case the spindle parts are the same as those of Figs. 1–4 and bear the same reference numerals and the balloon 16 is formed in the same manner as heretofore. In

this case, however, the guard is permanently attached to the guide eye 33 disposed above the spindle, said guide eye being carried by a bracket 34 attached to the spindle-supporting bracket 9. The lower end of the guard 1 is carried by an annular member 35 having an outwardly extending arm 36 for cooperation with a locking device 37 attached to bracket 9, said locking device operating similarly to the same type of device 23 shown in Fig. 1. As shown in Fig. 5 the guard is in drawn-out, locked, operative condition, disposed in spaced relation to the spindle, in position to protect the balloon. When the guard is to be collapsed, the arm 36 is withdrawn from the locking device 37 allowing the guard to collapse upwardly into the position shown in Fig. 6, thus removing it from the zone of operations about the spindle. In order to prevent possible up and down oscillation of the collapsed guard, another locking device 37a may be provided slightly above the spindle, for example on arm 34, said device being also similar in construction to devices 23 and 37.

In Figs. 7 to 10 the guard is of a type suitable for use with machines wherein an operative member, e. g. a ring rail is reciprocated with respect to a spindle, spool, package or the like, where a yarn balloon is formed which must be protected, and where the guard must of necessity expand and contract to a certain extent in accordance with the movement of such reciprocating member while still providing a balloon-protecting enclosure.

In these figures the guard is shown applied, for example, to a ring twister. The numeral 38 designates the spindle and bobbin assembly on which the twisted yarn is to be wound. This is driven, as usual, by the pulley 40 and belt 41. The numeral 42 is the ring rail to which the ring 43 is attached in coaxial relation to the spindle assembly, a ring being provided for each spindle assembly. Each ring 43 is equipped with a ring traveler 44. The yarn passes in the direction of arrow 51 from a source of supply (not shown) at the top, through the guide eye 39, about the traveler 44 and is wound up on the bobbin 38 in finished, twisted condition. During this operation the ring 43 and traveler 44 are of course moved up and down by ring rail 42 as indicated by arrow 45. During its travel the yarn forms the balloon indicated by 16, as before. The balloon guard 1, which is preferably of a shape substantially similar to that of the balloon, is permanently attached at its upper end to the guide eye 39, which is carried by a bracket 47. The lower end of the guard is carried by an annular member 46 which is detachably locked to the ring 43, for example by a suitable spring locking arrangement 48. Since the ring 43 is rigidly associated with the ring rail 42 and the annular member 46 is latched to the ring 43 by the locking device 48, the balloon guard will expand and contract as the ring rail moves up and down. When the guard is to be collapsed and retracted out of the operative zone of the spindle, the annular guard-retaining member 46 is unfastened from the ring 43 by manipulating the lock 48; the guard is then able to collapse upwardly and assumes the position shown in Fig. 9.

To prevent up and down oscillation of the guard if relatively soft springy material is used, or if the springiness of the guard has decreased, it is preferable to lock it in collapsed condition. For this purpose a locking arrangement 49 may be used, similar to those shown in Fig. 5 (reference numeral 37a). An extension 50 on the guard retaining member 46 is adapted to be locked in the member 49 by balls or rods 29, 30 as hereinbefore described. In lieu of using an annular member such as 46 for manipulating the guard, the end of the bottom terminal convolution may be bent off laterally and used in lieu of extension 50 for locking the guard in collapsed condition. Obviously the number of convolutions constituting the guard must be sufficient, when the guard is being drawn out and retracted by the movement of the ring rail, so as always to provide a protective enclosure about said balloon.

The guard of the invention has been described herein, merely for illustrative purposes, as applied to twisting spindles of the downstroke, e. g. ring-twister type, and to spindles wherein the twist is imparted by the spindle per se as it rotates, e. g. in the case of the spindles shown in Figs. 1 and 5. However it is obvious that the guard is also advantageously applicable to conventional up-stroke twisters where, for example, the supply package serves to insert the twist as it revolves, and, in general, to any textile machine where a true balloon is formed by the yarn or thread during the operation of the machine.

In addition to acting as a means for protecting the yarn balloon from damage, the guard also serves as a means for restricting the diameter of the balloon on twisting spindles, especially when yarn of very heavy denier is being twisted at high spindle speeds. In case of conventional or open and unrestricted balloons, very low spindle speeds would have to be used to prevent the balloon from slapping heavily in tangential fashion against the flat walls of the enclosures heretofore used. In the case of the guard herein described however the latter is preferably substantially of the same shape as the balloon and the yarn therefore contacts against a large portion of the inside walls of the enclosure and is thus effectively restricted.

In accordance with another feature of the invention the guard serves as a tension controlling means supplementary to other yarn tensioning devices that may be used on or within the spindle and even supplementing the tension-controlling action exerted by the balloon per se when not enclosed by a guard. Thus if the helical structure of the guard is coiled along the spiral direction in which the thread travels, the guard serves to urge the thread in its direction of flow and thus serves to reduce the balloon tension. On the other hand, if the guard is coiled along a spiral direction opposite that in which the thread travels, the guard serves to retard the thread in its direction of flow and thus to increase the balloon tension.

The guard is also adapted to control the twist concentration in specific areas of the yarn. Thus, in constructing the guard, if the helical convolutions are coiled along the spiral direction in which the yarn or thread travels, the guard acts to urge the twist in the direction of yarn flow and thus serves to reduce the twist concentration between the spindle and the point of contact of the yarn with the guard. Likewise, if the guard is coiled along a spiral direction opposite that in which the yarn travels, the guard serves to retard the flow of twist and thus acts to increase twist concentration between the spindle and the point of contact of the yarn with the guard.

The guard herein described permits constant visual inspection of the balloon and of the pack-

age from which the yarn is withdrawn if the guard is used on double twist spindles or conventional upstroke spindles (not shown in the drawing) and likewise of the balloon and the bobbin, if the guard is used on a ring twister or any other device where a balloon is formed. A readily available material for constituting the guard is heavy round spring steel wire, but the helical guard may with equal advantage be formed from flat strip steel or material of any suitable cross section. Suitable synthetic plastics adaptable for constituting the convolutions of the guard may also be used and such plastics may additionally be transparent if desired, for example in order to avoid gaps in the continuity of the image of the balloon when viewed with a stroboscope or otherwise. The material of which the guard is constituted as well as the mode of forming and treating the convolutions may be such as to cause the finished guard to possess sufficient retractibility (after it is drawn out) to collapse of its own accord so as to form a relatively thin, tightly condensed, cake-like structure, in which case it need not necessarily be locked in collapsed condition. However, if formed so as not to be collapsible of its own accord, or in cases where continuous flexing tends to reduce its inherent self-collapsing power, suitable means may be provided for locking it in collapsed condition as shown herein to prevent undesirable up and down oscillations thereof when servicing operations are being performed on the machine. When in collapsed condition the guard occupies a minimum of space away from the operative zone of the spindle or other parts of the machine. Inasmuch as it is adapted to remain on the machine with which it is to be used and is out of the way when not in use, it will not become mislaid or damaged and hence presents no storage problem. In the preferred embodiment, one end of the guard is permanently attached to a portion of the machine, the other end being detachably secured to another portion of the machine. If desired, however, each end of the guard may be detachably secured so as to permit it to be both collapsed and completely removed from the machine, but even in such case the collapsed, removed guard is of such small compass as to present no servicing difficulties.

I claim:

1. In a twisting spindle wherein yarn, thread, or the like forms a balloon during its travel, the provision of a guard for enclosing and protecting said balloon, said guard being longitudinally collapsible but capable of being manually moved to an extended condition to provide an enclosure for said yarn, and while in collapsed condition affording free access to the operating zone of the spindle where the ballon is formed.

2. In a twisting device wherein yarn, thread, or the like forms a balloon about a spindle, spool, package or the like, the provision of a guard for said balloon, said guard comprising a structure constituted of helically coiled convolutions of resilient material movable from an extended position forming a protective enclosure about said balloon to a collapsed position affording free access to the operating zone of the spindle where the balloon is formed, said guard being self-biasing to one of its positions, and means for holding it in the other position.

3. In a twisting device wherein yarn, thread, or the like forms a balloon about a spindle, spool, package or the like, the provision of a guard for said balloon, said guard comprising a collapsible

structure constituted of helically coiled convolutions of resilient material adapted when extended to form a protective enclosure about said balloon, means on said twisting device for permanently retaining one end of said guard, means on another portion of said twisting device for detachably securing the the other end of said guard when in extended condition, and means on said twisting device disposed at a point remote from said second means and adapted for detachably retaining said guard when in collapsed condition.

4. In a twisting device wherein yarn, thread, or the like forms a balloon about a spindle, spool, package or the like, and wherein said twisting device contains a stationary member and a reciprocating member, the provision of a guard for said balloon, said guard comprising a collapsible structure constituted of helically coiled convolutions of resilient material, one end of said guard being attached to said stationary member of said twisting device and the other end being attached to said reciprocating member for enabling said end to follow the movements of said reciprocating member, the number of convolutions constituting said guard being sufficient when one end of said guard is extended by the movement of said reciprocating member so as always to provide a protective enclosure about said balloon.

5. In a twisting device wherein yarn, thread, or the like forms a balloon about a spindle, spool, package or the like, and wherein said twisting device contains a stationary member and a reciprocating member, the provision of a guard for said balloon, said guard comprising a collapsible structure constituted of helically coiled convolutions of resilient material, one end of said guard being attached to said stationary member of said twisting device and the other end being attached to said reciprocating member for enabling said end to follow the movements of said reciprocating member, the number of convolutions constituting said guard being sufficient when one end of said guard is extended by the movement of said reciprocating member so as always to provide a protective enclosure about said balloon, one end of said guard being detachable from its place of attachment and adapted when released to permit said guard to collapse towards the other point of attachment and means at said other point of attachment adapted to lock said guard in collapsed condition out of the operative zone of said twisting device.

6. A balloon guard for twisting spindles comprising an enclosure of substantially the same shape as the balloon and formed by extending a springy coiled structure constituted of helically wound convolutions of resilient material from a point of first attachment to a second point of attachment, said guard being collapsible so as to occupy a minimum of space when not in use as an enclosure.

7. A balloon guard for twisting spindles comprising an enclosure of substantially the same shape as the balloon and formed by extending a springy coiled structure constituted of helically wound convolutions of resilient material, said guard being collapsible so as to occupy a minimum of space when not in use as an enclosure, and means for locking said guard in extended condition.

8. A balloon guard for twisting spindles comprising an enclosure of substantially the same shape as the balloooon and formed by extending a springy coiled structure constituted of helically wound convolutions of resilient material, said

guard being collapsible so as to occupy a minimum of space when not in use as an enclosure, means for locking said guard in extended condition, and means for locking said guard in collapsed condition when said first means is released.

9. In a twisting spindle assembly wherein yarn, thread, or the like forms a balloon about a spindle, spool, package or the like and wherein the tension of the yarn, thread or the like is controlled by means within the spindle and by the balloon per se, the provision of a guard for said balloon adapted to protect said balloon from injury and at the same time to serve as an additional means for controlling the tension of the yarn, thread or the like, said guard comprising a collapsible structure constituted of helically coiled convolutions of resilient material adapted when extended to form a protective enclosure about said balloon the shape of said enclosure being substantially the same as that of the balloon, the striking of said balloon against said enclosure serving to exert a uniform frictional drag on substantially all points of said balloon to serve as an additional means exterior of said spindle for controlling the tension of said yarn, thread or the like, and means for securing said guard at two points removed from each other.

10. In a twisting spindle wherein yarn, thread, or the like forms a balloon about a spindle, spool, package or the like and wherein the tension of the yarn, thread or the like is controlled by means within the spindle and by the balloon per se, the provision of a guard for said balloon adapted to protect said balloon from injury and at the same time to serve as an additional means for controlling the tension of the yarn, thread or the like, said guard comprising a collapsible structure constituted of helically coiled convolutions of resilient material adapted when extended to form a protective enclosure about said balloon, the shape of said enclosure being substantially the same as that of the balloon, the striking of said balloon against said enclosure serving to exert a uniform frictional drag on substantially all points of said balloon to serve as an additional means exterior of said spindle for controlling the tension of said yarn, thread or the like, the convolutions of said guard being coiled in the same spiral path of travel of the thread, yarn or the like and serving to reduce the tension exerted by the balloon.

11. In a twisting spindle wherein yarn, thread, or the like forms a balloon about a spindle, spool, package or the like and wherein the tension of the yarn, thread or the like is controlled by means within the spindle and by the balloon per se, the provision of a guard for said balloon adapted to protect said balloon from injury and at the same time to serve as an additional means for controlling the tension of the yarn, thread or the like, said guard comprising a collapsible structure constituted of helically coiled convolutions of resilient material adapted when extended to form a protective enclosure about said balloon, the shape of said enclosure being substantially the same as that of the balloon, the striking of said balloon against said enclosure serving to exert a uniform frictional drag on substantially all points of said balloon to serve as an additional means exterior of said spindle for controlling the tension of said yarn, thread or the like, the convolutions of said guard being coiled in a direction opposite the spiral path of travel of the thread, yarn or the like and serving to increasing the tension exerted by the balloon.

12. In a twisting device wherein yarn, thread or the like forms a balloon about a spindle, spool, package or the like, the provision of a guard for said balloon, said guard being constituted of an extensible but normally collapsed frame-work adapted in extended position to form a protective enclosure about said balloon, means on said twisting device for permanently retaining one end of said enclosure, and means on another portion of said device for detachably securing the other end of said enclosure when in extended condition.

13. A two-for-one twister assembly comprising in combination a rotatable spindle, a flyer and yarn storage device fixed to said spindle for rotation therewith, said spindle and storage device being formed for delivery of yarn therethrough, a supply package support carried by said spindle above said flyer, stabilizing means preventing rotation of said support with said spindle, pretensioning means carried by said support, and means surrounding said support and spaced therefrom acting in conjunction with said storage device to provide tension-shape control of the yarn balloon formed during rotation of the spindle when yarn is drawn from a yarn supply package on said support through said pretensioning means, through the spindle and storage device, upwardly from said flyer and between said last mentioned means and said support.

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