May 15, 1956 C. B. KINGSBURY 2,745,239

TWIST CONTROL BALLOON INCLOSURE

Filed April 6, 1953 2 Sheets-Sheet 1

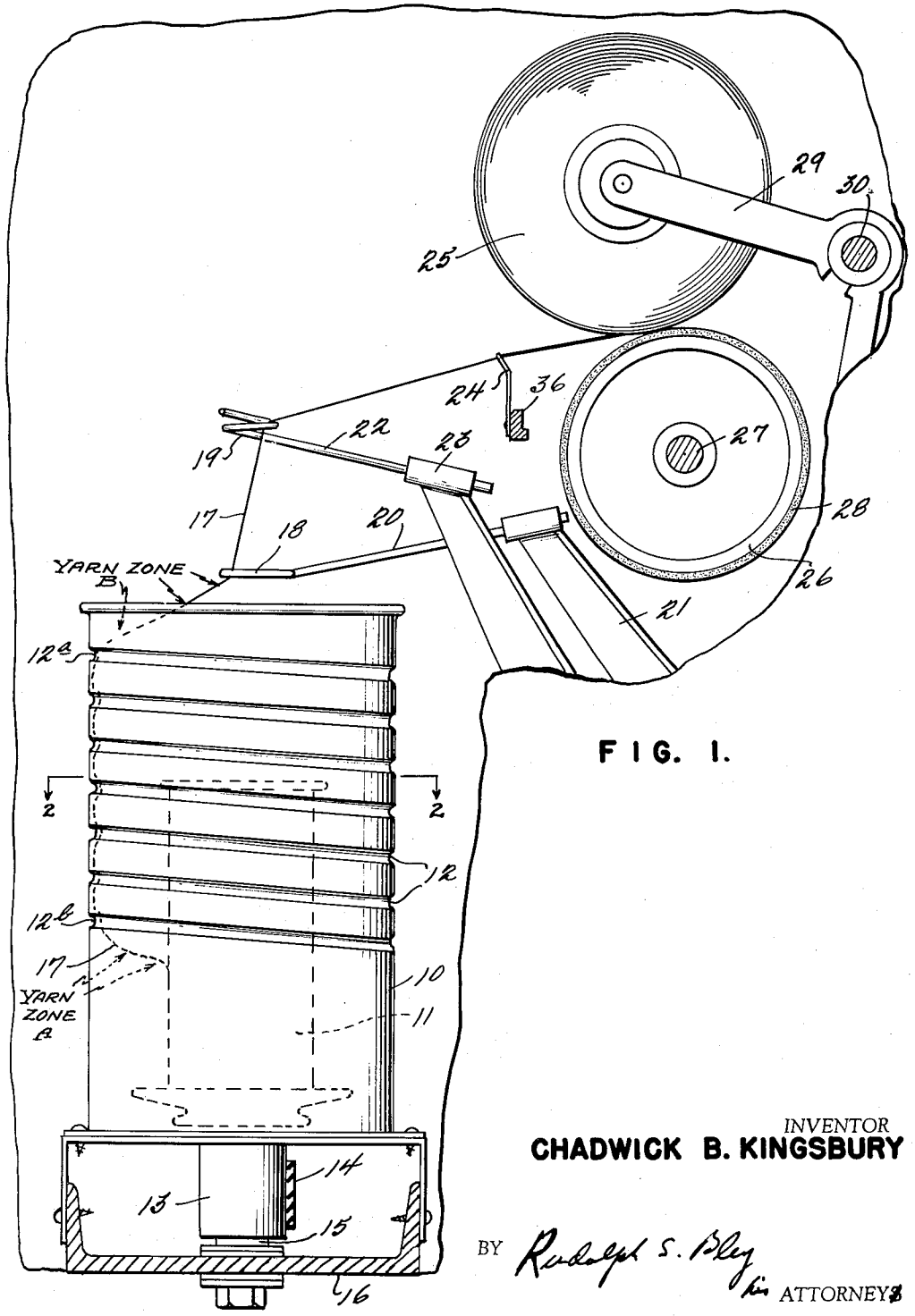


FIG. 1.

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FIG. 3.

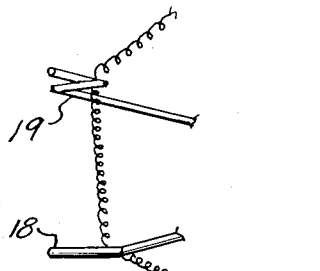
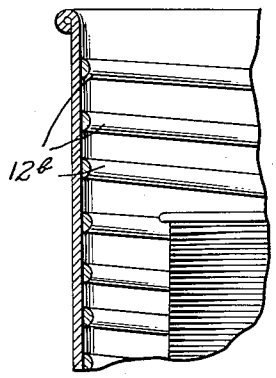


FIG. 4



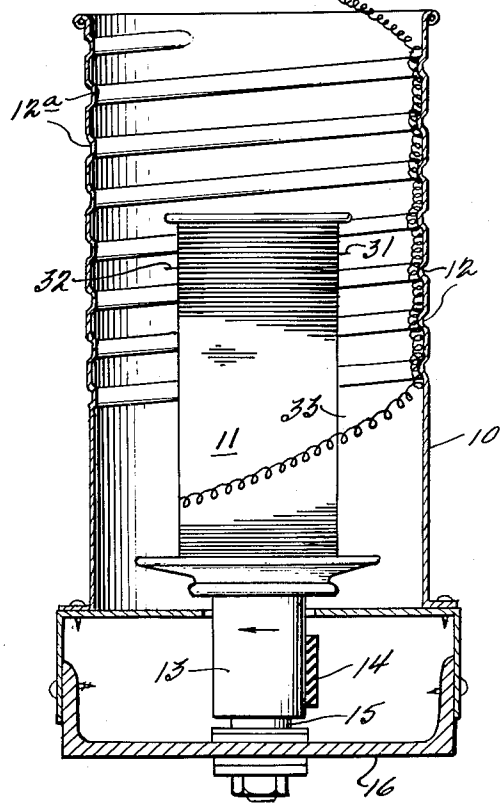
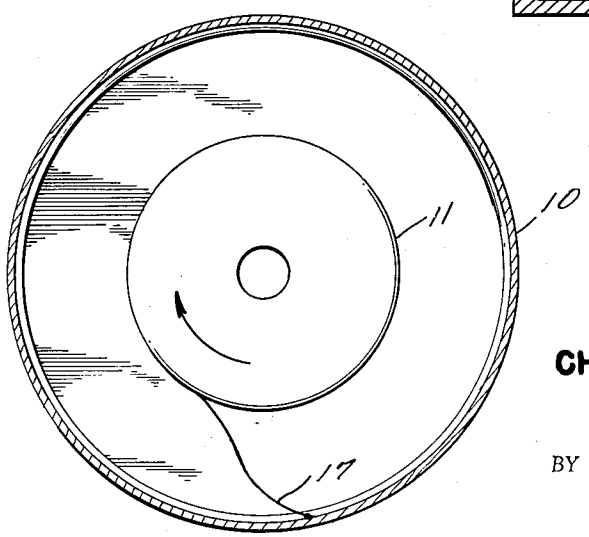


FIG. 2.



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TWIST CONTROL BALLOON INCLOSURE

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Application April 6, 1953, Serial No. 346,893

7 Claims. (Cl. 57—108)

This invention relates to yarn twisting machines in general. More particularly, this invention relates to a twist control balloon inclosure for yarn twisting machines especially of the upstroke type.

An object of this invention is to provide a yarn twisting machine having a yarn balloon inclosure adapted to control the application of twist to the yarn.

Another object of this invention is to provide an improved yarn twisting machine adapted for use with relatively high twist heavy denier yarn.

Still another object of this invention is to provide an improved yarn twisting machine with a balloon inclosure having a spiral-shaped ridge adapted to restrict the balloon and control the application of twist to the yarn.

Still another object of this invention is to provide an improved yarn twisting machine, the structure of the balloon inclosure of the twisting machine being of such nature as to provide zones of twist control throughout the length of the ballooning thread.

In accordance with this invention there is provided an improved yarn twisting machine with a generally cylindrical yarn balloon inclosure. This balloon inclosure is constructed to have a helical ridge with a plurality of convolutions on the internal surface of the inclosure to engage the yarn balloon. The direction of the upwardly spiralling ridge convolutions formed on the inner surface of the balloon inclosure is the same as the direction of rotation of the twisting bobbin which is positioned inside of the inclosure.

During operation of the machine of this invention, the centrifugal force of the yarn balloon holds portions of the balloon into intimate contact with the inner surface of the balloon inclosure. Since the direction of the spiral convolutions is the same as the direction of rotation of the bobbin, and since the pitch of the spiral convolutions within the guard is greater than the rate of rise of the thread in the balloon, the twist being inserted in the balloon is urged upward along the thread. This in effect creates a zone of relatively low twist between the revolving supply bobbin and the first contact point which the balloon makes with the inclosure. As a result, a zone of relatively high twist is created in the yarn between the last point of contact which the yarn makes with the balloon inclosure and the gathering eye.

On the other hand, if the direction of the upwardly spiralling convolutions is opposite to the direction of rotation of the yarn supply bobbin, the opposite effect is produced. Namely, a zone of higher twist is produced between the supply bobbin and the first point of contact of the yarn with the balloon inclosure and a zone of lower twist is produced between the point at which the yarn disengages the inclosure and the gathering eye.

It is well known in the trade that yarns of the continuous filament type often have imperfections such as broken filaments, hooks, etc. These imperfections very often protrude radially from the surface of the yarn when the bobbin is rotated at high speed. A particular advantage of the yarn twisting machine of this invention

is the fact that if the twist in the zone of the balloon between its point of departure from the revolving bobbin and its first contact with the balloon guard is kept sufficiently low, these imperfections, protruding from the surface of the revolving bobbin, will not be wound into or otherwise entangled in the ballooning thread.

It is, therefore, an important object of this invention to provide a yarn twisting machine in which the amount of twist can be controlled at various zones in the balloon so that short, loose ends protruding from the yarn surface on the bobbin will not be wound into the yarn leaving the bobbin and thereby be plucked out of the yarn on the bobbin causing more broken filaments. If the ballooning thread is allowed to continue plucking the protruding filaments, the broken filament condition is aggravated to such an extent that a break in the thread will occur.

Referring to the drawings briefly:

Fig. 1 shows a view of this invention in side elevation partially broken away;

Fig. 2 is a sectional view taken along the line **2—2** of Fig. 1 showing the yarn bobbin and corrugated inclosure;

Fig. 3 is a vertical partially broken away view of the inclosure and bobbin positioned therein, said view being employed for the purpose of facilitating the explanation of the operation of this invention; and

Fig. 4 is a fragmentary sectional view of an upper corner of the inclosure and bobbin showing a modified form of this invention.

Referring to the drawing in detail, there is illustrated in Fig. 1 a view in side elevation of an embodiment of this invention and reference numeral **10** designates substantially a cylindrical inclosure surrounding the yarn bobbin **11** which is shown in dotted outline. The inclosure **10** is preferably made of sheet metal such as stainless steel and it may be fabricated in any manner to provide the desired shape, including the inwardly protruding spiral convolutions **12**. These convolutions are preferably shaped so that the cross-sections thereof are substantially semi-circular, although they may be of other shapes as long as a substantially spiral corrugated surface is provided to the inner surface of the inclosure **10**. Such shape may also be provided by soldering or welding a spiral **12*b*** made of a metal rod or tube to the inside of a smooth tubular member.

The bobbin **11** is supported on a spindle not shown and is rotated by means of the whorl **13** that is engaged by the belt **14** and is rotatably supported on the flange **15** that is bolted to the structural member **16**.

The yarn **17** is fed from the bobbin **11** and balloons out against the spiral convolutions **12** and surfaces of the inclosure **10** between these convolutions as it is drawn upward and passed through the gathering eyes **18** and **19**. The gathering eye **18** is formed in the free end of the rod **20** that is adjustably supported by the member **21**. Likewise, the gathering eye **19** is formed in the free end of the rod **22** that is adjustably supported by the member **23**. After the yarn **17** passes through the gathering eyes **18** and **19**, it engages the traverse guide **24** that is reciprocated back and forth in a direction parallel to the axis of the take-up bobbin **25** by means of the traverse bar **36**.

The periphery of the bobbin **25** contacts the driving roll **26** that is mounted on the driven shaft **27**. The roll **26** may be provided with a surface sleeve **28** made of cork or similar material and this sleeve engages the outer layer of yarn wound upon the bobbin **25** during the winding of the yarn on this bobbin. The mechanism supporting the bobbin **25** may consist of a pair of arms such as the arm **29** that is rotatably supported on the shaft **30** and this mechanism may be constructed in the manner disclosed in my co-pending application Serial

No. 322,682, filed November 26, 1952, to which reference is herein made for the details of construction thereof.

The yarn **17** leaving the bobbin **11** forms a balloon that is restricted by the inclosure **10**. The centrifugal force of the yarn **17** caused by the high speed rotation of the bobbin **11** causes the yarn **17** to hug the inner surface of the inclosure **10** very closely. This action in combination with the spiral shape of the balloon inclosure has a tendency to urge the twist imparted to the yarn by the rotating bobbin **11**, upward along the yarn to the portion thereof between the lower gathering eye **18** and the top convolution **12***a* because the direction of the spiral convolutions **12** is the same as the direction of rotation of the bobbin **11**. As a result, the lower portion of the ballooning thread between the bobbin **11** and the lower convolution **12***b* is of comparatively lower twist. This is illustrated in Fig. 3. The convolutions in the yarn are shown graphically in Fig. 3 at various portions of the balloon indicating low twist in zone A and resulting high twist in zone B.

High speed rotation of the bobbin **11** causes all imperfections such as broken filaments **31**, **32** and **33** to protrude radially from the surface of the yarn body. Consequently, there is a tendency for a protruding broken filament, such as the filament **33**, coming in contact with the thread ballooning from the bobbin **11** in zone A and to be twisted into the ballooning yarn. Such broken filaments twisted into the ballooning yarn are plucked out of the yarn body of the bobbin and cause further damage, often resulting in breakage of the ballooning yarn. This tendency is practically eliminated by this invention because, as outlined above, the amount of twist in the ballooning thread in zone A is insufficient to completely entrap the broken filaments protruding from the yarn body.

As a result, a yarn of substantially improved quality is produced and breakage is minimized by employing the apparatus of this invention. Furthermore, conventional flyers rotating with the bobbin are unnecessary and disadvantages inherent in such flyers are consequently eliminated.

This invention is not limited in its application to heavy denier yarn such as is employed in tire cord although it finds ready application with such yarns. It may, however, be employed with various yarns wherever high twist is applied to the yarn. In fact, this invention has considerable merit in the throwing of light denier yarns made of either continuous filament or staple fiber.

I, therefore, do not desire to limit this invention to the exact details described and illustrated except insofar as those details are set forth in the claims.

I claim:

1. A yarn twisting machine for placing a substantial number of twists into the yarn per inch of yarn length comprising a yarn bobbin, means for rotating said bobbin to apply twist to the yarn as the yarn is being removed from said bobbin, and rigid means engaging the yarn for urging the twist existing therein away from the portion of the yarn immediately adjacent to said bobbin so that said portion of the yarn does not tend to wrap thereinto the loose yarn filaments projected from said bobbin by the centrifugal action of the rotating bobbin.

2. A yarn twisting machine for placing a substantial number of twists into the yarn per inch of yarn length comprising a yarn bobbin, means for rotating said bobbin to apply twist to the yarn as the yarn is being removed from said bobbin, and a rigid spiral shaped member for engaging the yarn and for urging the twist existing therein away from the portion of the yarn immediately adjacent to said bobbin so that said portion of the yarn does not tend to wrap thereinto the loose yarn filaments projected from said bobbin by the centrifugal action of the rotating bobbin.

3. A yarn twisting machine for placing a substantial number of twists into the yarn per inch of yarn length comprising a yarn bobbin, means for rotating said bobbin to apply twist to the yarn as the yarn is being removed from said bobbin, and a rigid cylindrical member surrounding said bobbin, said cylindrical member having means engaging the yarn for urging the twist existing therein away from the portion of the yarn immediately adjacent to said bobbin so that said portion of the yarn does not tend to wrap thereinto the loose yarn filaments projected from said bobbin by the centrifugal action of the rotating bobbin.

4. A yarn twisting machine for placing a substantial number of twists into the yarn per inch of yarn length comprising a yarn bobbin, means for rotating said bobbin to apply twist to the yarn as the yarn is being removed from said bobbin, and a rigid cylindrical member surrounding said bobbin, said cylindrical member having a spiral shaped ridge formed therein for engaging the yarn and for urging the twist existing therein away from the portion of the yarn immediately adjacent to said bobbin so that said portion of the yarn does not tend to wrap thereinto the loose yarn filaments projected from said bobbin by the centrifugal action of the rotating bobbin.

5. A yarn twisting machine comprising a yarn bobbin, means for rotating said bobbin for imparting a substantial number of twists per inch of length of said yarn, yarn take-up means for receiving the yarn removed from said rotatable bobbin and rigid means for engaging the yarn balloon formed by the yarn thrown from said bobbin, said last-mentioned means having means for controlling the twist existing in different sections of the yarn in said balloon so that the yarn as it leaves said bobbin is subjected to relatively low twist so as substantially to prevent the yarn from twisting broken filaments protruding from said bobbin into the yarn as it leaves said bobbin.

6. A yarn twisting machine comprising a yarn bobbin, means for rotating said bobbin for imparting a substantial number of twists per inch of length of said yarn, yarn take-up means for receiving the yarn removed from said rotatable bobbin and a rigid inclosure for engaging the yarn balloon formed by the yarn thrown from said bobbin, said inclosure surrounding said bobbin and being coaxial therewith, said inclosure having means for controlling the twist existing in different zones of the yarn in said balloon so that the yarn as it leaves said bobbin is subjected to relatively low twist so as substantially to prevent the yarn from twisting broken filaments protruding from said bobbin into the yarn as it leaves said bobbin.

7. A yarn twisting machine comprising a yarn bobbin, means for rotating said bobbin for imparting a substantial number of twists per inch of length of said yarn, yarn take-up means for receiving the yarn removed from said rotatable bobbin and means for restricting the yarn balloon formed by the yarn thrown from said bobbin, said last-mentioned means having a spiral shaped ridge for engaging said yarn balloon and for controlling the twist existing in different zones of the yarn in said bobbin, the direction of the spiral in said ridge being the same as the direction of rotation of said bobbin so that the portion of the yarn immediately as it leaves said bobbin is subjected to relatively low twist.

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