

Sept. 21, 1954

R. J. CLARKSON

2,689,449

AUTOMATIC BALLOON CONTROL

Original Filed June 20, 1952

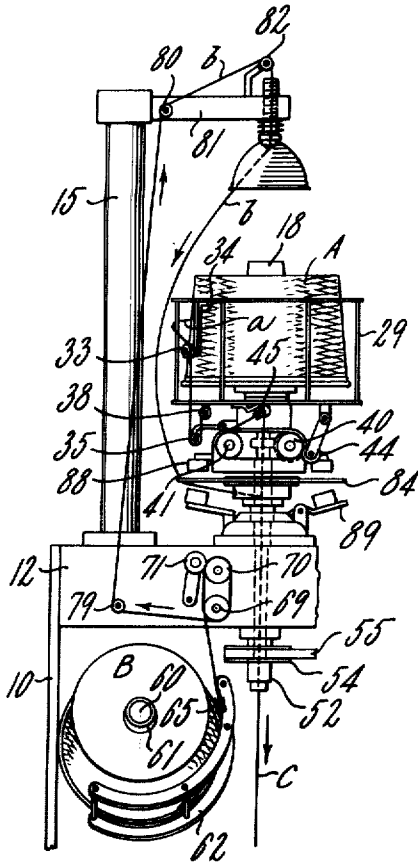


FIG. 1

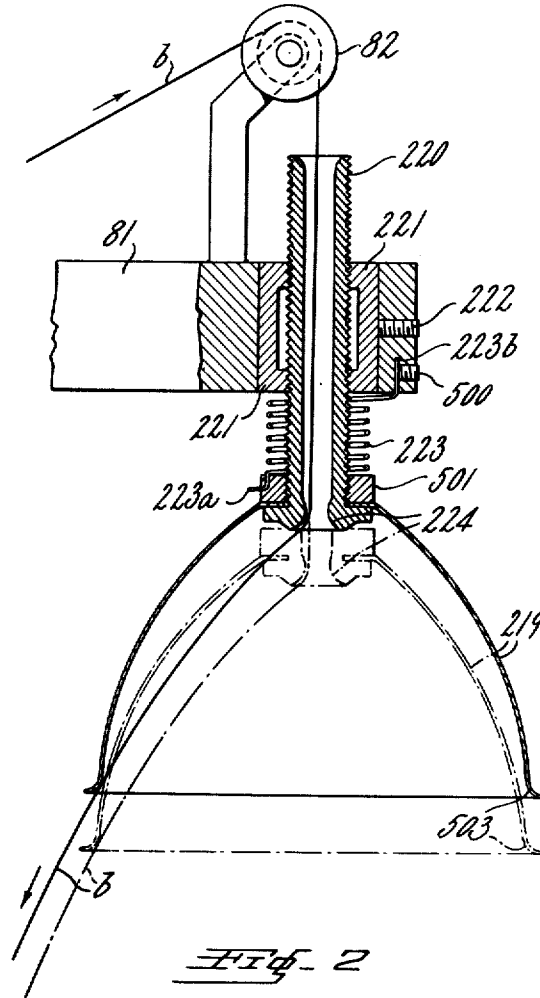


FIG. 2

INVENTOR.  
ROBERT J. CLARKSON  
BY *David B. Miller*  
ATTORNEY

## UNITED STATES PATENT OFFICE

2,689,449

## AUTOMATIC BALLOON CONTROL

Robert J. Clarkson, Winnsboro, S. C., assignor to  
United States Rubber Company, New York,  
N. Y., a corporation of New Jersey

Original application June 20, 1952, Serial No.  
294,675. Divided and this application June 12,  
1953, Serial No. 361,269

4 Claims. (Cl. 57—106)

1

This invention relates to an apparatus for automatically controlling the size of yarn balloons such as those which occur when a length of yarn or cord is revolved at high speeds during a twisting operation.

The present application is a division of my co-pending application Serial No. 294,675, filed June 20, 1952.

In twisting textile strands to form yarns, and in plying yarns to form cord, and in similar twisting operations, a strand is fed from a source of supply to a generally stationary guide and thence through a rotating traveler or flyer to a rotating spindle. The strand between the guide and the traveler or flyer is rotated at very high speeds, and consequently it bulges or balloons outwardly from the guide under the centrifugal force generated in the yarn. Since in these twisting operations, it is customary to provide a great many spindles within a small space, it is desirable to control the size of the balloon thus formed so that the balloons of adjacent spindles do not strike each other to tangle and break the strands.

This invention contemplates a simple effective means for automatically controlling the size of such balloons. In accordance with this invention, the fixed guide is replaced with a movable guide which can be moved vertically to vary the size of the balloon formed by the running strand. A simple means is provided which is responsive to the size of the strand balloon to vary the vertical position of the movable guide and thereby to control the size of the balloon.

More specifically, in accordance with this invention the guide is mounted on a hollow shaft which has screw threads on its external surface. This shaft is supported in a fixed sleeve having screw threads on its internal surface so that as the sleeve is rotated the screw-threaded shaft, hence the guide, will be moved vertically in the threaded sleeve. A bell is fixed to the threaded shaft and extends beneath the guide and about a portion of the strand balloon, so the strand may rub against an inner surface of this bell as it rotates in the balloon. Since the bell is fixed to the threaded shaft, rotation of the bell will raise or lower the guide eye. A loading spring having one end fixed to the rotatable bell and its other end fixed to a fixed support rotatably urges the threaded shaft in a direction to raise the bell. This spring is mounted so that the frictional drag exerted on the bell by the moving strand urges the bell in a direction to stress the spring; hence, to rotate the shaft to lower the guide.

It will therefore be seen that by using this de-

2

vice the guide can be adjusted to an original position wherein the spring is stressed to produce a balloon of predetermined size. If the balloon should become smaller than this predetermined size, the frictional drag of the strand on the rotatable bell will be lessened as the strand in the balloon moves inwardly and away from the bell surface, so the spring may raise the guide to increase the balloon size. Conversely, if the balloon becomes larger than the predetermined size, the frictional drag of the strand on the bell will be increased, and the shaft will be rotated against the force of the spring to lower the guide and to decrease the size of the balloon.

For a better understanding of the nature of this invention, reference should be had to the following description when read in conjunction with the accompanying drawings, wherein:

Fig. 1 is a side elevational view of a spindle for producing cord as described in the above mentioned application which incorporates the automatic balloon control of this invention; and

Fig. 2 is a cross sectional view of the apparatus for controlling balloon size in accordance with this invention.

Referring now to the drawings, and particularly to Fig. 1, there is shown a spindle for plying two strands together to form a cord as disclosed in the above mentioned application. This spindle is supported on a frame which is partially shown in Fig. 1 and which comprises a support having a side frame 10 and a longitudinally extending beam 12. The frame would generally carry a plurality of spindles, but since these spindles and this machine form no part of the present invention, only one spindle has been shown to illustrate the operation of the balloon control of the instant invention. A post 15 extends upwardly from the beam 12 and carries on its upper end a horizontally extending arm 81 which is adapted to support the balloon controlling mechanism of this invention.

An outer yarn package B is supported on a bracket 60 which extends outwardly in an incline direction from the frame of the machine and which rotatably supports a spindle 61 on which the package B is mounted. The package B is partly surrounded by the squirrel cage 62 which carries a guide pulley 65 for guiding the yarn b from this outer package as it is delivered toward the cord forming point. From the guide pulley 65, the yarn b is led several times about a pair of driven yarn metering rollers 69 and 70 which pull the yarn from the package at a controlled rate. A small idler roller 71 presses against one

3

of the metering rollers to maintain the yarn *b* on these rollers.

From the metering rollers, the yarn *b* is led about a pulley 79 and thence upwardly to the pulley 80 which is supported on the horizontally extending arm 81. From this pulley 80, the yarn *b* is led to a third pulley 82 which is disposed above the central axis of the inner yarn package and above the central axis of the balloon formed in the yarn *b* by its rotation.

From the pulley 82, the yarn *b* passes downwardly through the hollow shaft and movable guide of the balloon control mechanism of this invention and thence past the inner package and through a guide eyelet fixed in the outer periphery of a nonmetallic disc 84 which is secured to a rotatable hollow spindle 52. As this spindle is rotated, the disc 84 and guide eyelet therein will rotate the yarn *b* between this disc and the movable guide above the inner package to form a balloon in the yarn about the inner package.

The inner package A has its cone 18 supported on a member which is rotatably supported on the spindle 52. The yarn *a* is led from the package A about the squirrel cage 29 to a roller 33 to be guided over the floating roller 35, and roller 38 to be fed to the laterally spaced metering rollers 40 and 41 which advance the yarn *b* to the pulley 45 to be directed downwardly through the center of the hollow rotating spindle 52. As in the case of the outer package, a small idler roller 44 may run against one of the metering rollers 40 to maintain the yarn thereon. Within this rotatable spindle 52 the yarn *a* is united with the yarn *b* which latter passes from the disc 84 through an opening in the spindle. The cord *c* thus formed is pulled downwardly out of the rotating spindle to be wound on a package (not shown). To prevent the supporting structure for the metering rolls 40 and 41 and their appurtenant mechanism from rotating as the spindle 52 is rotated, magnets 88 are affixed to the supporting member which carries these non-rotating elements. As pointed out heretofore, this supporting member is rotatably mounted on the rotatable shaft 52. Co-operating magnets 89 are positioned outside of the balloon formed by the yarn *b* and opposite the magnets 88 which serve to hold the magnets 88, consequently the metering rollers and their appurtenant mechanism, in a fixed position in space. The rotatable spindle 52 carries a pulley 54 affixed thereto which is rotated by the driven belt 55.

Referring now to Fig. 2, the balloon controlling mechanism in accordance with this invention there shown comprises a movable guide or eyelet 224 carried on the end of a hollow shaft 220 which is provided with screw threads on its external surface. This shaft 220 is threadedly received in an internally threaded sleeve 221 which is locked by a set screw 222 in a hole formed in the above described supporting arm 81. A bell-shaped member 219 is rigidly secured to the lower end of this long hollow shaft 220, hence as the bell 219 is rotated, the shaft 220 will be raised or lowered in the fixed sleeve 221 to raise or lower the guide eyelet 224. The lower portion of the threaded shaft 220 is surrounded by a coil spring 223; one end of this coil spring 223*b* is anchored to the arm 81 by set screw 500, and the other end of this coil spring 223*a* is attached to the threaded shaft 220 by means of a nut 501 thereon which also serves to lock the bell 219 to this shaft. The bell 219 extends beneath the eyelet 224 and about the upper portion of the balloon so that the run-

4

ning strand *b*, as it rotates in its balloon, rubs against the inner surface 503 of the lower end of this bell during operation of the cord former.

In operation, the balloon control of the present invention is adjusted so that the yarn *b* rubs against the inner surface 503 of the bell 219 to produce a balloon of predetermined size. Under such conditions, the spring 223 is pretensioned so that it tends to rotate the hollow shaft 220 in a direction to raise the guide eyelet 224. However, the frictional drag of the strand *b* as it rubs against the bell 219 tends to rotate this bell, consequently the shaft 220, in a direction to lower the bell and thus to counteract the force in the spring. During normal operation, the bell 219 assumes a vertical position in which the rotating force exerted on the bell by the yarn *b* is just sufficient to counteract the counter-rotating force exerted on the bell by the spring 223. In this position the yarn *b* forms a balloon of predetermined size.

If for any reason, such as variations in weight of the yarn *b*, the balloon tends to vary in size the balloon control of this invention will be adjusted automatically to maintain the desired size of balloon. Thus, for example, if a heavier strand of yarn should be encountered so that the balloon would tend to grow, this yarn would rub against the bell 219 with a greater force and produce a greater frictional drag on the bell. This greater drag would unbalance the mechanism so that the yarn *b* would rotate the bell against the force of the spring 223 to lower the shaft 220, hence the guide eyelet 224 to decrease the size of the balloon until it had again reached the desired size. Conversely, should the balloon become smaller for any reason, the frictional drag of the strand *b* on the bell 219 would be lessened and the spring 223 would be permitted to raise the shaft 220, consequently the guide eyelet 224, to produce a balloon having the desired size.

Thus it will be seen that by utilizing the balloon control of the instant invention, the balloon formed by the yarn *b* may be adjusted to a predetermined size which will clear the inner package A and appurtenant mechanism, yet which will be small enough so that it will not tangle with the balloons formed by adjacent spindles, and that this predetermined size balloon will be maintained despite the presence of factors which tend to vary the size of the balloon.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. In strand-twisting apparatus, in combination, mechanism for rotating a yarn strand in the form of a balloon and for pulling the yarn forward, a central guide at the apex of the ballooning yarn, mechanism for controlling the size of the balloon comprising an annular member rotatably supported near said apex in concentric relation therewith and adapted to be turned in one direction by the revolving balloon, means for yieldingly turning said member in the opposite direction, and means controlled by the rotation of said member for controlling the size of the balloon.

2. In strand-twisting apparatus, in combination, mechanism for rotating a yarn strand in the form of a balloon and for pulling the yarn forward, a central guide at the apex of the ballooning yarn, mechanism for controlling the size of the balloon comprising an annular member rotatably supported near said apex in concentric relation therewith, said annular member

5

having a portion thereof positioned to be brushed against by an intermediate portion of the ballooning yarn, means for yieldingly turning said member in the opposite direction, and means controlled by the rotation of said member for controlling the size of the balloon.

3. In strand-twisting apparatus, in combination, mechanism for rotating a yarn strand in the form of a balloon and for pulling the yarn forward, a central guide at the apex of the ballooning yarn, mechanism for controlling the size of the balloon comprising an annular member rotatably supported near said apex in concentric relation therewith, said annular member having a portion thereof adapted to be brushed against by an intermediate portion of the ballooning yarn, a spring for yieldingly turning said member in the opposite direction, and means controlled by the rotation of said member for controlling the size of the balloon.

5

10

15

20

6

4. In strand-twisting apparatus, in combination, mechanism for rotating a yarn strand in the form of a balloon and for pulling the yarn forward, a central guide at the apex of the ballooning yarn, mechanism for controlling the size of the balloon comprising an externally threaded hollow spindle carrying said central guide at its lower end, an annular member fixed to said rotatable spindle near said apex in concentric relation therewith having a portion thereof adapted to be brushed against by an intermediate portion of the ballooning yarn, means for yieldingly turning said hollow shaft in the opposite direction, and means controlled by the rotation of said member for controlling the size of the balloon.

No references cited.