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YARN GUIDE ASSEMBLY

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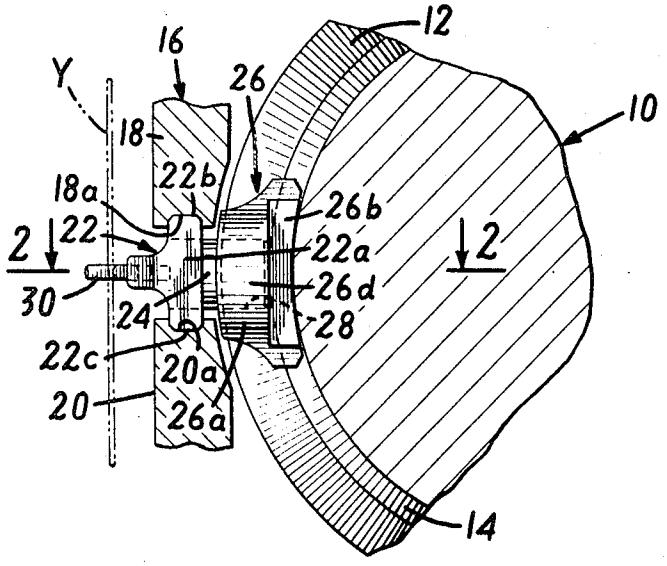


FIG. 1

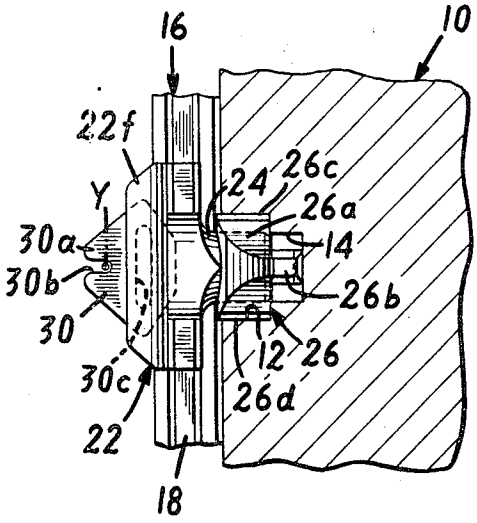
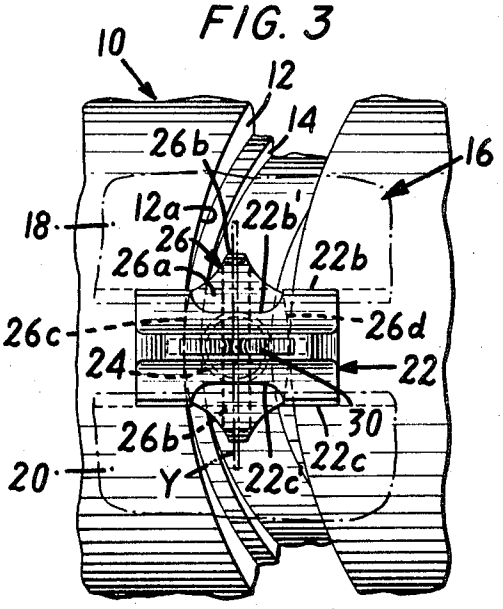


FIG. 2

FIG. 3



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YARN GUIDE ASSEMBLY

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ABSTRACT OF THE DISCLOSURE

A yarn guide assembly for use in the traverse mechanism of a winding machine comprising a pair of spaced-apart, elongated slide bars having grooves facing each other and constituting parallel slide tracks and a slide element having flange portions received in the tracks on the slide bars for sliding movement. A yarn guide projects from one side of the slide element in a direction generally perpendicular to the plane defined by the axes of the slide bar grooves, and a cam follower projects from the slide element in the other direction.

Background of the invention

This invention relates to a yarn guide of the type used in the traverse mechanism of a winding machine.

In winding yarn (or other thread-like elements) into a roll or so-called "package," the yarn is moved back and forth across the length of a rotating take-up roll by a traverse mechanism to produce a cylindrical, conical or other desired shape of package. One type of traverse mechanism is composed of a drum cam having an endless cam groove of appropriate shape to build the desired roll and a yarn guide assembly constituted by a fixed rod parallel to the roll, a tubular guide piece carried by the rod and provided with a yarn guide element, and a cam follower suitably connected to the guide piece.

Although the slide rod type of traverse guide assembly is quite small and generally weighs only a few ounces, their operation at high speeds can create extremely high forces at the reversal points of the cam grooves. At these points, the moving parts of the traverse mechanism are rapidly decelerated in one direction and accelerated in the other direction.

The force acting on the cam and reacting against the cam follower at any given point is a function of the mass of the moving parts of the mechanism and the acceleration of those parts relative to the cam surface. The acceleration, in turn, is a function of the operating speed and the shape of the cam groove. Although slight reductions in the weight of the moving parts of the rod type of guide can be made where a particular design is found to create excessive forces, the sizes of those parts cannot, of course, be reduced below those providing a minimum strength to endure the operating loads that they must carry. Moreover, the geometry of the cam surface is generally determined and fixed by the requirements of providing a specific movement of the yarn across the rotating surface of the package to maintain uniformity and prevent excessive build-up at the ends of the roll. Therefore, any major reductions in the forces at the cam reversal points must generally be made by reducing the operating speed of the mechanism.

Summary of the invention

There is provided, in accordance with the present invention, a novel and improved yarn guide assembly which, although it can be used advantageously in any traverse mechanism, is particularly adapted to high speed traverse mechanisms and affords higher operating speeds with a given cam design than have heretofore been practicable

with the rod-type traverse guide assembly. More particularly, the yarn guide assembly of the invention is employed with a rotating drum scroll cam of the type conventionally used in a traverse mechanism and comprises a pair of spaced-apart, elongated slide bars having parallel track formations, such as, for example, grooves facing each other. A slide element having slide-following portions received for sliding movement on the track formations of the slide bars carries a yarn guide element on one side and a cam follower on the other side of the path of movement.

The slide bars can be spaced relatively close to each other, and thus the slide element can have a size and weight considerably less than the size and weight of the tubular guide used in a rod-type of guide assembly without any reduction in strength. A further advantage of the closely spaced slide bars and the slide element is that the dimension in a direction generally radially of the drum cam can be minimized, thus making it possible to minimize the size and length of the cam follower shaft with a consequent further reduction in weight. In other words, the cam can be located closer to the yarn guide point, and the sizes of all of the moving parts can be reduced accordingly.

In a preferred embodiment of the invention, the slide element is composed of (1) a body in the general form of a flat plate, each of two opposite edges of which are formed to match the slide formations of the slide bars and are received for sliding movement along the slide bar, (2) a flange projecting from one face of the body and carrying the yarn guide element, and (3) a cylindrical shaft extending from the other side of the body. The cam follower has a cylindrical hole and is mounted for pivotal movement on the shaft, the follower preferably being of a type that is slidable along the groove. A preferred form of cam follower is that described and shown in copending application Ser. No. 647,023 for "Cam Mechanism," filed June 19, 1967, which is assigned to the assignee of this application.

The slide element may be formed in one piece, preferably of a moldable material, and the yarn guide element may be a separate part secured to the slide element by molding it in place. Advantageously, the body of the slide element is generally rectangular and elongated in the direction of sliding movement, the longer edges of the body having a cut-out portion defining a pair of longitudinally spaced-apart projections or flanges which are received by and slide along the slide bar formations. The cut-outs further reduce the weight of the slide element while providing flanges of an appropriate length for the guiding surfaces to provide stability.

For a better understanding of the invention, reference may be made to the following description of an exemplary embodiment, taken in conjunction with the figures of the accompanying drawings, in which:

FIG. 1 is a view in end cross-section of a portion of a traverse mechanism embodying the yarn guide assembly, the moving parts of the guide assembly, however, being shown in elevation for greater clarity;

FIG. 2 is a top view in cross-section through a portion of the traverse mechanism of FIG. 1, the moving parts again being shown in elevation and the view being taken generally along the lines **2—2** of FIG. 1 and looking in the direction of the arrows; and

FIG. 3 is a front elevational view of the mechanism of FIGS. 1 and 2, the guide bars, however, being shown in phantom to enable a clearer illustration of the slide and cam follower elements.

Description of an exemplary embodiment

Referring to the drawings, the traverse mechanism includes a rotating drum scroll cam **10** having an end-

less cam groove **12** extending helically around the drum between reversal points **12***a* (only one of which is shown, see FIG. 3). Formed in the base of the cam groove **12** is a keel groove **14** which, as is described in greater detail below, is traversed by a keel on the cam follower element which guides the cam follower across a cross-over (not shown) in the groove **12**. Where the particular form of cam groove does not have a cross-over, then the keel groove **14** is not needed. The drawings illustrate only the segment of the cam **10** and its cam groove **12** and keel groove **14** in the region of the cam groove reversal **12***a*. In this region, the keel groove **14** is somewhat wider than it is in the helical parts of the cam groove **12** so as to allow for the curvature and a slight amount of cocking of the cam follower with respect to the instantaneous axes of the grooves **12** and **14**.

The drum cam **10** drives a yarn guide assembly **16** which is composed of a pair of spaced-apart, elongated slide bars **18** and **20**, only portions of which are shown in the drawings. The slide bars are suitably fastened to fixed parts of the machine, and each is provided with a track formation in the form of a groove **18***a* and **20***a*, respectively. The bars **18** and **20** are spaced relatively close to each other equidistant from a radial axial plane of the cam **10** and are, of course, mounted so that the axes of the grooves **18***a* and **20***a* are parallel to each other and parallel to the axis of the cam **10**.

The guide element **22** includes a body **22***a* generally in the form of a rectangular plate. The longer edges **22***b* and **22***c* of the plate are formed, in cross-section (FIG. 1), to match the shapes of the slide bar groves **18***a* and **20***a* (see FIG. 1), and each includes a cut-out **22***b'* or **22***c'* subdividing the edges **22***b* and **22***c* into spaced-apart segments, the segments constituting the track-follower portions of the slide element **22** and being slidably received in the slide bar grooves.

Projecting rearwardly toward the axis of the cam **10** is a cylindrical shaft **24** which receives a cam follower element **26**, the cam follower **26** having a hole **28** of a size affording pivotal movement of the follower **26** on the shaft **24**. The follower **26** includes a main cam-following portion **26***a* of a width substantially equal to the width of the cam groove **12** and somewhat elongated in the direction of the axis of the cam groove **12** and a keel portion **26***b* extending down from the base of the main follower portion **26***a*. The keel portion **26***b* is substantially narrower and longer than the main cam-following portion **26***a* and projects into the keel groove **14** of the cam. Throughout the major part of the rotation of the cam **10**, the follower **26** is guided along the slot by engagement of one or the other of the side faces **26***c* or **26***d* of the portion **26***a* with the co-engaging wall of the cam groove **12**.

As the cam rotates and with the follower **26** in a position where it moves from right to left, with respect to FIG. 3, the right face **26***d* of the follower engages the right wall of the cam groove **12** until the point where the reversal portion **12***a* of the groove begins and the follower is decelerated in the leftward direction. In the position illustrated in FIG. 3, the cam follower is approximately at the center of the reversal portion **12***a* at the left end of the cam **10**, and in this position and in the following approximately 180° of rotation of the cam **10**, the left face **22***c* of the follower engages the left wall of the groove **12**.

When the cam **10** is designed to make two revolutions for each complete back and forth traverse of the yarn guide assembly **16**, as in the embodiment illustrated in the drawings, the cam groove **12** will have a cross-over (not shown) and thus the keel groove **14** is provided to guide the follower through the cross-over where, as is well understood by those skilled in the art, the cam groove **12** is interrupted and there is no cam surface for the main follower portion **26***a* to engage.

The embodiment of the follower illustrated in the

drawings conforms to the principles of the cam follower described in the copending application of John P. Kieronski entitled, "Cam Mechanism," filed June 19, 1967, as mentioned above. Briefly, the cam-following faces **26***c* and **26***d* of the cam follower are curved, and the minimum curvature of the faces is greater than the maximum curvature of any point along the cam groove **12**. This construction provides a significant reduction in compressive or contact stresses at the line of contact between the follower and the cam groove **12**. Accordingly, the follower is capable of enduring higher loads and therefore higher operating speeds.

Extending from the front face of the guide element **22** is a flange **22***f* which is disposed generally in a radial-axial plane of the cam **10**. The flange **22***f* supports a yarn guide element **30**, which is made of, for example, a ceramic material and is in the form of a flat plate having tapered edges converging toward a tip **30***a* formed with a slot **30***b*.

The slide element **22** should be made of a low-friction material, such as nylon, and where the material can be molded or cast, the yarn guide element **30** can be molded or cast in place. The main body portion **22***a*, the shaft **24** and the flange **22***f* can readily be formed integrally regardless of whether the slide element is cast and then machined or ground or is machined from a block of material. When the yarn guide element **30** is cast in place, it includes an elongated hole **30***c* which becomes filled with the material and is thereby firmly secured in place on the slide member **22**.

In operation, the cam drum **10** is rotated and drives the cam **26**, slide element **22** and yarn guide **30** longitudinally back and forth. As the guide changes direction at the reversal points **12***a* of the cam groove **12**, the moving parts of the guide assembly, that is, the yarn guide element **30**, the slide element **22** and the cam follower **26**, are subjected to high acceleration relative to the groove **12**, thus creating forces of relatively high magnitude. Because the moving parts of the mechanism are of minimum size and weight, owing to the novel and improved structural features of the assembly, the forces are nonetheless minimized for a given acceleration. As a result, the speed of operation of the mechanism can be quite high without exceeding the strengths of the elements. Despite the higher operating speeds and the ability of the mechanism of the invention to sustain them, the guide mechanism operates with good stability of the guide element **22**, which is enhanced by the relatively large span between the segmented guide flanges constituted by the edges **22***b* and **22***c* of the slide element body **22***b*. The grooves **18***a* and **20***a* of the slide bars **18** and **20**, respectively, maintain the slide element **22** in proper orientation in all axes.

The forming of the slide element **22** as an integral member composed of the shaft **24** carrying the cam follower and the flange **22***f* carrying the yarn guide element **30** eliminates the need for the connections that would be required if the parts of the guide were separate. As mentioned previously, the construction of the mechanism, particularly insofar as it embodies slide bars guiding the slide element along a guide space between them, enables the location of the slide element **22** and the yarn guide element **30** very close to the drum **10**, thereby minimizing the sizes and thus the weights of these parts.

The above described embodiment of the invention is intended to be merely exemplary, and those skilled in the art will be able to make numerous variations and modifications of it without departing from the spirit and scope of the invention. All such variations and modifications are intended to be included within the scope of the invention as defined in the appended claim.

We claim:

1. A yarn guide assembly for use with a rotating drum scroll cam in a traverse mechanism and having a low

weight and size and being thus adapted for high speed operation without creating correspondingly high forces upon acceleration comprising a pair of closely spaced-apart elongated slide bars having parallel slide grooves facing each other; a one-piece molded or cast slide element having (1) a body in the general form of a flat plate straddling the space between the slide bars, the body being elongated in a direction longitudinally of the slide bars and the longer edges being received in the slide grooves for sliding movement therealong, and the body having notches formed in the said longer edges to define longitudinally spaced slide segments, (2) a narrow elongated flange projecting from one face of the body and disposed with its longer dimension aligned with the longer axis of the body, and (3) a cylindrical shaft projecting from the other face of the body in a direction opposed to the flange; a yarn guide carried by the slide element, the yarn guide being a platelike element disposed with its major plane substantially perpendicular to the slide element body and aligned with the slide element flange and being embedded in the slide element flange for joinder

to the slide element, and a cam follower having a cylindrical hole, the hole receiving the slide element shaft for rotation of the cam follower thereon as the cam follower is traversed by the cam.

References Cited

UNITED STATES PATENTS

2,934,284	4/1960	Steeger	242—158.3
3,059,874	10/1962	Hays	242—158.5
3,086,722	4/1963	Altice et al.	242—43
3,373,949	3/1968	Swallow	242—43

FOREIGN PATENTS

475,215	11/1937	Great Britain.
802,430	10/1958	Great Britain.

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U.S. Cl. X.R.

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