Sept. 21, 1954 G. A. HUNTER 2,689,694

THREAD GUIDE

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Fig. 1.

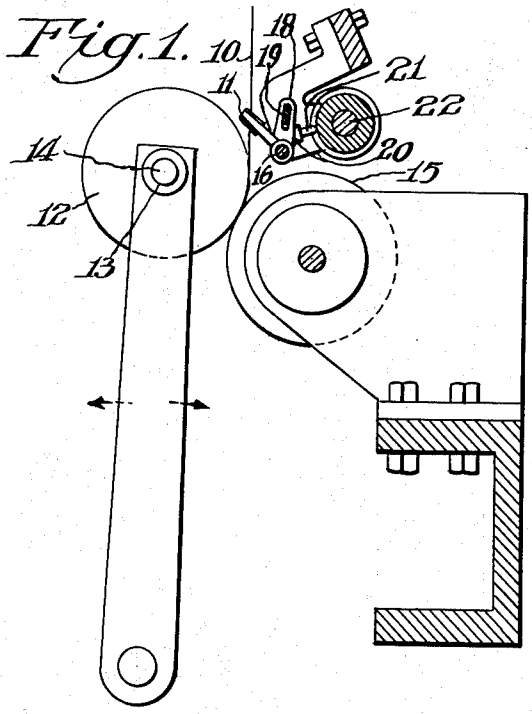


Fig. 2.

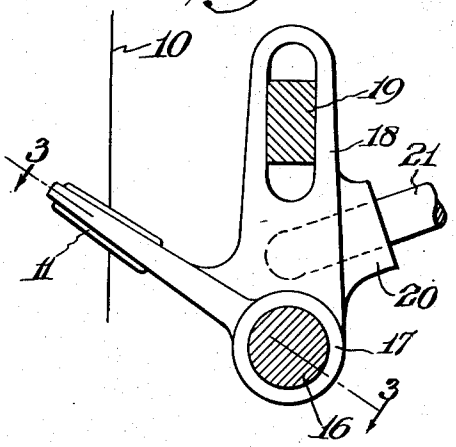


Fig. 3.

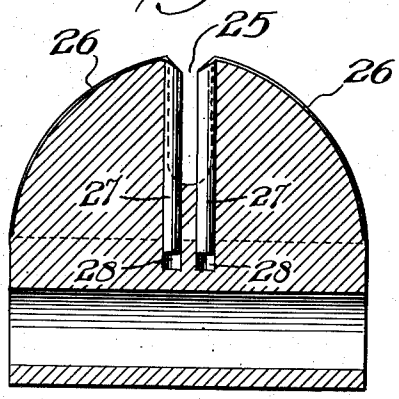
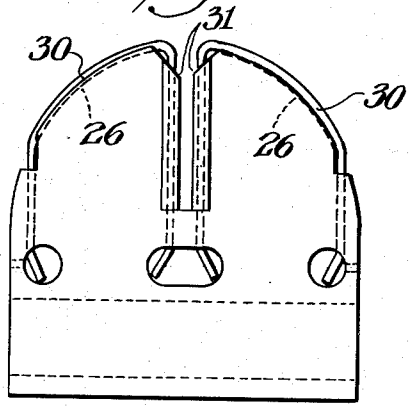


Fig. 4.



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THREAD GUIDE

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2 Claims. (Cl. 242—157)

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This invention relates to the winding of threads, and more particularly to reciprocating thread guides for use therein.

Reciprocating thread guides are used in winding straight sided cakes. When winding such cakes at high speeds it is necessary for the guides to reciprocate at high frequencies in order to obtain good bobbin formation. The textile industry, however, has long been restricted to guides which reciprocate rather slowly and has therefore not been able to attain the high winding speeds which the other parts of the winding equipment are capable of withstanding.

High frequency reciprocation of these thread guides has not been practical previously because it involves an extremely rapid reversal in the direction of the kinetic energy of the guide at the points of stroke reversal. This rapid change in the direction of the kinetic energy produces extremely high momentary stresses in the guides and cam-followers which, after a few hundred cycles at high speed, causes ordinary guides and/or followers to fail through fatigue. Attempts to overcome this fatigue deficiency of common fabricating materials, such as steel, steel alloys, brasses, bronzes and the like, by the use of massive guides necessitates an excessive power input and, in addition, the large mass of the guide places undue stress on the cam-followers which causes excessive wear and breakage. A further difficulty encountered at high winding speeds is that the high thread velocity results in an unexpectedly severe wear on guide surfaces, especially when winding highly delustered threads.

It is an object of this invention to provide a thread guide which combines light weight, high strength and fatigue resistance. It is a further object of this invention to provide a reciprocating thread guide which is resistant to mechanical wear where it slides over the guide bars. It is a still further object of this invention to provide a unitary reciprocating thread guide whose thread guiding and thread contacting surfaces are extremely resistant to wear even when winding a highly delustered synthetic filament or yarn. Other objects will become apparent from the following description and claims.

The objects of this invention are accomplished by forming the main body of the reciprocating thread guide of nylon, providing a thread-guiding slot faced with a fused, hard, mineral material, and providing wear resistant surfaces on other portions of the guide which contact the thread during string-up. The invention will be more readily understood by reference to the drawing, which illustrates preferred embodiments of the thread guide.

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Figure 1 is an end view of a thread guide and associated bobbin winding mechanism,

Figure 2 is an enlargement of the thread guide shown in Figure 1, in order to show the construction more clearly,

Figure 3 is a cross-section of one embodiment of thread guide in accordance with this invention, taken on the line 3—3 of Figure 2,

Figure 4 is a modified form of the embodiment of the invention shown in Figure 3.

Referring to Figure 1, a thread or yarn 10 passes downward through guiding portion 11 of the thread guide and is wound into a package 12 about bobbin 13, which is rotatably supported on shaft 14. The bobbin is rotated by frictional contact with a motor-driven drive roll 15. The thread guide is slidably supported on horizontal rod 16 by sleeve bearing 17 integrally molded into the guide. Above bearing 17 is an additional bearing 18 which slides on guide bar 19. Nylon is an admirable material for these bearing surfaces because of its long life, resistance to deformation and fatigue, and light weight. It is highly resistant to wear as a bearing material and the bearings need only an initial light oiling, so that one source of yarn contamination and soiling is eliminated.

The righthand projection 20 of the thread guide contains a hole into which the end of cam-follower 21 is fitted. A motor-driven cam shaft 22 is provided with a continuous helical groove like the grooves on the barrel of an automatic Yankee screw driver. The cam-follower fits into and follows this groove to provide a reciprocating motion to the thread guide.

Referring to Figure 3, the thread-guiding surfaces comprise slot 25 and leading edges 26. These are surfaces which must be made resistant to wear produced by the thread in order to provide the guide with a suitably long life. One manner in which this may be accomplished is to force pins 27 of a fused, hard, mineral material into holes 28 drilled or molded into the guide body at the base of the slot so as to align the pins with the slot edges. These pins are a force fit in these holes such that the resilient nylon body holds them firmly. These pins contact the thread during the entire winding of the package and should be highly wear-resistant. A good material has been found to be "Alsimag," a fused titanium dioxide supplied by the American Lava Company. Other suitable materials include fused silica, titania, zirconia, alumina and their comounds, e. g.,

porcelain and glass. The leading edges **26**, which contact the thread only during string-up, are plated with a layer of hard wear-resistant metal, e. g., nickel, which is then polished smooth. Additionally, the plating is carried over the ends of the pins **27** to provide added insurance against the pins slipping out of place, to prevent breakage of the pins by anchoring the outer end, and to present a smooth surface for facilitating the automatic string-up feature described below.

Alternatively, as shown in Figure 4, these wear-resistant surfaces may be provided by a chrome-plated or wear-resistant steel alloy wire **30** coving edges **26**, and also serving as means for holding hollow mineral pins **31** in the guide slot. Other methods for holding wear-resistant surfaces in place will be readily apparent to one skilled in the art.

In Figure 1 is shown the normal thread line running through the guide slot. At the string-up, the thread is brought down on one side of the guide and wrapped around the bobbin to start the winding operation. Then, as the thread guide reciprocates, the thread automatically rides over the rounded edge and falls into the slot in its normal running position.

For convenience, the invention will be described in terms of a thread winding device in which the mode of reciprocation is by means of a relatively small diameter cam shaft containing a continuous helical groove similar to the groove on the barrel of an automatic Yankee screw driver. The cam-follower protruding from the hole in the projection **20** of the thread guide must have a flat tapered end to make the cam-follower run in the given groove. Otherwise, at the cross-overs of two slots it could inadvertently get into the wrong groove and go in the wrong direction. At the ends of the traverse stroke, this flat tapered cam-follower (sometimes called a boat-tail cam-follower) has to rotate through the angle prescribed by the slot reversals. Consequently, the cam-follower must be a reasonably loose fit in the hole of the reciprocating thread guide. Due to this factor, light strong metals such as aluminum, magnesium, or aluminum-magnesium alloys cannot be used as a fabrication material for these guides, because of a peening action between the cam-follower and the side walls of the hole which quickly destroys the usefulness of the thread guide, and because the ductility of these metals and alloys produces flaring of the end portions of the elongated cylindrical bores which serve as bearing surfaces when the force couples induced at the reversal points act upon them.

Actually the thread guides of this invention are advantageous with any grooved cam shaft, whether the groove crosses itself as described above or whether the groove has no cross-overs. When the groove has no cross-overs it is normal practice to make the cam-follower an integral part of the guide (e. g., by making the follower stem a press fit or a threaded fit in the hole of projection **20**) and to provide a roller on the follower end rather than the boat-tail described above.

Additionally, the thread guide of this invention can be used with any reciprocating guide bar, however actuated. Again, in this instance, it is the usual custom to make the connecting link between the guide and the bar an integral part of the guide as described above. Thus it can be seen that these methods of construction eliminate the peening action between the cam-follower and the side walls of the hole in projection **20**, but they do not eliminate the equally destructive forces which flare the end portions of the elongated cylindrical bores serving as the bearing surfaces when these guides are made of the light and strong yet ductile metals and alloys of aluminum and magnesium.

The molded nylon thread guides of this invention can be operated up to 800 or 1,000 cycles per minute, or even more, without failing by fatigue or by damage to the guide or through wear or deformation of the bearing surfaces. Reciprocating thread guides made of steel usually fail in the range of 200 to 400 cycles per minute. Hence, by the use of the guides of this invention at 800 cycles per minute, instead of at the customary 200 cycles per minute for the guides of the prior art, it is possible to increase the thread wind-up speed four-fold.

Since many different embodiments of the invention may be made without departing from the spirit and scope thereof, it is to be understood that the invention is not limited by the specific illustrations except to the extent defined in the following claims.

What is claimed is:

1. A reciprocating thread guide comprising in combination a main body of nylon and a thread-guiding slot formed by parallel pins of a fused, hard, mineral material and surfaces for guiding a thread into said slot during string-up, said surfaces being provided with wear-resistant inserts.

2. A reciprocating thread guide comprising in combination a main body of nylon and a thread-guiding slot formed by parallel pins of a fusible, hard, mineral material and surfaces for guiding a thread into said slot during string-up, said surfaces being formed of a wear-resistant material.

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