April 28, 1964 R. A. DYSART 3,130,938

THREAD GUIDE

Filed May 13, 1963

FIGURE 1

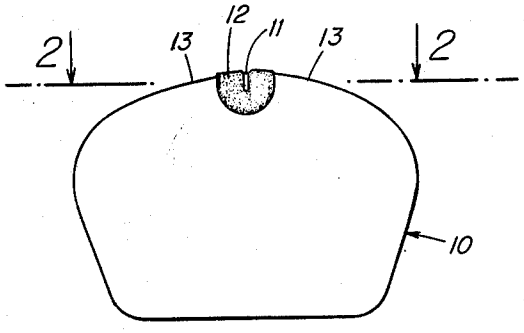
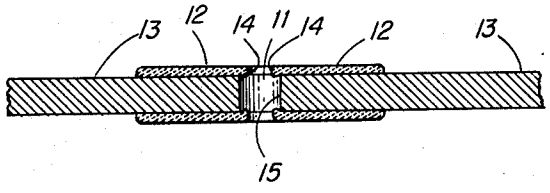


FIGURE 2



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THREAD GUIDE

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This invention relates to a unique thread guide for handling running filaments and yarns. More particularly, the invention is directed to a single metal piece thread guide which combines light weight, high strength, fatigue resistance, contacting surfaces which are extremely resistant to wear, among other distinct advantages, and especially having a narrow guide opening.

In the construction of thread guides, various metals such as stainless steel, aluminum, and the like, have been designed for use in the handling of moving filaments, yarns, and the like. These metal thread guides have not proven satisfactory for use in the handling of yarns and especially synthetic yarns since these yarns in general are quite abrasive and rapidly cut the surface of the guides causing damage to the running yarn. To overcome this problem, ceramic inserts have been placed in the slots of the thread guide to withstand this abrasive action of the yarns. The disadvantages of utilizing ceramic inserts are numerous. For example, it is well known that considerable difficulty is encountered in adhering the ceramic insert to the metal thread guide holder and maintaining the insert in the same relative position on use. Furthermore, the ceramic inserts break very easily and replacement of the inserts is frequent. An additional disadvantage of the use of ceramic inserts is the added bulk to the thread guide. It is highly desirable to utilize a thread guide of light weight, especially in a reciprocating traverse thread guide used to obtain good bobbin formation. In using a traverse thread guide, the yarn moves through an opening in the ceramic guide and the entire assembly moves back and forth traversing the yarn going to a wind-up spool. In view of the normally high speeds employed, if the traverse guide is of considerable bulk, it is possible to increase considerably the wear on the device moving the traverse guide back and forth.

It is known in the art to produce a thread guide having a continuous ceramic surface coated over the entire contacting surface. For this type of thread guide, a wider guide slot is required to provide the continuous coating of the entire contacting surface and, as is known, if the thread guide slot width increases, the frequency of allowing the yarn to become disengaged also increases. It is also essential in producing a good yarn package at high speeds, that a minimum clearance in the guide slot is required.

It is an object of this invention to provide a thread guide having a narrow guide opening which decreases the possibility of allowing the yarn to become disengaged from the guide; said thread guide containing high strength, fatigue resistance, low bulk and a non-continuous ceramic coating firmly bonded to the exposed edges of the slot guide.

The thread guides of this invention are manufactured by utilizing a single metal piece of appropriate size and shape and containing a thread guide slot not exceeding 0.03 inch in width and having the area surrounding the thread guide slot plated with a hard ceramic coating firmly bonded to the metal piece in a manner to provide a cover of the exposed edges of the thread guide slot.

The uniqueness of the thread guide of this invention relates to the fact that the inner portion of the guide slot is not coated but the spill over of the ceramic material on the edges of the slot provides the contacting surface

for the running filaments, yarns and the like. The feature of the spill over of the ceramic material over the edges of a slot assures a uniform narrow slot for containing the running yarns, filaments, and the like and also the contacting surface which the spill over ceramic material provides is one of high resistance to wear and also characterized by low friction when suitably finished in accordance with known methods.

The method of obtaining the spill-over feature of the ceramic material in this invention can be provided by utilizing a flame-spraying procedure such as described in U.S. Patent 2,714,563. By the flame-spraying technique, a material such as aluminum oxide, chromic oxide, titanium oxide, and the like is heated in a molten state and sprayed upon the metallic surface surrounding the guide slot in the form of fine globules which are thereby bonded to the metallic surface. It should be apparent that the feature of the spill over of ceramic material over the edges of the guide slot can only be accomplished on a narrow guide slot not exceeding 0.03 inch in width and, preferably not exceeding 0.015 inch since the narrowness of the guide slot prevents the fabricator from obtaining the proper angle to apply a continuous coating over the inner portion of the slot. As can be readily seen, a non-continuous ceramic coating of the inner portion of the guide is then obtained and the spill over provides a contacting surface with a uniform sized opening. A dip-coating procedure of the narrow slot area would cover the entire inner portion of the guide slot, but would not assure a uniform sized opening of these narrow guide slots.

The invention can be more fully understood by reference to the accompanying drawing in which:

FIGURE 1 is an enlarged proportional front elevation of a reciprocating traverse thread guide representing one form of the embodiment of the invention.

FIGURE 2 is a magnified sectional view along lines 2—2 of FIGURE 1.

Referring to FIGURE 1, a single metal piece 10 such as stainless steel, aluminum or other metals suitable for this fabrication comprises a thread guide slot 11 which only has the edges of the thread guide slot 11 covered with a hard ceramic coating 12 and a circular area around the thread guide slot 11, although not necessary, can also be included. The uncovered edges 13 of the thread guide are the extreme portions of the metal piece 10. The reverse side of the thread guide of FIGURE 1 as shown is a duplicate of FIGURE 1. The width of thread guide slot 11 does not exceed 0.03 inch and it is preferred to maintain this width below 0.015 inch. At these small sizes, a flame-spraying technique, hereinbefore described, cannot cover the inner portions of the thread guide slot 11 since the proper angle to provide continuous coating cannot be obtained by the fabricator to cover the complete portion. Therefore, the edges of the thread guide slot are merely covered and the spill over ceramic material as shown in FIGURE 2 supplies the contacting area for the running filaments, yarns, and the like without contacting the exposed metal portion of the thread guide slot.

FIGURE 2 illustrates a magnified view of the cross section of the thread guide through a portion of the thread guide slot 11. The ceramic coating 12, as shown, only covers the edges of the thread guide slot 11 with additional ceramic material extending beyond the edges away from the guide slot. The spill over ceramic material 14 over the edge is the only contacting area for the running filaments, yarns, and the like. The inner portion of the thread guide slot 15 is not coated providing for a non-continuous coating and represents an extremity of the single metal piece 10 while the uncovered outer edges 13 also

represent the outer extremities of the single metal piece **10**.

The ceramic coating which is bonded to a single piece can include any type of material which can be flame sprayed and will readily form a hard surfaced coating insoluble in water. It is preferred that a metal oxide having a melting point in the range from about 600° C. to about 1000° C. be used. These metal oxides can include, for example, aluminum oxide, beryllium oxide, chromium sesquioxide, silicon dioxide, stannic oxide, titanium oxide, tungsten carbide, zirconium oxide, and the like. Mixtures of the oxides may be used if desired and materials other than metal oxides may be added to the ceramic compositions such as fillers and pigments. The thickness of the ceramic coating applied to the edges of the thread guide slot is not necessarily critical, but it should not exceed the thickness where the spill over ceramic material would completely close the thread guide slot. On the other hand, a ceramic coating too thin may not be beneficial to provide the desired results. Suitable thickness of the ceramic coating can range from .0005 to as high as 0.005 inch, if desired.

In the most preferred embodiment of the invention, it is desired to utilize aluminum as the single metal piece of the desired design as the base to make a non-bulky, light weight thread guide. In addition, appropriate holes can be drilled in the thread guide without decreasing its physical strength but yet decreasing the amount and weight of aluminum over a solid metal piece. It is further preferred to utilize aluminum oxide as the ceramic coating in the spray technique. This provides a bonding of aluminum oxide with the flame plated aluminum oxide to provide a uniform metal composite, good bonding characteristics and light weight. The flame sprayed aluminum oxide coatings exhibit high resistance to abrasion and corrosion and have exceptionally long wear life.

The spill over ceramic surface on the edges of the thread guide slot, as sprayed, is not generally suitable for immediate use for handling textile materials. The as-sprayed surface is too rough and can contain sharp surface irregularities which not only result in a high coefficient of friction but also cause damage to the yarns which are processed therethrough. It is highly desirable to smooth the spill over ceramic material in the inner portion of the thread guide slot as well as the remaining coating material. The spill over ceramic material in the thread guide slot can be smoothed by passing a wire, such as copper, a suitable abrasive, or other conventional polishing techniques, through the slot while the remaining coating can be ground down substantially smooth by grinding, lapping or brushing procedures.

The following example serves to illustrate the invention without limiting the same:

Example

An aluminum traverse guide of the type shown in FIGURE 1 having a thread guide slot which is 0.059 inch in depth and 0.010 inch in width is sand blasted around the thread guide slot on both sides of the outer surface of the thread guide. The area sand blasted is plated by flame spraying aluminum oxide to provide a coating of approximately 0.003 inch. The area coated with aluminum oxide and the uncoated edges of the traverse guide are polished to free these surfaces of burrs and other irregularities. The spill over portion of the aluminum oxide extending into the thread guide slot was smoothed by passing a copper wire over this area to provide a satisfactory surface. A bright polyethylene terephthalate yarn is passed through the thread guide slot making contact with only the spill over flame sprayed aluminum oxide at 1620 feet per minute for approximately 40 days, and higher. No substantial wear is observed during this period of time. In a control experiment using the same type of traverse guide as described in FIGURE 1, but eliminating the flame spraying of aluminum oxide, the ultimate wear of the non-treated guide averages less than one day.

In a similar manner as the above example, stainless steel, copper, mild steel, and the like, can be substituted for aluminum with a similar result as obtained in the example. In like manner, beryllium oxide, chromium sesquioxide, silicon dioxide, stannic oxide, titanium oxide, tungsten carbide can be substituted for aluminum oxide in the flame-spraying technique as described in the above example to obtain similar results as those of the example.

It is understood that the foregoing description is merely illustrative of preferred embodiments of the invention of which many variations may be made by those skilled in the art within the scope of the following claims without departing from the spirit thereof.

What is claimed is:

1. A thread guide comprising a single metal piece having a thread guide slot not exceeding 0.03 inch in width and having the area surrounding said thread guide slot plated with a hard ceramic coating firmly bonded to said metal piece to cover the exposed edges of said thread guide slot and provide a spill over of said ceramic coating in a manner to form a non-continuous coating with the metal exposed in the inner portion of said thread guide slot and the thread contact is solely with said ceramic spill over in said thread guide slot.

2. The thread guide of claim 1 wherein the thread guide slot does not exceed 0.015 inch in width.

3. The thread guide of claim 1 wherein the single metal piece is aluminum.

4. The thread guide of claim 1 wherein the single metal piece is stainless steel.

5. The thread guide of claim 1 wherein the ceramic coating is a metallic oxide.

6. The thread guide of claim 1 wherein the ceramic coating is aluminum oxide.

7. A thread guide comprising a single aluminum piece having a thread guide slot of about 0.010 inch in width and having the thread guide slot plated with a ceramic aluminum oxide coating firmly bonded to said aluminum piece to cover the exposed edges of said thread guide slot and provide a spill over of said aluminum oxide coating in a manner to form a non-continuous coating with the aluminum metal exposed in the inner portion of said thread guide slot and the thread contact is solely with said aluminum oxide spill over in said thread guide slot.

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