United States Patent [19]

Heaven

[11] **3,805,362**

[45] **Apr. 23, 1974**

[54] **METHOD OF APPLYING GUIDE ELEMENT COVER**

[75] Inventor: **Malcolm Dennis Heaven,** Farringdon, England

[73] Assignee: **Raychem Corporation,** Menlo Park, Calif.

[22] Filed: **June 22, 1972**

[21] Appl. No.: **265,302**

[52] **U.S. Cl.** **29/417,** 29/235, 29/450

[51] **Int. Cl.** **B23p 17/00**

[58] **Field of Search** 29/417, 450, 235, 423

[56] **References Cited**

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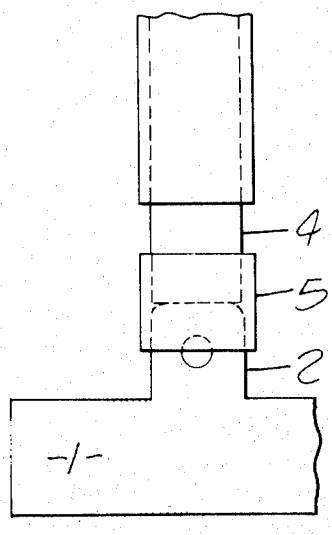
Primary Examiner—Charles W. Lanham
Assistant Examiner—Victor A. Dipalma
Attorney, Agent, or Firm—Lyon & Lyon

[57] **ABSTRACT**

The guide element of a knitting machine needle is covered by placing a polymeric material around a former having a cross-section similar to the cross-section of the guide element, removing a length of material from the former, such as by procedures used for stripping insulation, and transferring the material to and positioning it over the guide element.

7 Claims, 7 Drawing Figures



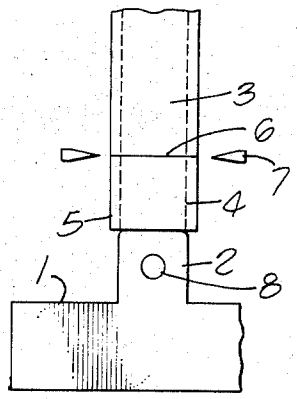


FIG. 1.

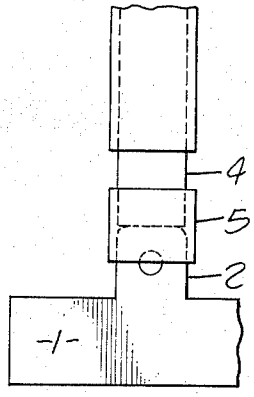


FIG. 2.

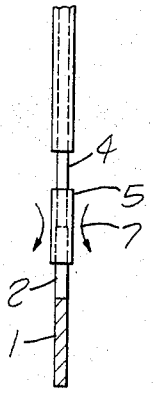


FIG. 3.

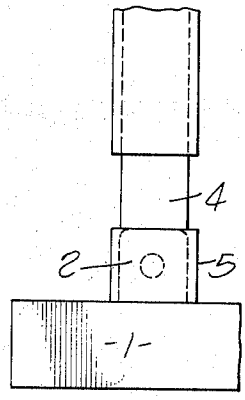


FIG. 4.

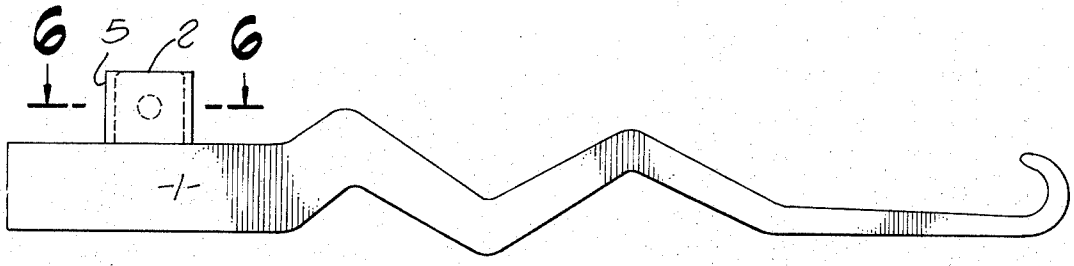


FIG. 5.

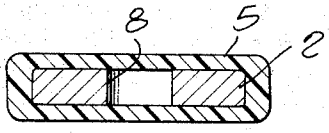


FIG. 6.

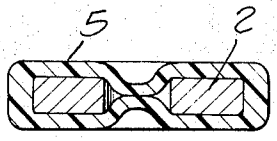


FIG. 7.

METHOD OF APPLYING GUIDE ELEMENT COVER

This invention relates to high speed machinery, more especially knitting machines, and provides a method of increasing the speed of operation of such machinery.

Certain modern knitting machines employ a plurality of needles which are caused to travel round a horizontally mounted closed-circuit guide member which is of generally circular cross-section and which provides a path having a number of vertical curves of varying sharpness. Each needle has a foot which fits into the guide, the dimensions of the foot requiring to be closely controlled to ensure accurate positioning of the needle in operation and to ensure that the needle does not jam in the guide member at any stage, especially at sharp corners. The needles are metallic, for example a hard tool steel. The guide is also metallic, for example a similar tool steel.

It has been found that the maximum speed of travel of the needles along the guide so far obtainable is about 1.5 metres per second, and that this is at present the limiting factor on the output of the machines. It has been found that frictional losses and frequent breakages of needles (possibly caused by vibrations set up at the sharp corners) prevent the operation of the machines above this speed.

The present invention is based on the observation that a plastic cover on the foot of the needle increases the maximum operating speed of the needles. It has, however, proved difficult to provide such a cover to the necessary close dimensional tolerances required. since the normal methods of the manufacturing plastics tubing or moulding parts are not sufficiently precise. Further, the large number of different needle sizes makes it imperative to provide a number of different cover sizes and thus a method capable of providing a range of different sizes is essential.

Embodiments of the invention are shown in the drawings wherein:

FIGS. 1–5 illustrate steps of the process for applying a cover to the guide element and

FIGS. 6 and 7 are cross-sectional views along lines 6—6.

The present invention provides a method for covering a guide element of a component, especially one suitable for use in precision high-speed machinery, for example the foot of a knitting machine needle, which comprises covering an elongate former of cross-section similar to and preferably slightly smaller than the cross-section of the guide element with th desired covering material, if desired or required machining the outer surface of the covering to suitable dimensions, removing a length of covering material from the former, transferring it to and positioning it over the guide element and removing an exposed length, preferably the corresponding length, of former from the former.

Preferably, the required length of covering material is removed from the former, leaving the corresponding exposed length of former to be cut off subsequently, but before the next required length of covering material is removed.

The properties desired for the covering material, in addition, of course, to a low coefficient of friction, are low cold flow, high abrasion resistance, high melting point, high damping capacity, and high resistance to stress cracking. It is of course appreciated that such

terms are relative, but those skilled in the plastics art will be able to consider a particular polymer and determine whether it will be suitable for a particular application. The materials may be crosslinked, for example, to improve their high temperature properties.

As material suitable for use in covering the guide members or feet of knitting machine needles there may be mentioned, for example, thermoplastic polyimides, for example, poly(1,12-dodecamethylene pyromellitimide), polyamides, and polyvinylidene fluoride and, more especially, acetal homopolymers and copolymers. A polyacetal (a du Pont polymer sold under the trademark DELRIN) has proved very suitable. As a material believed to be much less suitable, there may be mentioned polytetrafluoroethylene which has poor cold flow properties.

In general, the cross-section of the foot of a needle is approximately rectangular, the long sides being about 3.0 mm, the short sides being about 0.5 mm. For covering such materials a conductor for flat cable, having linear dimensions slightly (about 10 percent smaller than this, makes an ideal former, and extrusion of a suitable material over such a conductor by techniques known in the cable industry provides the continuous length of covered former needed for rapid, automatic application.

In suitable fashion, the free end of the foot is presented end-on to the end of the free end of the covered former. The covering material is then stripped from the former at the correct distance from the end directly placed over the foot to provide a force-fitting covering over it. The stripping means and method may be those commonly used in the electrical industry for this purpose adapted, so far as is necessary, to ensure that the length of covering material is prevented from changing its internal dimension, or is expanded if necessary to allow it to slip over the foot.

The foot may have a transverse hole provided therein, to allow the covering material to be peened or welded (for example, by ultrasonic welding) to attach it more firmly to the foot.

Referring to the drawings, it can be seen that the process of this invention is illustrated by FIGS. 1–7.

In FIG. 1, a portion of the knitting needle 1 is shown. The needle has guide element 2 shown projecting upwardly from the needle. The covered former 3 is shown directly above guide element 2 and is positioned so that the cross-section of former 4 is aligned with the cross-section of guide element 2. The former covering is then cut at 6 by any desired stripping means 7 such as those used in stripping electrical insulation. Guide element 2 is illustrated as having a hole or indentation 8 which may be used for securely affixing the covering 5. Such an indentation is not necessary and is simply an optional feature of this invention.

FIG. 2 illustrates a section of covering 5 being forced by the stripping means onto guide element 2. FIG. 3 is a side view illustrating forcing of the covering onto the guide element by stripping means 7. FIG. 4 illustrates a section of material 5 in place on guide element 2. The exposed section of former 4 is then cut and removed from the length of covered former 3.

FIG. 5 is a view of the entire knitting needle 1 with guide element 2 covered by the covering material 5.

FIG. 6 is a cross-sectional view along lines 6—6 which illustrates the hole or indentation 8. FIG. 7 illus-

trates a method of securing the covering by impressing it into hole **8.**

In tests using a DELRIN covered needle foot, the working life at a running speed of 3.5 metres/second was approximately equal to the life of a needle at the running speed of 1.5 metres/second. An added advantage was quieter running and reduced need for lubrication.

What we claim is:

1. A method of covering a guide element of a component which comprises covering an elongate former of a length greater than and cross-section similar to and slightly smaller than the cross-section of a guide element with a length of polymeric covering material greater than the length of the guide element; removing a length of covering material substantially equal to the length of the guide element from the former; and, transferring it directly to and positioning it over the guide element by positioning the former end to end

next to the end of the guide element and sliding the covering material over the former and onto the guide element.

2. A method as claimed in claim **1,** wherein the corresponding exposed length of the former is cut off before the next required length of covering material is removed.

3. A method as claimed in claim **2,** wherein the guide element is the foot of a knitting machine needle.

4. A method as claimed in claim **3,** wherein the outer surface of the covering is machined to suitable dimensions.

5. A method as claimed in claim **4,** wherein the covering material is a thermoplastic.

6. A method as claimed in claim **5,** wherein the material is a polyacetal.

7. A guide element whenever prepared by a method as claimed in claim **1.**

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