

[54] **AUTOMATIC THREAD-KNOTTING DEVICE**

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[51] Int. Cl. A01d 59/04

[58] Field of Search 289/2, 17

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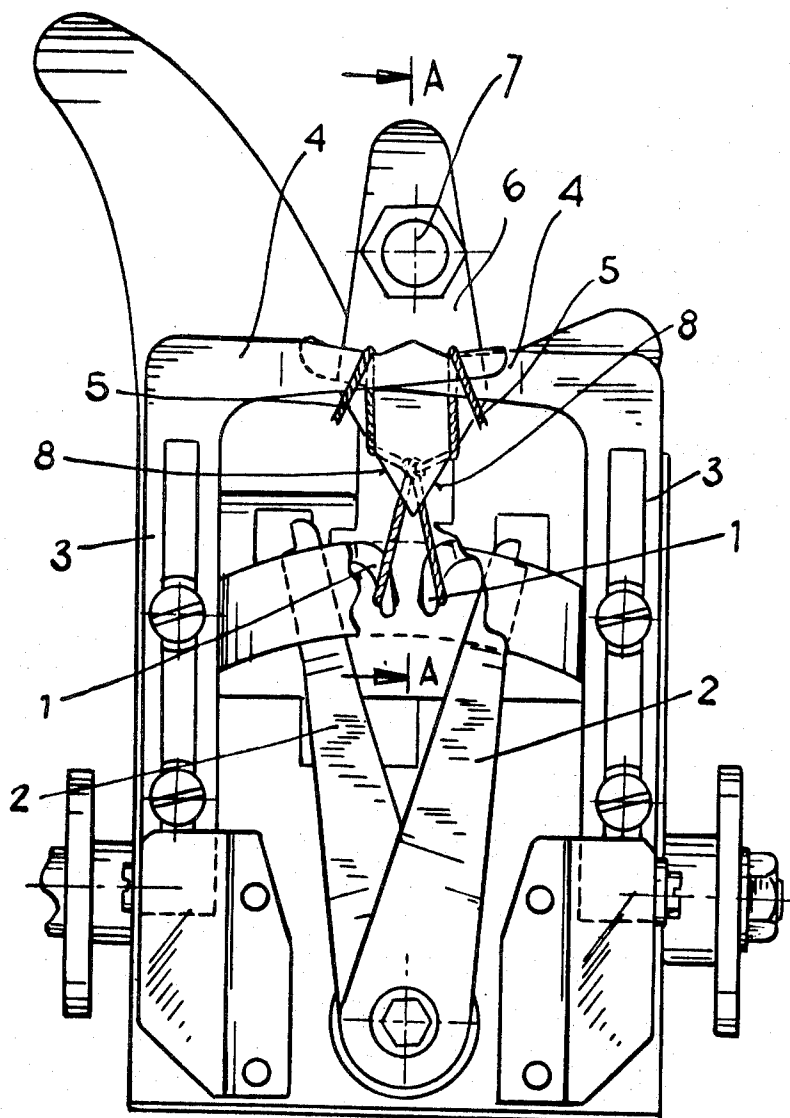
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Primary Examiner—Louis K. Rimrodt

[57] **ABSTRACT**

Automatic Fisherman's Knot-making device which comprises besides the conventional knotting elements: a tightening member which is conically shaped at one end for ready insertion among the threads and a V-shaped lower portion which allows the knotted threads to slide along the diverging inclined surfaces of said lower portion, whereby a horizontal component force is applied automatically to the opposite ends of the knotted threads and the knot is perfectly tightened and prevented from becoming untied regardless of the type of thread material employed.

3 Claims, 5 Drawing Figures



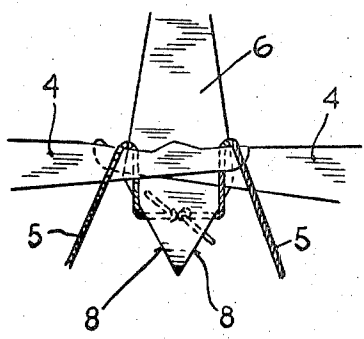
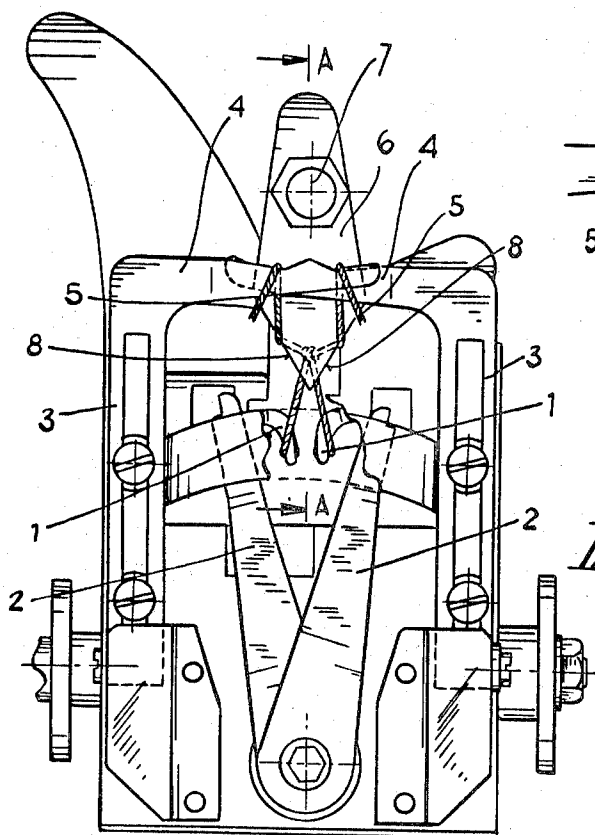


Fig. 2

Fig. 1

Fig. 3

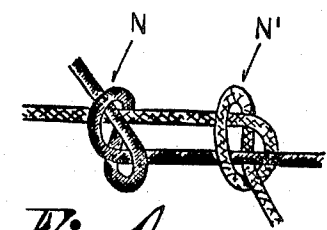
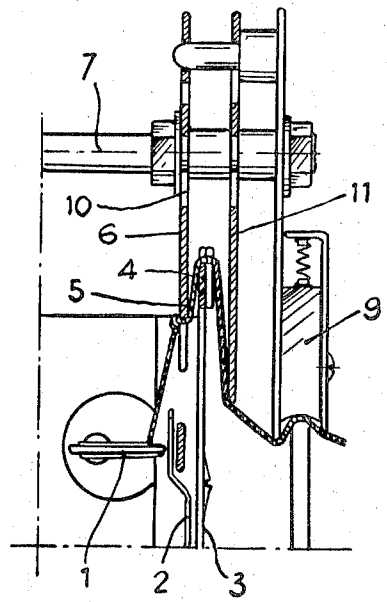


Fig. 4

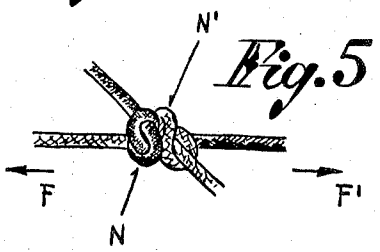


Fig. 5

AUTOMATIC THREAD-KNOTTING DEVICE

The present invention is related to automatic thread-knotting devices, particularly those employed in the production of the so-called "Fisherman Knot," wherein scissor-pincer knotting means, thread-spreading levers and at least one thread-extracting frontal lever are generally utilized.

There are known automatic thread-knotting devices, wherein the Fisherman Knot is made by the conventional scissor-pincer means in cooperation with the thread-tension levers, which levers also determine a traction action on the threads so as to tighten the knot soon after it is made.

Also known are thread-knotting devices, wherein, besides the thread-tension levers, there is provided a frontal lever which is vertically displaceable and which engages and displaces the threads after knotting, so as to impart thereon a vertical traction action for tightening the knot while the severed extremities of the threads are still retained by the scissor-pincer means.

However, all of these devices heretofore known have limited applicability and cannot be satisfactorily employed with slippery threads such as those made of synthetic material. The known devices are found to be unsatisfactory in their ability to tighten sufficiently the knot after manufacture.

It is therefore an object of the present invention to provide an automatic thread-knotting device suitable for all types of thread, synthetic and non-synthetic, such device comprising means for the prevention of sliding of threads while being tightened, and for the attainment of a perfect tension parallel to the plane of the knotted threads, with the consequent ultimate tightening of the knot before it is removed from the knotting device.

Briefly stated, the device of the invention is characterized in that, concurrently with the known thread-spreading and frontal levers, it is provided with conically shaped-ending member mounted on the support of the thread-blocking means so as to act as a thread-spreader during the vertical displacement of the knotted threads and so as to determine an auxiliary traction force on the threads to completely tighten the knot before it is fully removed by the scissor-pincer means.

IN THE DRAWINGS:

FIG. 1 is a frontal elevational view of the assembled knotting device, showing furthermore the extremities of the threads during the knotting operation;

FIG. 2 shows in detail the operation of the assembled device for tightening the knots;

FIG. 3 is a sectional view taken along the line indicated by arrows A—A in FIG. 1; and

FIGS. 4 and 5 are schematic illustrations of two successive phases of the tightening of a knot.

With reference to the accompanying drawings, the device of the invention comprises (coordinated and actuated in accordance with known techniques) scissor-pincers 1 for the knotting operation, thread-spreading levers 2 and two frontal levers 3 opposed to each other, vertically displaceable and each having a horizontal arm 4 for engaging the knotted threads 5 and for the displacement thereof and the removal of the formed knot from the device.

Further to these known elements, the device of the invention comprises a member 6 having a conically-

shaped extremity and being mounted on a support 7, which support bears the controlled blocking means for the threads (operative) during the knotting operation. Member 6 is so mounted as to result vertically positioned in the space existing between the scissor-pincer means 1 and the horizontal arms 4 of the two frontal levers 3. Member 6, furthermore, has, on its lower part, two V-shaped inclined surfaces 8, diverging from each other in an upward direction and such as to wedge themselves between the threads knotted by the scissor-pincer means.

Referring particularly to FIG. 3, member 6 is mounted on support 7 in coordination with the thread-blocking element 9 and is provided with an intermediate oblong slot 10 so as to be height-regulated depending on the knotting operation and cooperating with a second similar member 11 for the purpose of obtaining a perfect closing of the knot without in the least damaging the thread, regardless of its diameter, its composition or its resistance to traction.

The knotting operation is effected in accordance with well known techniques and it is, therefore, unnecessary to describe it. However, at the termination of the knotting phase of threads 5, after the individual knots are closed and during the time at which the threads terminals are still retained by the scissor-pincer means 1 - see FIGS. 1 and 3 - the vertical levers 3 are displaced upwardly so that their horizontal arms 4, acting on the threads 5, displace the threads upwardly. Due to this forced upward displacement, the threads come to rest against the inclined surfaces 8 of member 6 and are forced to spread and, consequently, to be subjected to additional traction in opposite direction, which then results in a further tightening of the knot for a complete closing thereof. The inclined surfaces 8 of member 6, in essence, exert a horizontal component force of the upwardly displacing force caused by the vertical levers upon the threads. This horizontal component force determines the necessary auxiliary traction force on threads 5 for a complete tightening of the knot.

Substantially, therefore, member 6 exercises the function of spreading the knotted threads to effect their traction in opposite directions, just like during a manual knotting operation, and to obtain a knot which is considerable more reliable and less prone to become untied.

The closing of the knot takes place in two successive phases of the operation: in the first phase, the vertical levers 3, in cooperation with the thread-spreading levers 2, remove from the scissor-pincer means 1 the individual knots N-N' forming the Fisherman's Knot and begin to tighten them as illustrated in FIG. 4; in the second phase, the vertical levers 3 move the threads of the knots N-N' onto the inclined surfaces 8 of member 6 so that the threads are subjected to oppositely-applied traction forces (F,F') with the resultant approachment and tightening of the knots N-N' as illustrated in FIG. 5.

What is claimed and is wished to protect by Letters Patent of The United States is:

1. In an automatic thread-knotting device for making Fisherman's Knots and comprising thread-knotting scissor-pincer means, thread-spreading levers, at least one frontal, vertically-displaceable thread-extracting lever and thread-blocking means, the improvement which comprises a member having a conically-shaped extremity, a support on which said member is mounted,

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said member being positioned vertically in the space existing between the scissor-pincer means and the thread-extracting lever.

2. The improvement according to claim 1, wherein said member has in the lower part thereof a pair of V-shaped inclined surfaces, upwardly diverging from each other, for the sliding of the knotted threads therealong.

3. The improvement according to claim 1, wherein said member has an intermediate oblong slot therein for predeterminedly adjusting the height of the member with respect to its mounting support.

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