KNOTTER FOR FISHERMAN'S KNOTS IN THE TEXTILE INDUSTRY

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This invention appertains to knot-tying devices or knotters for use for tying together ends of yarns or threads. Knotters are used, for example, for tying together ends of broken yarns or threads during doubleting, twisting, winding, weaving, knitting and analogous operations.

More particularly, the invention relates to fisherman's knotters, knotters of the type adapted to tie fisherman's knots. Knotters of this type broadly comprise a pair of spaced side plates each having formations for receiving and supporting two yarn or thread ends to be tied together, knotting mechanism including two tying heads, interposed between the side plates, each head including a rotary bill equipped with cam-operated openable and closable jaws and elements for reversing, i.e., crossing, the said yarn or thread ends and so looping them around the bills, and a stripper for stripping from the bills a knot formed by rotation of the latter, and a spring influenced thumb-operated actuating member (hereinafter referred to for convenience simply as a "trigger") adapted, when depressed, to effect operation of the knotting mechanism and the stripper.

The aforesaid two formations, provided in each side plate, are usually but not necessarily in the form of upwardly-open grooves, and are each adapted to support one yarn or thread end. Thus, in using a knitter of this type one of the two yarn or thread ends to be knotted is placed in one groove or formation in one side plate and in the equivalent groove or formation in the other side plate and the other yarn or thread end is placed in the other groove or formation in each of the side plates. Where the formations are in the form of grooves the yarn or thread ends, to be appropriately located for correct formation of a knot, must be disposed in the lower sections of the grooves. This arrangement of the yarn or thread ends in the formations is essential for the correct formation of a knot.

In textile mills and like circumstances it is important to join any broken yarns or threads quickly and efficiently. Now experience has shown that it is not impossible that the operator of a knitter in haste inadvertently wrongly places the yarn or thread ends in the formations of the knitter, e.g., places both ends in the same pair of grooves or formations, i.e., both ends in one formation in each of the two side plates, and proceeds to operate the knitter by depression of the trigger. Even in this instance, however, the operator may not realize that the knitter has been wrongly operated since a knot of some form will usually be produced. The threads are not connected, however, by a fisherman's knot but by a sliding or hooked knot which is unsatisfactory in the textile trade since it is very prone to failure.

Moreover, since such wrong knots are not, because of their small size, immediately detected by the eye and distinguishable from fisherman's knots, the conventional fisherman's knitter has the disadvantage that any mistake in placing of the broken yarn or thread ends in the knitter and resulting wrong knots is not detected by the operative and is only evident in the resulting finished product.

The object of the invention, therefore, is to provide an improved fisherman's knitter designed to overcome the afore-mentioned disadvantages.

In accordance with the present invention there is provided a knitter of the type adapted to tie fisherman's knots, wherein there are provided safety means for detecting whether yarns have been placed in the formations of at least one of the side plates, said means being connected with the knotting mechanism and the arrangement being such that whenever yarn or thread ends are not received in the said formations the knotting mechanism will be locked and prevented from functioning to tie knots, but whenever yarn or thread ends are correctly placed in the said formations the locking effect will be released so that the knotting mechanism can be actuated to tie a knot.

Manifestly, the knitter provided in accordance with the present invention overcomes the aforementioned disadvantages encountered with conventional knitters since if the yarn or thread ends are incorrectly placed in the said formations no knots can be produced and the operative will immediately realize that the ends have been incorrectly located. Advantageously, the arrangement is such that when the knotting mechanism is locked the trigger is locked and cannot be depressed so that an operative will immediately, upon an attempt to depress the trigger, be aware that the mechanism is locked.

Usually the aforesaid formations in the side plates for receiving the yarn or thread ends will be in the form of upwardly open recesses, the yarn or thread ends being required to be positioned for correct production of a fisherman's knot, in the lower sections of the said grooves. In this event, the aforesaid detecting or safety means advantageously comprise two movable members normally urged into operative or safety positions in which parts of the members are located respectively adjacent the lower sections of the two grooves in each side plate, these members being so connected with the knotting mechanism that, in the aforesaid operative positions, the knotting mechanism is locked and is prevented from functioning to produce a knot, but the arrangement being such that when yarn or thread ends are placed respectively in the two grooves in the said side plate the two movable detecting members are deflected, by the ends, from their operative positions into inoperative positions in which the locking effect upon the knotting mechanism is released and this mechanism can be actuated to produce a knot.

Conveniently, the aforesaid two movable detecting members are located closely adjacent to, and at the exterior of, one of the two side plates of the knitter. Moreover, where, as will usually be the case, the two elements for reversing, i.e., crossing, the said yarn or thread ends are located adjacent one of the two side plates of the knitter and at the interior of the latter, the two detecting members are advantageously provided adjacent the same side plate of the knitter but outside the latter.

In this event, the said detecting members are advantageously co-operable with the two said reversing elements suchwise that when the members are in the operative positions the elements are prevented from movement and hence the knotting mechanism is locked. Thus, for example, the detecting members may have extensions which protrude through slots formed in the relevant side plate of the knitter, which extensions, when the members are located in their operative positions, are received in recesses in and abut against the reversing elements thereby locking the knotting mechanism, the arrangement being such that when the members are moved to the inoperative positions the said extensions are retracted clear of the elements so that the latter and the knotting mechanism is no longer locked.

In any event, the detecting or safety members are advantageously resiliently biased into their operative or safety positions and return to these positions following formation of a knot, whereby the knitter is, immediately after removal of the knotted thread, again ready for use in its safety condition.
In order that the invention may be more clearly understood one specific constructional example thereof will now be described with reference to the accompanying drawings, wherein:

FIGURE 1 is an elevation of the knotter from one side,

FIGURE 2 is a vertical cross-sectional view taken on the line II—II of FIGURE 5 from the opposite side of the knotter.

FIGURE 3 is a vertical transverse cross-sectional view through the part of the knotter shown in FIGURE 2 and taken on the line III—III of FIGURE 2.

FIGURE 4 is a vertical cross-sectional view taken on the line IV—IV of FIGURE 5, that is to say taken from the same side as FIGURE 2 but showing the internal knotting mechanism of the knotter, and

FIGURE 5 is a plan view of the complete knotter.

Referring to the drawings it will be seen that the body 1 of the knotter has a support member 2 rigidly connected thereto. The body 1 includes, as will be most clearly seen in FIGURE 5, two suitably spaced parallel side plates 3 and 4 each formed with two grooves or slots 5 and 6 which are separated by a prong portion or the equivalent 7 of the side plate to receive and support across the two side plates 3 and 4 two yarn or thread ends (not shown) to be tied together. The grooves 5 and 6 are somewhat deeper than the grooves 7 so that the lower sections of the grooves 5 and 6 are of equal height respectively to one another.

These side plates 3 and 4 are connected together by transversely extending end plates 8 and 9, as shown most clearly in FIGURE 2. Mounted between the side plates 3 and 4 are two tying heads, indicated generally at H1 and H2 (FIGURES 4 and 5), each including a rotary bill 10 of conventional form. The spindles 11 of the bills 10 are adapted to be rotated in usual fashion from a screw 12, through the medium of pairs of intermeshed spur gears 13 and 14 (FIGURE 4), rotation of this screw 12 being transmitted to a thumb-operated trigger 15 constituting the main actuating member of the knotter. The trigger 15 is controlled by a helical torsion spring 16 (see FIGURE 5).

As shown in FIGURE 4 fixed cam rings 17 are provided for opening and closing the usual relatively movable elements of the tying bills 10, the arrangement being such that the bills 10 there are provided, as well known to those acquainted with fisherman's knotters, means for crossing or reversing the yarn or thread ends at the sides of the bills 10 whereby the ends are looped around the latter.

These means comprise two elements or arms 18 and 19, as shown in dotted lines in FIGURE 1 and in full lines in FIGURES 3 and 4. These elements 18 and 19 are roughly of bell crank form each having a main elongated limb 18a, 19a which is forked at its outer extremity for engagement with a yarn or thread, and a secondary limb 18b, 19b. The two elements are turnable upon pivot screws 20 and the secondary limbs of the two arms are connected by means of a pin 21 upon the limb 18b which enters a slot in the limb 19b. Thus, the arrangement is such that the elements 18, 19 are turnable together towards and away from one another by means of the trigger 15.

The conventional stripper for stripping from the bills 10 a knot formed in the yarn or thread ends by rotation of the bills, is designated by the reference numeral 22. This stripper 22 is pivoted at 23 and is actuated from the trigger 15 through intermediate connections 24 and 25, the movements of which are controlled by a pin 26 working in a suitably profiled slot 27 formed in a box form quadrant 28 attached to the trigger 15. Whenever the trigger 15 is depressed the quadrant 28 turns about the fixed pivot pin 29 extending between the side plates 3 and 4. The aforesaid spring 16 controlling the trigger 15 is mounted upon this pivot pin 29. Two covers 30 supporting the end plates 8 and 9 serve to enclose and support the cam rings 17, gears 13, etc.

As well known to those acquainted with fisherman's knotters the knotter operates as follows.

The two yarn or thread ends are united and span the side plates 3 and 4 and are engaged respectively in the grooves 5 and 6 formed in the two side plates. That is to say one of the yarn or thread ends is engaged in the groove 5 in the side plate 3 and in the groove 5 in the side plate 4 and the other yarn or thread end is engaged in the groove 6 in the side plate 3 and in the groove 6 in the side plate 4. The construction and arrangement of a fisherman's knotter as broadly described above is such that each time the trigger 15 is depressed and caused to make an operative stroke against the action of the spring 16, the two reversing or cross over elements or arms 18 and 19 will be swung inwardly to cross or reverse the two yarn or thread ends at the sides of the bills 10 whereby the ends are looped around the latter. Upon further depression of the trigger 15 the twin bills 10 will be rotated to form a fisherman's knot after which the stripper 22 will be swung upwardly to strip the formed knot from the bills. Thereafter, upon release of the trigger 15, it will automatically make a return stroke to restore all of the parts of the knotting mechanism to their starting, i.e. inoperative, positions.

The construction, arrangement and operation of such a fisherman's knotter is so well known that no further description of the basic knotters is considered to be necessary.

In accordance with the present invention there are provided two detecting or safety members or levers 31 and 32 which are mounted upon the outside of the knotter upon the side plate 4. These two safety or detecting members or levers 31 and 32 are each adapted to turn about pivot screws 33. As will be seen most clearly in FIGURE 1, each of these safety members or levers 31 and 32 is of bell-crank form having a main limb 31a, 32a and a smaller limb 31b, 32b. The limbs 31b, 32b are each of crescent form. The limb 31b in the operative position of the member 31 is adapted to cover, i.e. overlie laterally, the lower section (deepest point) of the groove 6 in the plate 4, whereas, the limb 32b is adapted, in one position of the member 32 to cover, i.e. overlie laterally, the lower section (deepest point) of the groove 5 in the plate 4. These two safety or detecting members 31 and 32 are each adapted to be normally urged into these positions by means of springs 34. However, the members 31 and 32 may be turned, about the screws 33, against the action of the springs 34, to uncover the lower sections of the grooves 5 and 6, as shown in FIGURE 4.

The turning movements of the members 31 and 32 are limited by blocks or extensions 35 extending laterally from the lower ends thereof, and entering arcuate slots 36 formed in the side plate 4 and extend therefrom to the inside of the knotter, as shown most clearly in FIGURES 2 and 3. These members 31 and 32 are of different lengths and the arrangement is such that the extremities of the limbs 31b, 32b of the members 31, 32 are offset with respect to one another in accordance with the different heights of the bottom sections of the grooves 5 and 6 and so that the members are movable quite independently of one another.

Recesses 37 are provided in the lower ends of the elements 18 and 19 and are adapted to receive the blocks or extensions 35, as shown in FIGURE 3. Thus, the arrangement is such that, with the members 31 and 32 in the operative positions shown in FIGURE 1, the blocks or extensions 35 enter the recesses 37 in the elements 18 and 19 and prevent turning of both of the latter. Manifestly, by virtue of the fact that both elements 18 and 19 are connected together, should only one of the safety or detecting members 31 or 32 be located in the position in which its block or extension 35 enters the
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recess 37 of the element 18 or 19, turning of either of the elements will be prevented. The operation of the safety device will now be described:

Normally, prior to actuation of the knotter by depression of the trigger 15, the safety or detecting members 31, 32 are located in the positions shown in FIGURE 1 with the limbs 31b and 32b covering the lower sections of the grooves 5 and 6 and the extensions or blocks 35 engaged in the recesses 37 in the elements 18 and 19 so that rotation of the latter and actuation of the trigger 15 is prevented, i.e. the knotting mechanism is locked.

When two thread ends are to be united they are inserted separately into the grooves 5 and 6 respectively and are moved to the lower sections of the grooves. During this operation when the relevant thread end is moved to the lower section of the groove 5 it will contact the limb 31b and thereby turn the member 31 against the action of the relevant spring 34 to move the extension or block 35 thereon out of engagement with the recess 37 in the element 19. Similarly, when the other yarn end is moved to the lower section of the groove 5 it will contact the limb 32b of the member 32 and turn the latter, against the action of the relevant spring 34, so as to move the block or extension 35 out of the recess 37 of the element 18. As a result, the cross elements 18 and 19 are free to be turned, i.e. the locking effect upon the knotting mechanism is released, and, upon depression of the trigger 15, these elements will be turned to cross over the thread ends engaged in the grooves 5 and 6.

However, if the two yarn or thread ends are not correctly inserted into the grooves 5 and 6 as described above but are inserted wrongly, for example, both thread ends being inserted into the grooves 6, then actuation of the elements 18 and 19, and hence actuation of the trigger 15 and the tying heads will be prevented, i.e. the knotting mechanism will be locked so that the knotter cannot be operated. That is to say, if both of the thread ends are moved to the lower section of the groove 6 in the plate 4 then the safety member 31 will be turned and will release the associated block or extension 35 from the recess in the element 19, but the safety member 32 will not be turned so that the associated block or extension 35 remains in engagement with the recess 37 in the element 19. This engagement of the block or extension 35 in the recess 37 of the element 19 prevents not only the element 19 from turning but also the element 19 so that the knotting mechanism is locked and cannot be actuated. The operative will, therefore, immediately realize that the yarn or thread ends are incorrectly fed into the knotter and can immediately rectify this. A similar effect takes place if both the threads are fed only into the grooves 5.

When yarn or thread ends have been correctly placed in the grooves 5 and 6 and the knotter has been actuated to tie a knot and strip the formed knot from the bills and the yarn or thread ends from the grooves 5 and 6 in the two side plates 3 and 4, the safety members 31 and 32 will be moved, under the action of the springs 34, into their operative positions guarding the grooves 5 and 6 in the plate 4 so that the knotter is in the safety yarn-detecting position.

I claim:

1. A knotter comprising, in combination, two spaced side plates having formations to receive and support across the side plates two yarn ends to be tied together; knotting mechanism including two tying heads mounted between the side plates and having a rotary bill and associated means for looping said yarn ends around the bills; a stripper for stripping from said bills a knot formed in the yarn ends by rotation of the bills; a thumb-operated trigger adapted when depressed to actuate the tying heads and the stripper; detecting means arranged adjacent the yarn end receiving formations to be contacted by yarn ends placed in said formations; and means arranged between said detecting means and said knotting mechanism whereby whenever yarn ends are not received in said formations the knotting mechanism will be locked and prevented from functioning to tie knots and wherever yarn ends are located in the said formations the locking effect will be released so that the knotting mechanism can be actuated to tie a knot.

2. A knotter comprising, in combination, two spaced side plates each formed with two upwardly-open grooves for receiving and supporting across the side plates two yarn ends to be tied together; knotting mechanism including two tying heads mounted between the side plates and each having a rotary bill and associated means for looping said yarn ends around the bills; a stripper for stripping from said bills a knot formed in the yarn ends by rotation of the bills; a thumb-operated trigger adapted when depressed to actuate the tying heads and the stripper; two movable yarn end detecting elements movable between operative and inoperative positions, means for normally urging said yarn end detecting members into the operative positions in which parts of said members are located respectively adjacent the lower sections of the two grooves in one side plate; and means arranged between said yarn-end detecting members and said knotting mechanism whereby whenever yarn ends are not received in said two grooves in said side plate the knotting mechanism will be locked and prevented from functioning to tie knots and whenever yarn ends are received in the lower sections of said two grooves in said side plate said detecting members will both be moved to their inoperative positions and the locking effect will be released so that the knotting mechanism can be actuated to tie a knot.

3. A knotter according to claim 2, wherein the aforesaid two movable detecting members are located closely adjacent to, and at the exterior of, one of the two side plates of the knotter.

4. A knotter comprising, in combination, two spaced side plates each formed with two upwardly-open grooves for receiving and supporting across the side plates two yarn ends to be tied together; knotting mechanism including two tying heads mounted between the side plates and each having a rotary bill and an associated yarn-reversing element for looping one of said yarn ends around the respective rotary bill; a stripper for stripping from said bills a knot formed in the yarn ends by rotation of the bills; a thumb-operated trigger adapted when depressed to actuate the two tying bills and the two yarn-reversing elements; two movable yarn end detecting members movable between operative and inoperative positions, means for normally urging said yarn end detecting members into the operative positions in which parts of said members are located respectively adjacent the lower sections of the two grooves in one side plate and means arranged between said yarn end detecting members and said yarn reversing elements whereby whenever yarn ends are not received in said two grooves in said side plate the yarn reversing elements will be prevented from movement so that the knotting mechanism is locked and prevented from functioning to tie knots and whenever yarn ends are received in the lower sections of said two grooves in said side plate said detecting members will both be moved to their inoperative positions and the locking effect will be released so that the knotting mechanism can be actuated to tie a knot.

5. A knotter according to claim 4, wherein the two yarn reversing elements are located adjacent the said side plates inside the knotter and the two yarn end detecting members are also located adjacent the said side plate of the knotter at the exterior of the latter.

6. A knotter according to claim 5, wherein the detecting members are provided with extensions which penetrate through the relevant side plate of the knotter and the said reversing elements are formed with recesses for receiving the said extensions, the arrangement
being such that when the detecting members are located in their operative positions the extensions are received in said recesses and, in abut against, the reversing elements thereby locking the latter and the knotting mechanism, and when the members are moved to the inoperative positions the said extensions are retracted clear of the elements so that the latter and the knotting mechanism is no longer locked.

7. A knoter according to claim 6, wherein the said extensions of the detecting members protrude through the side plate respectively through two slots in the latter, the shape and size of the slots serving to limit the movements of the two detecting members.

8. A knoter according to claim 2, wherein the two detecting members are resiliently biased into their operative positions and return to these positions following formation of the knot and stripping of the latter from the tying head and stripping of the yarns from the grooves, whereby the knotter is, immediately after removal of the knotted thread, again ready for use in its safety condition.

9. A knoter comprising, in combination, two spaced side plates each formed with two upwardly-open grooves for receiving and supporting across the side plates two yarn ends to be tied together one of said side plates also being formed with a pair of arcuate slots, knotting mechanism including two tying heads mounted between the side plates and each having a rotary bill and an associated yarn-reversing element formed with a recess and located adjacent the said slotted side plate of the knoter for looping one of said yarn ends around the respective rotary bill; a stripper for stripping from said bills a knot formed in the yarn ends by rotation of the bills; a thumb-operated trigger adapted when depressed to actuate the two tying bills and the two-yarn-reversing elements; two movable yarn end detecting members located upon the said slotted side plate at the exterior of the knotter, each of these yarn end detecting members being in the form of an angle lever having a main limb pivotally mounted upon the knoter and an integral smaller limb and an extension extending through the relevant one of the slots in the said plate, the members being turnable about said pivots between operative positions, in which the smaller limbs cover, i.e. overlie laterally respectively, the lowest sections of the two grooves in said slotted plate and said extensions enter said recesses in said reversing elements and prevent operation of the latter, and inoperative positions in which the smaller limbs are clear of the grooves and the extensions are clear of said recesses in said reversing elements whereby the latter are free to be operated; and means for resiliently biasing the said yarn end detecting members into their operative positions, whereby whenever yarn ends are not received in said two grooves in said side plate the knotting mechanism will be locked and prevented from functioning to tie knots and whenever yarn ends are received in the lower sections of said two grooves in said side plate said detecting members will both be moved to their inoperative positions and the locking effect will be released so that the knotting mechanism can be actuated to tie a knot.

10. A knoter according to claim 9, wherein the secondary limb of each of the members, which is adapted to cover the relevant groove in the side plate of the knoter, is of crescent form.

11. A knoter according to claim 9, wherein the two grooves in the side plate of the knoter are of different depths so that the lower sections of the grooves are offset heightwise relatively to one another and the secondary limbs of the two members are offset with respect to one another in accordance with the different heights of the lower sections of the grooves so that the members are movable quite independently of one another.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Inventor</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,497,354</td>
<td>Byrd</td>
<td>June 10, 1924</td>
</tr>
<tr>
<td>1,965,023</td>
<td>Abbott et al.</td>
<td>July 3, 1934</td>
</tr>
<tr>
<td>2,264,784</td>
<td>Abbott</td>
<td>Dec. 2, 1941</td>
</tr>
<tr>
<td>2,981,559</td>
<td>Furst</td>
<td>Apr. 25, 1961</td>
</tr>
</tbody>
</table>