May 27, 1958 W. J. MOORHOUSE ET AL 2,836,012

APPARATUS FOR UNTWISTING MATERIAL IN TWISTED ROPE FORM

Filed June 12, 1956 5 Sheets-Sheet 1

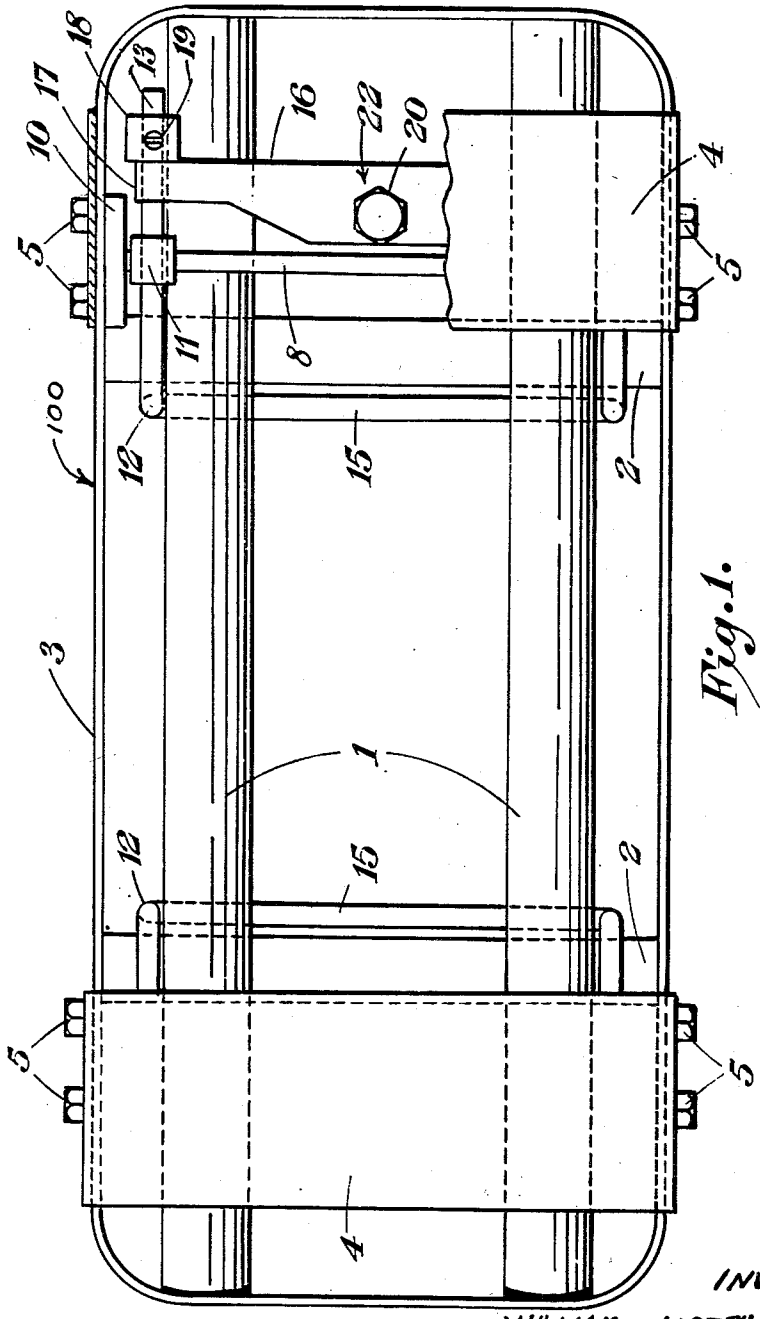


Fig. 1.

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APPARATUS FOR UNTWISTING MATERIAL IN TWISTED ROPE FORM

Filed June 18, 1956 5 Sheets-Sheet 2

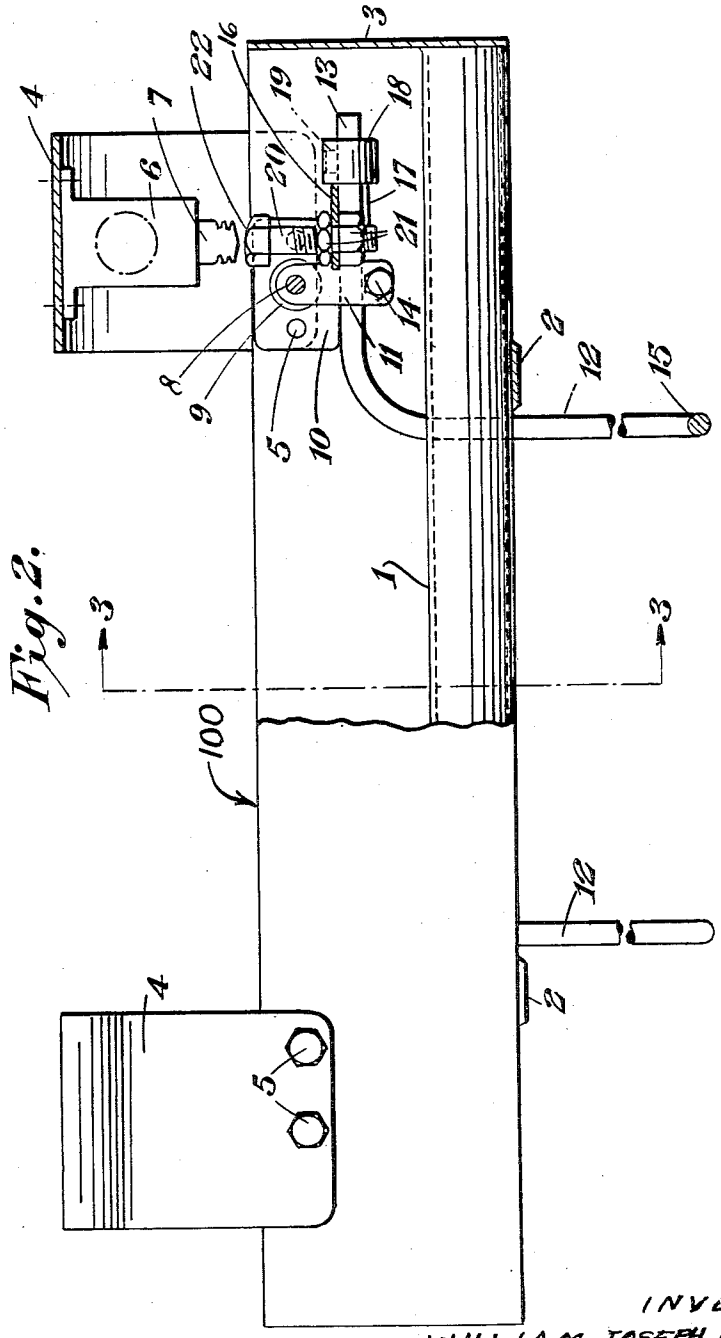


Fig. 2.

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APPARATUS FOR UNTWISTING MATERIAL IN TWISTED ROPE FORM

Filed June 18, 1956 5 Sheets-Sheet 3

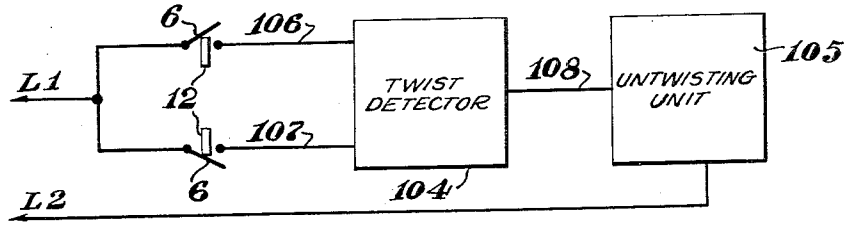


Fig. 6.

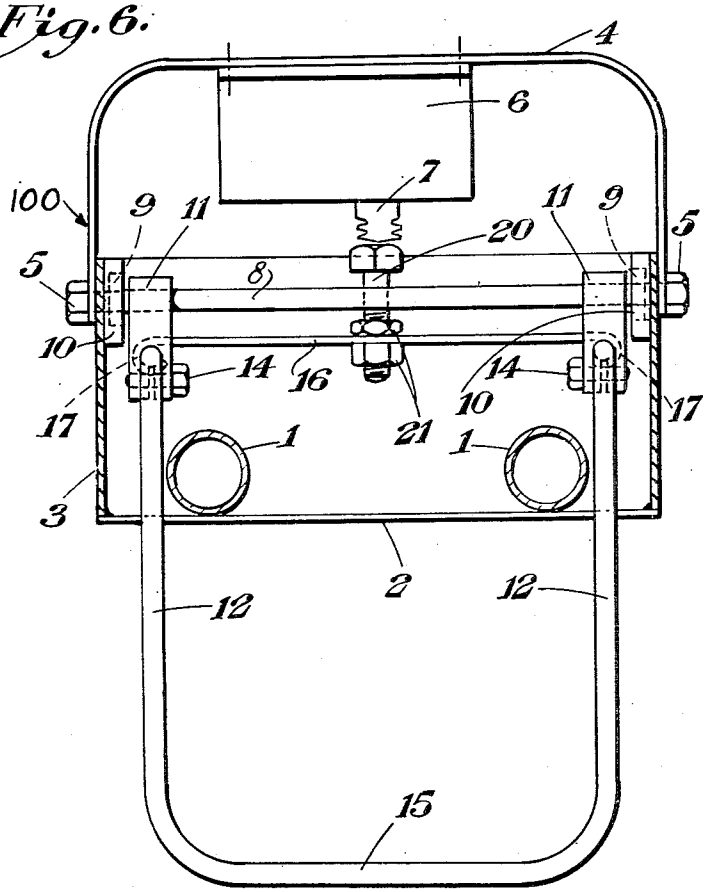


Fig. 3.

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APPARATUS FOR UNTWISTING MATERIAL IN TWISTED ROPE FORM

Filed June 18, 1956 5 Sheets-Sheet 4

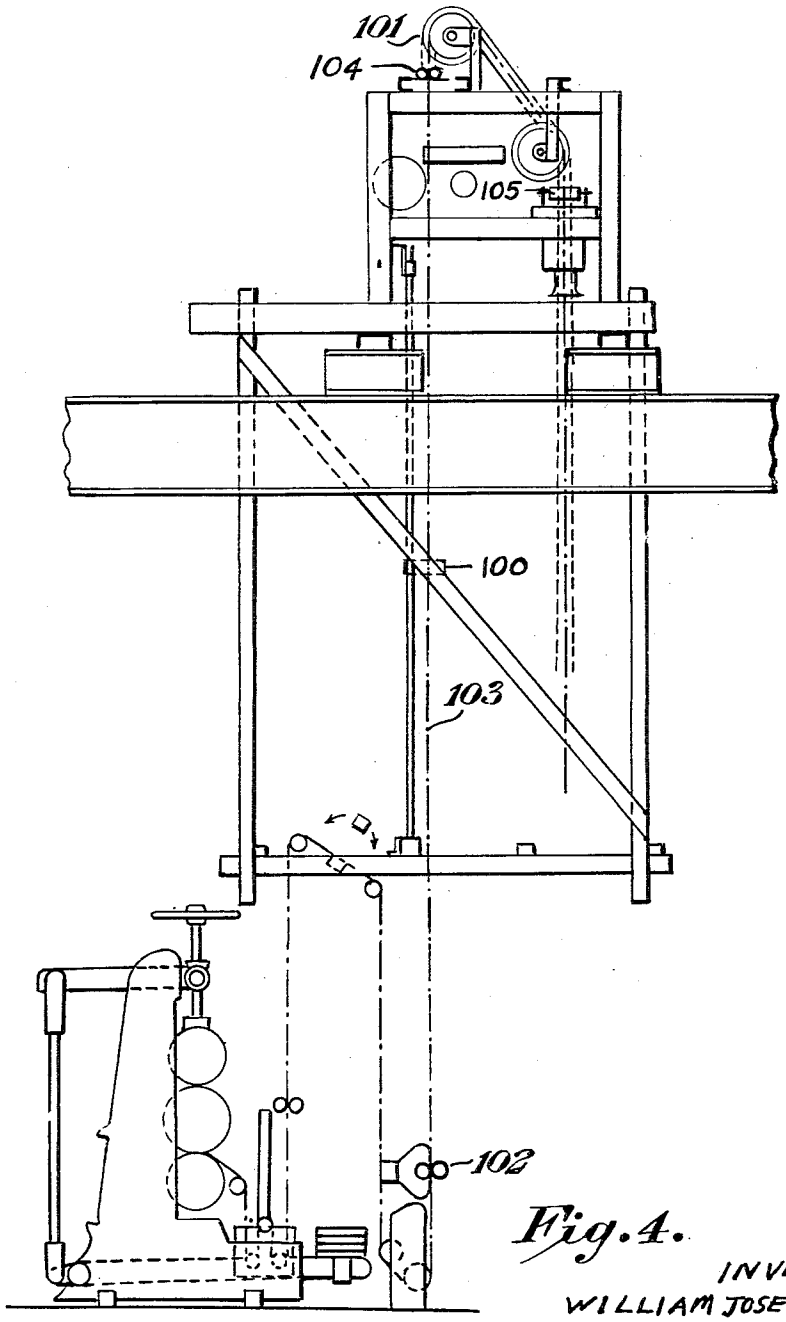


Fig. 4.

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APPARATUS FOR UNTWISTING MATERIAL IN TWISTED ROPE FORM

Filed June 18, 1956 5 Sheets-Sheet 5

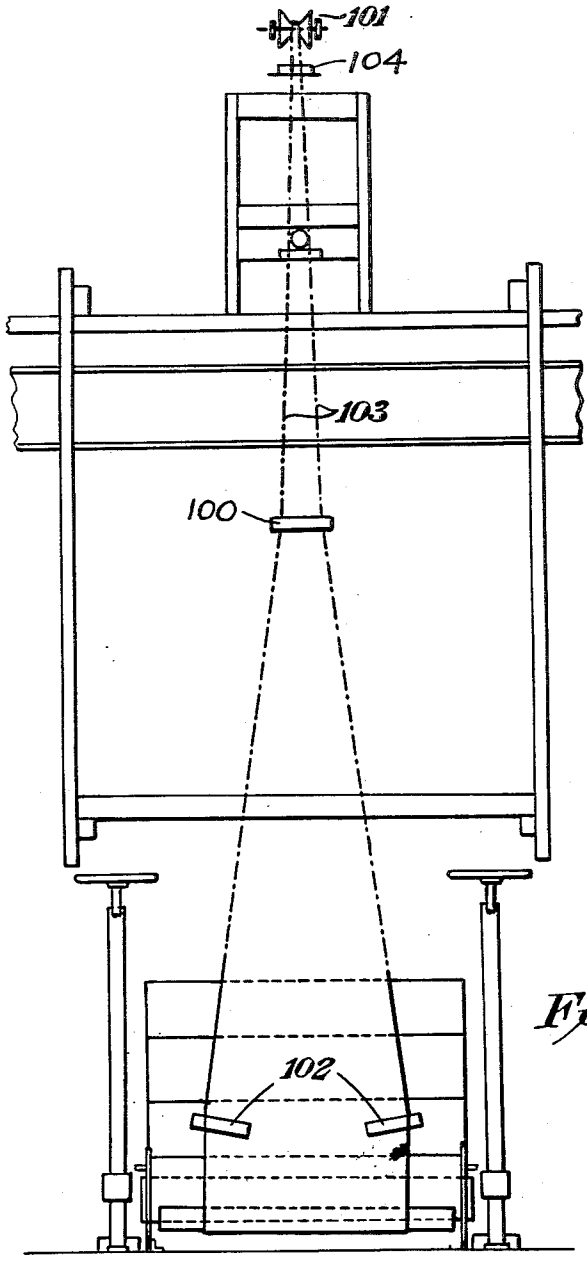


Fig. 5.

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United States Patent Office 2,836,012 Patented May 27, 1958

2,836,012

APPARATUS FOR UNTWISTING MATERIAL IN TWISTED ROPE FORM

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Application June 18, 1956, Serial No. 591,951

8 Claims. (Cl. 57—1)

This invention relates to apparatus for taking the twist out of cloth or other material in twisted rope form. Such apparatus is used in the textile industry in which fabrics are put into rope form for treatment such as dyeing, bleaching, and washing after which it is necessary to restore the fabric to its normal open condition.

Before effecting this restoration it is first necessary to remove all twist from the rope and this up to the present has been done in various ways. The twist is sometimes removed by hand but more often an apparatus is used which usually comprises a twist detector and a turntable, on which is a container for cloth, actuated by the twist detector; or a twist detector and an untwisting unit actuated by the twist detecor, which comprises two pairs of spring loaded rollers so designed to nip the rope material passing through them; the rollers being mounted in a frame work capable of being rotated in a clockwise or anti-clockwise direction, as indicated by the twist detector.

The twist detector faithfully records any twist in the rope, either a left hand or a right hand twist, and causes the untwisting unit, be it either rollers or a turntable, to remove that twist; more often than not, not only does the untwisting unit remove the twist as dictated by the twist detector but it also over-corrects and twists the cloth in the reverse direction. This is due to the fact that the untwisting unit having rotated a sufficient number of revolutions to remove the twist recorded by the twist detector, does not stop dead but continues rotating for a further revolution or two twisting the cloth in the reverse direction. This reverse twist at a later stage is detected by the twist detector and consequently removed but the untwisting unit, due to this "over run," is creating work for itself. It will be thus appreciated that although the apparatus used at present satisfactorily removes all twist it does tend to create work for itself causing undue wear and tear particularly to the reversing starter of the untwisting unit.

It is known that the twists in roped material that has been dyed, bleached, or washed are not all in one direction and quite often a length of rope material of say 30 yards will have a 10 yards length with right hand twist, another 10 yards length with no twist and a further 10 yard length with left hand twist, so that if that 30 yards length of material was stretched out the left hand twist and the right hand twist would counteract each other.

It is an object of this invention to make use of this fact and to provide a device hereinafter referred to as an anti-hunting device that governs the operation of the twist detector so that it only actuates the untwitsing unit when absolutely necessary.

According to the present invention an anti-hunting device, for use with apparatus for taking the twist out of roped material, which apparatus includes an untwisting unit, a twist detector, and a pair of cloth guiders for opening the untwisted rope to full width, comprises, at a location between the twist detector and cloth guiders,

means adapted to give a response according to the width of material at that location, and means for transmitting or relaying said response to govern the operation of the twist detector. The effective distance of the response means from the cloth guiders may be adjustable to suit different widths of material that may pass through the apparatus.

In a preferred form of the invention, the twist detector controls the untwisting unit electrically and the response means of the anti-hunting device comprises a pair of spaced apart switches, biased to the closed position, between the operating arms of which the material passes so that the switches are sensitive to the width of the material. It is preferable that, when both the switches of the anti-hunting device are held open by the cloth pressure against the operating arms, they render the twist detector electrically inoperative, but, if either is closed, due to rope formation reducing the width of the material and thus releasing the pressure on one or both arms, the twist detector is then made electrically operative. The spacing of the switches may be adjusted to suit different widths of material that may pass through the apparatus.

The switch arms are conveniently U-shaped, depending swinging arms.

The invention will now be described by way of example with reference to the accompanying drawings, in which

Figure 1 is a plan view of the anti-hunting device with certain parts removed and other parts broken away;

Figure 2 is a side elevation of the device shown in Figure 1, with certain parts in section and other parts removed;

Figure 3 is a section along the line 3—3 of Figure 2;

Figure 4 is a diagrammatic view in side elevation of untwisting apparatus incorporating the anti-hunting device;

Figure 5 is a diagrammatic view in front elevation showing part of the apparatus of Figure 4; and

Fig. 6 is a diagram showing electrical connections between the anti-hunting device, the twist detector, and the untwisting unit.

Referring to Figures 1 to 3, the anti-hunting device is designated generally by the reference numeral 100 and includes a frame which comprises two spaced apart parallel tubular members 1, two spaced apart bar members 2 welded to the underside of the members 1 and perpendicular thereto, and a strip casing 3, surrounding and welded to the tubes 1 and bars 2.

A pair of switch mounting plates 4 of a substantially inverted U-section span the frame and are secured by bolts 5 to the casing 3. The plates 4 are positioned one substantially beyond each of the bars 2. An inverted microswitch indicated generally at 6 and of the type which is normally closed, is secured (by means not shown) to the center of the cross piece of each plate 4; a switch-actuating plunger 7 protrudes vertically downwards from each switch 6.

A pair of swivel shafts 8 span the frame, one below each plate 4. The ends of the shafts 8 are journalled in bearings 9 carried by brackets 10, which brackets are secured to the inside of the casing 3 by the bolts 5. A swivel clamp 11 is mounted near each end of each shaft 8.

A substantially U-shaped switch-operating arm 12 is secured to each shaft 8 by its free ends 13, which are bent back at right angles to the plane of the arm and which pass through and protrude beyond the clamps 11. The ends 13 are secured within the clamps 11 by bolts 14. The arms 12 are so positioned that the vertical members of each arm pass inside the bars 2 and between the tubes

1 and the casing 3 so that the cross limbs 15 of the arms are below the frame.

Mounted to the free ends 13, of each arm 12, that protrude beyond the clamps 11 is a cross plate 16 the ends 17 of which are curled around the ends 13. Each plate 16 is held in position on the ends 13 by locating collars 18, each of which is provided with a locking screw 19.

An upstanding bolt 20 is mounted in the center of each plate 16 and vertically below the plunger 7 of the micro-switch 6 by two lock nuts 21, which nuts allow adjustment of the height of the bolt above the plate 16. The head of the bolt 20 is filed over as indicated at 22.

Referring to Figures 4 and 5, an untwisting apparatus of known type is diagrammatically shown which comprises a pulley 101 over which the roped material passes prior to its final down-run to a pair of cloth guiders 102. A twist detector, indicated generally by the reference numeral 104, is also in the down-run but above the anti-hunting device, and an untwisting unit, indicated generally by the reference numeral 105, is in the up-run of the roped material. The approximate formation of the material during its down-run is indicated by the broken line 103. The anti-hunting device 100 is mounted, as shown in Figs. 4 and 5, so that the material passes, in the course of its down-run, between the two tubular members 1 and the cross limbs 15 of the anti-hunting device.

Referring to Fig. 6, the twist detector 104 and the untwisting unit 105 are shown as being connected in an electrical circuit whereby the anti-hunting device may control energization of the untwisting unit. Thus a power lead L1 is connected to parallel leads 106 and 107 both of which feed into the twist detector 104. Switches 6 of the anti-hunting device 100 are shown as being interposed in leads 106 and 107 so that when both switches are open the circuit between L1 and the twist detector is broken. Arms 12 of anti-hunting device 100 are indicated generally in Fig. 6 and are further indicated as holding switches 6 open which, of course, is what occurs when the material, as shown by the broken line 103, bears against arms 12 and forces them apart. Since switches 6 have been mentioned as being normally closed, should either arm 12 fail to bear against its associated switch to hold the switch open, then the circuit between L1 and twist detector 104 will be closed. The twist detector completes the circuit to the untwisting unit 105 which, being thus connected across leads L1 and L2, is energized to untwist the roped material.

The anti-hunting device 100 is positioned so that material passing through the device normally bears against and tends to force apart the arms 12, the outward movement of the arms being limited by the bars 2. When either arm is moved outwards it pivots with the corresponding shaft 8 and its free ends 13 together with the plate 16 and bolt 20 are moved upwards. As the bolt 20 moves upwards the head thereof abuts against the plunger 7 forcing it into the micro-switch 6, thus opening the switch and breaking one of the input circuits 106, 107 of the twist detector.

The extent of outward movement of the arms 12 can be varied by adjusting the position of the free ends 13 within the clamps 11; that is to say, referring to the right hand arm 12 in Figures 1 and 2, if the free ends 13 are adjusted to the left, the amount of outward movement of the arms 12 is increased, whereas if the free ends 13 are adjusted to the right the outward movement of the arm 12 is decreased.

Adjustment of the arms 12 will necessitate adjustment to the height of the head of the bolt 20 relative to the plunger 7. This adjustment is effected by means of the lock nuts 21. The head of the bolt 20 is filed over as indicated at 22 (Figures 1 and 2) so as to prevent excessive over-travel of the plunger 7 in the micro-switch 6.

It will be appreciated that adjustment of the arms 12 will also mean adjustment of the positioning of the cross plates 16 on the free ends 13. This is carried out by releasing the locating collars 18, by unscrewing the locking screws 19, moving the plates 16 to their now desired positions and securing the plates by re-locking the locating collars 18.

So that the function of the invention may be clearly understood, the operation of an untwisting apparatus without an anti-hunting device will be briefly described first of all and then the operation with an anti-hunting device will be described.

The untwisting apparatus is switched into operation after it has been "loaded," i. e. the material to be untwisted in twisted rope form has been fed up through the untwisting unit, over the pulley 101 down through the twist detector 104 and fanned or opened out to full width and attached to the cloth guiders 102 from which it is led off to a mangle or folding apparatus. Thereafter, when any twist in the rope is detected, the untwisting unit 105 is caused to rotate in such a direction as to remove the twist. The material, still gathered but untwisted then continues to fan out to full width by the action of the cloth guiders 102. As previously mentioned, the twist detector faithfully records any twist in the roped material and causes the untwisting unit to remove that twist, but not only does the untwisting unit remove the twist as dictated by the twist detector, it also tends to give the material one or two twists in the reverse direction for reasons already described, this reverse twist being later detected and removed.

An untwisting apparatus having an anti-hunting device 100 is loaded in a similar manner as described above except that the rope material having been passed through the twist detector 104 is then passed through the anti-hunting device before being attached to the cloth guiders. The spacing of the arms 12 of the anti-hunting device is such as to constrict the fanning out of the material so the edges thereof will normally bear against and force apart the arms 12. The outward movement of the arms 12 is restricted by the bar members 2, thus preventing undue strain on the plungers 7 and the micro-switches 6.

So long as the material is proceeding normally the twist detector 104 is rendered electrically inoperative but should a twist develop in the material in the course of its downrun and that twist creeps down below the level of the anti-hunting device 100, the material will cease to bear against both of the arms 12 thus allowing at least one to swing inwards and permitting its associated micro-switch 6 to return to its normally closed position.

As shown in Fig. 6, when either micro-switch 6 is closed, an electrical circuit is completed to the twist detector 104. The twist detector, being mechanically responsive to the twisted material passing through it, has already established an electrical connection to the untwisting unit 105 so that when either of the micro-switches 6 closes, the untwisting unit is energized to remove the twist detected by the twist detector. Inasmuch as the twist detector has been mentioned previously herein as controlling the untwisting unit electrically and since such a twist detector is well known to those skilled in the art as exemplified by the twist detectors shown in applicants' British Patent No. 677,647, the complete specification of which was published on August 20, 1952, details of the twist detector are not shown since the twist detector per se does not form the present invention. It is believed to be apparent from the foregoing that while the twist detector may respond mechanically to twist in the material passing through it to establish an electrical connection to the untwisting unit, the untwisting unit is not actually energized until either of the micro-switches 6 closes.

The advantage of so-to-speak "disabling" the twist detector from energizing the untwisting unit is that, as previously mentioned above, a given length of material

passing through the apparatus may have a portion having one direction of twist followed later by a portion having an opposite direction of twist whereby the twists counteract each other when the material is stretched out. Therefore if, by the time that the material reaches the anti-hunting device, it no longer has the twist detected by the twist detector, then the untwisting unit **105** is not energized even though the twist detector itself has established an electrical connection to the untwisting unit. This obviously takes advantage of those situations wherein the material corrects itself insofar as twist is concerned and therefore reduces the number of times that the untwisting unit **105** must go into action. Of course, if a twist detected by the twist detector **105** persists until the anti-hunting device **100** is reached, then the untwisting unit **105** does go ino action as described above to remove the twist. Following this, when the untwisted material reaches the anti-hunting device and has the predetermined width which it should have when it reaches the anti-hunting device, the arms **12** of the anti-hunting device are forced apart, thereby opening both micro-switches **6** and thus breaking the circuit to the twist detector and the untwisting unit.

The greater the width of material that is passed through the untwisting apparatus, the longer the effective length of the down-run of the material between the anti-hunting device and the cloth guiders must be for the guiders to fan out the material to full width. It may be desirable therefor to mount the anti-hunting device on the untwisting apparatus so that it may be readily raised or lowered relative to the cloth guiders. Furthermore the means (not shown) for adjusting the height of the anti-hunting device may be coupled to the adjusting means (not shown) of the cloth guiders.

If desired, instead of using micro-switches actuated by U-shaped arms, these may be replaced by a pair of photoelectric cells. In fact, if material of a flimsy nature is being untwisted by the untwist apparatus, it may not have sufficient weight, nor strength to force apart the arms to actuate the micro-switches and therefore in this instance the use of photoelectric cells would be more satisfactory.

The above remarks regarding the operation of untwisting apparatus with and without the use of an anti-hunting device are correct with regard to roped material passing through said apparatus at high speed (say 150 yds./min.) but when roped material is passed through at low speeds (say 12 yds./min.) the apparatus will not operate at all without an anti-hunting device.

What is claimed is:

1. An apparatus for taking the twist out of roped material comprising an untwisting unit, a twist detector, and a cloth guider arranged in series so that roped material may pass from said untwisting unit to said twist detector and then to said cloth guider, said untwisting unit being operable to untwist said roped material, said twist detector being operable to detect twists in said roped material, and said cloth guider being operable to open said roped material to full width after said material leaves the twist detector, means connecting said twist detector to said untwisting unit to actuate said untwisting unit in response to actuation of said twist detector, and means connected to said twist detector to disable said twist detector from actuating said untwisting unit even though said twist detector detects twists in roped material passing through the twist detector, said last named means being located between the twist detector and the cloth guider and being responsive to the width of the material passing from the twist detector to the cloth guider at said location.

2. An apparatus for taking the twist out of roped material comprising an untwisting unit operable when energized to untwist twisted roped material as the material passes through the untwisting unit, a twist detector operable to detect twists in roped material as the material passes through the twist detector, cloth guider means operable to open the untwisted roped material to full width after said material leaves the twist detector, said untwisting unit, twist detector, and cloth guider means being arranged so that the roped material passes from the untwisting unit to the twist detector and then to the cloth guider means, anti-hunting means located between said twist detector and said cloth guider means, said anti-hunting means being responsive to the width of the material passing from said twist detector to said cloth guider means at said location and being actuated to energize said untwisting unit if said width falls below a predetermined minimum, and means connected between said anti-hunting device and said untwisting unit to energize said untwisting unit when said anti-hunting device is actuated, said last named means including said twist detector.

3. An apparatus for taking the twist out of roped material comprising an electrically operated untwisting unit operable when energized electrically to untwist twisted roped material as the material passes through the untwisting unit, a twist detector operable mechanically to detect twists in roped material as the material passes through the twist detector, cloth guider means operable to open the untwisted roped material to full width after said material leaves the twist detector, said untwisting unit, twist detector and cloth guider means being arranged so that the roped material passes from the untwisting unit to the twist detector and then to the cloth guider means, anti-hunting means located between said twist detector and said cloth guider means, said anti-hunting means being actuated if the width of the material passing from said twist detector to said cloth guider means at said location falls below a predetermined minimum, and electrical circuit means connected between said anti-hunting device and said untwisting unit to energize said untwisting unit when said anti-hunting device is actuated, said last named means including said twist detector.

4. Apparatus according to claim 3, wherein said anti-hunting means includes electrical switch means connected in said electrical circuit means and said electrical switch means is actuated if the width of the material passing from said twist detector to said cloth guider means at the location of the anti-hunting means falls below said predetermined minimum.

5. An apparatus according to claim 4, wherein said electrical switch means is biased to normally closed position but is held open by material passing from said twist detector to said cloth guider means as long as the material width at the location of the anti-hunting means is above a predetermined minimum, said electrical switch means closing in response to the bias thereon if said material width falls below said predetermined minimum.

6. In apparatus for taking the twist out of roped material including a twist detector and means to open the material to full width after the material leaves the twist detector; a device for detecting the width of said material at a location between said twist detector and said opening means, said device comprising a pair of spaced apart width sensing means between which the material may pass as it travels from the twist detector to the opening means, at least one of said width sensing means being operable to initiate a control signal when the width of the material passing between said width sensing means falls below a predetermined minimum.

7. In apparatus for taking the twist out of roped material including a twist detector and means to open said material to full width after the material leaves the twist detector; a device for detecting the width of the material at a location between the twist detector and the opening means, said device comprising a pair of spaced apart electrical switches, each biased normally to closed position, an operating arm positioned adjacent each switch and operative when moved toward the switch with which it is associated to open said switch against the switch bias, said

operating arms also being spaced apart to permit material passing from the twist detector to the opening means to pass between and bear against each operating arm to force each operating arm against its associated switch and hold the switch open whereby, should the width of the material fall below a predetermined minimum so that the material fails to bear against both operating arms, at least one of said switches closes in response to its bias.

8. In apparatus for taking the twist out of roped material including a twist detector and means to open said material to full width after the material leaves the twist detector; a device for detecting the width of the material at a location between the twist detector and the material opening means, said device comprising a frame through which the material may pass, a pair of spaced apart normally closed switches mounted on said frame, and a pair of U-shaped depending swinging arms pivotally connected to said frame, the lower ends of said arms being spaced apart in opposed relation to permit material to pass therebetween and bear against each arm to swing it with respect to said frame, each arm including means connected thereto which abuts the switch with which the arm is associated to open said switch when the arm is swung outwardly by material bearing against the lower end of the arm whereby, should material fail to bear against an arm, the latter may swing inwardly to remove the switch abutting means from the switch associated therewith and therefore permit said switch to close.

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