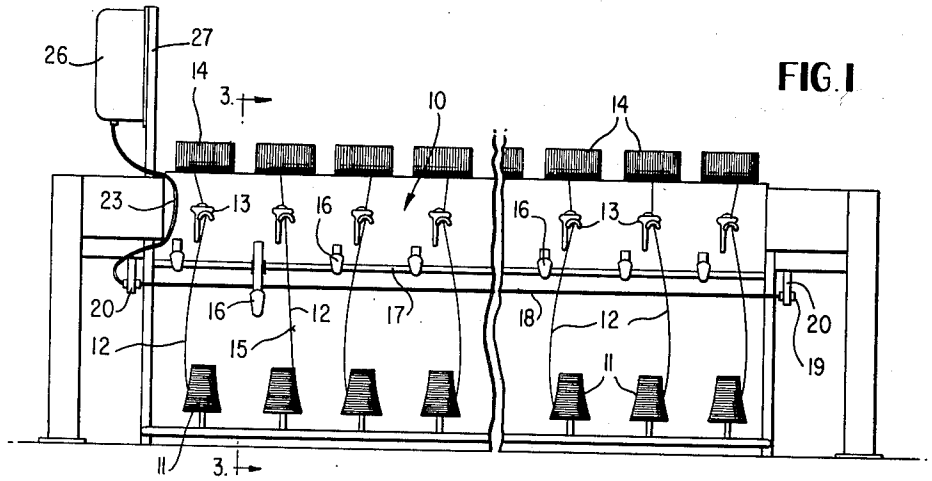
March 10, 1964 M. F. O'BRIEN ETAL 3,124,316

KNOT COUNTING ATTACHMENT FOR TEXTILE WINDERS

Filed Sept. 26, 1962

FIG. 1



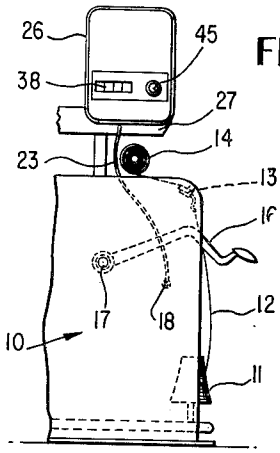
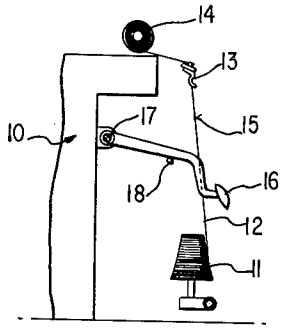


FIG. 2

FIG. 3



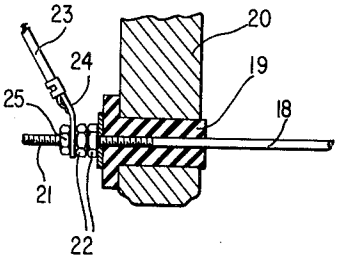
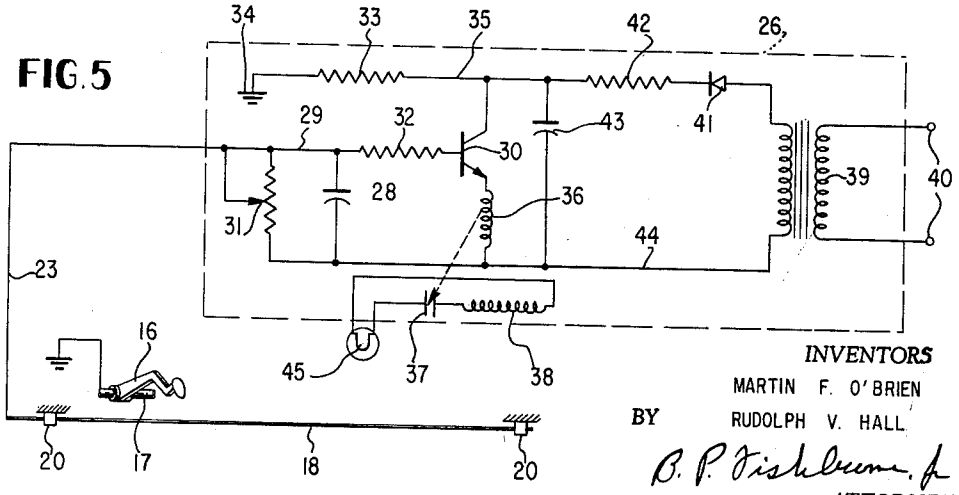


FIG. 4

FIG. 5



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KNOT COUNTING ATTACHMENT FOR TEXTILE WINDERS

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This invention relates broadly to textile machinery, such as the well-known manual winder for yarn, and more particularly to a production and quality control attachment for such machinery.

More specifically, the object of the invention is to provide a highly simplified, low energy electronic counter means for manual winders and like textile apparatus, enabling the accurate counting of the number of knots tied manually by the operator of the winder in the various strands of yarn being wound from one package to another, during normal operation of the machine.

A further object is to provide an electronic counting system for the knots which are tied subsequent to yarn breakage and during tie-ups to new packages after doffing full packages of yarn, thereby enabling the textile mill to collect accurate data pertaining to the quality of production, as well as data to form the basis of an incentive pay system for operators and to reduce the number of pay standards now commonly employed in the industry.

Under conventional practice, winder operators are paid by the number of pounds of yarn produced per week for a given job assignment. Yarn breaks and tie-ups are not counted and quality control is to a great extent guesswork. Many mills have multiple pay rates or standards, such as a separate pay rate for each type of yarn produced or packaged on a winder.

In accordance with the present invention, the low energy electronic counter constituting a simple attachment for the manual winder actually counts the number of tie-ups or starts during the operation of the winder, as well as the number of knots tied due to yarn breakage which automatically stops the operation of the machine, or a unit of the machine. The counting system is substantially foolproof and has a built-in time delay factor rendering it substantially impossible for the operator to "cheat," by recording on the counter a greater number of knots than those actually tied. By accurately counting the actual number of knots tied, which is a direct function of the work performed by each operator, the mill can install an equitable incentive pay system, and quality control is improved, since the mill now has an accurate record of the number of knots or tie-ups for a given period of machine operation. The very simple invention attachment is installable upon new or existing manual winders or like textile machinery, with substantially no structural modification thereof and with no interference whatsoever with the efficiency or normal operation of the machinery.

Other objects and advantages of the invention will be apparent during the course of the following detailed description.

In the accompanying drawings forming a part of this application and in which like numerals are employed to designate like parts throughout the same,

FIGURE 1 is a partly diagrammatic side elevation of a conventional manual winder equipped with the invention attachment, partly broken away,

FIGURE 2 is a fragmentary end elevation of the winder and invention attachment,

FIGURE 3 is a fragmentary transverse vertical section taken substantially on line 3—3 of FIGURE 1,

FIGURE 4 is an enlarged fragmentary vertical sectional view of a conductor wire and associated elements

and showing the manner of mounting the wire upon the winder, and

FIGURE 5 is a schematic view of the electronic circuit forming a part of the invention.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of the invention, the numeral 10 designates generally a conventional manual winder of the type used to wind yarn from one package of a given form to another package of a different form or from a bobbin to a package, and the like. The manual winder includes a great number of separate winding units, a few of which are shown in FIGURE 1, all normally driven by a main drive shaft, not shown. In FIGURE 1, each winding unit comprises a bottom package 11 of yarn having a yarn strand 12 unwound therefrom and engaging a conventional guide means 13, prior to rewinding of the yarn strand onto a top package 14. The particular packages shown and their arrangement are illustrative only, and variations in the size, shape and arrangement of the packages being wound and unwound are contemplated and quite usual in the operation of the manual winder.

In the conventional operation of the manual winder 10 without the present invention applied thereto, whenever one of the strands 12 breaks or the yarn is wound completely off of one of the packages 11, the particular unit composed of the two adjacent packages 11 and 14 is released automatically from the drive shaft of the winder and this unit stops, while the remaining winder units continue to operate. At this time, the operator must either tie up the broken yarn strand to produce a knot 15 therein, as illustrated in FIGURE 1, or the operator must doff a full package of yarn and tie up the yarn end of a supply package with a new package to be formed, thereby resulting in the manual tying of a knot similar to the knot 15. When either of these manual knot tying operations is performed, the operator depresses one of a number of manual levers 16 on a shaft 17 near the front of the machine and re-engages the particular stopped winding unit with the continuously driven shaft and again starts the winding of yarn at this particular unit. The several winding units to this extent are independent in operation and each winding unit is adapted to stop automatically upon yarn breakage or exhaustion of yarn from the supply package, and each unit is manually reset or brought into action by the adjacent manual lever 16, as stated. FIGURE 1 and FIGURE 3 show one lever 16 in the depressed position for restarting a particular winder unit after the knot 15 has been tied. FIGURE 1 and FIGURE 2 show the other levers of the other winder units in their normal raised positions as when such units are winding yarn normally. All of this construction and operation is conventional and well-known and need not therefore be described in further detail herein. The construction and mode of operation of the conventional manual winder with which the present invention is associated is disclosed substantially in prior United States Patent 1,958,060 of May 8, 1934 to J. O. McKean. Substantially the same conventional machine is shown on page 33 of the April 1963 edition of "Textile Bulletin" designated Model 102 of Foster Machine Company, Westfield, Massachusetts.

The counting attachment or system of the present invention which enables the mill to record and keep track of the number of knots tied by the operator for the purposes above specified is as follows.

A sturdy conductor rod or wire 18 spans the front of the machine horizontally and longitudinally, forwardly of the lever shaft 17 and beneath the manual levers 16. The ends of this conductor 18 are received within insulating bushings 19, held within depending brackets 20, secured rigidly to end portions of the manual winder frame. The

extreme ends of the conductor 18 may be screw-threaded as at 21 to receive nuts 22 employed to render the straight conductor 18 taut so that it will not sag or deflect appreciably when engaged by one of the levers 16 as shown in FIGURE 3. The conductor 18 is insulated by the bushings 19 from the main framework of the machine.

A cable 23 has an electrical terminal 24 connected at 25 to one end of the conductor 18, and this cable leads into a housing 26 mounted upon an upstanding support 27, secured rigidly to the main frame of the manual winder 10 near one end thereof.

The control circuit of the counter attachment or system is enclosed within the overhead housing 26, and with reference to FIGURE 5, this circuit comprises a condenser 28 connected with a wire 29, in series with the cable 23. The cable 23 leading from one end of conductor 18 and the wire 29 provides a charging path for condenser 28 and forward bias for transistor 30, as shown in FIGURE 5. A potentiometer 31 in parallel with condenser 28 provides a means of varying the length of time that condenser 28 maintains transistor 30 in the forward bias or conduction condition, thereby affording a time delay in the counter circuit. A resistor 32 in series with wire 29 and transistor 30 limits the amount of bias current to the transistor. Another resistor 33, grounded at 34 and connected with a wire 35 limits surge current when condenser 28 begins charging. When transistor 30 is in conducting condition, a relay 36 is energized, closing counter contacts 37, causing a counter 38 to count. The power supply in the housing 26 consists of a transformer 39, connected with a suitable source of power at 40, a diode 41 which rectifies alternating current from the transformer to direct current, and a resistor 42 which limits surge current through rectifier 41, and which is filtered by a condenser 43, connected between the wire 35 and a wire 44 leading from the transformer 39 and interconnecting the latter with the potentioemter 31 and other elements, as shown. An indicator light 45 connected in parallel with counter 38 lights when relay 36 is energized, indicating to the operator that the counter system is operating and has counted one knot.

In operation, as long as no breaks occur in the several yarn strands 12 and none of the supply packages 11 are completely exhausted, all of the winder units operate continuously and without interruption to wind yarn from the packages 11 onto the packages 14. If a break occurs in any one of the strands 12 or if a supply package is exhausted, necessitating the provision of a new supply package, and/or the doffing of a full package 14, the particular winder unit of the machine will stop operating automatically, as previously stated. Assuming that a break in one of the strands 12 has occurred, the operator will tie the knot 15, as shown, and after doing this, the adjacent lever 16 is depressed, as shown in FIGURES 1 and 3, for restarting the associated winder unit.

Simultaneously, the lever 16 will engage the bare conductor 18, grounding the very low energy circuit through the lever and through the frame of the machine. The voltage in the conductor 18 is in the millivolt range and extremely low energy is therefore being dealt with in the conductor 18. When so grounded, the circuit of FIGURE 5 which is constantly supplied with power at 40 is energized, and the potentiometer 31 has been preset so that the time delay factor is about four seconds, or just enough to allow the operator to move to the next winder unit which may need attention. The primary purpose of the time delay is, however, to eliminate false counts which might be caused by bouncing of the lever 16 or the operator depressing the lever, two, three or more times in quick succession to thereby falsely indicate that a greater number of knots have been tied. This is not possible with the present circuit having the built-in adjustable time delay factor previously mentioned. By the time that the counter 38 counts and records the tied knot and after the time delay interval has elapsed, the particular winder unit will have again started. In any event, it is much easier for the operator to tie up the broken end of yarn than it would be to wait through the time delay interval and attempt to get extra counts thereby jeopardizing her job.

When the particular lever 16 engages the conductor 18 and grounds and thereby energizes the counter circuit, a charge is built up on condenser 28, and in conjunction with the time delay potentiometer, this condenser feeds the transistor 30 and maintains the same in the forward bias or conducting condition for a predetermined time, such as four seconds. When the transistor 30 is in conducting condition, relay 36 effects closing of the contacts 37, in a conventional manner, and the counter 38 records one knot tied as previously explained.

The counting system of the invention is virtually foolproof in operation, very simple in construction and requires very little maintenance. It is easy to install on new or existing equipment and requires virtually no physical alteration of the equipment and does not interfere with the normal use thereof or the normal procedure of the human operator.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention or scope of the subjoined claims.

Having thus described our invention, we claim:

1. In a textile machine of the type employed to wind yarn from supply packages to packages of different form, a reset lever shaft, a plurality of reset levers mounted upon said shaft and adapted to be individually depressed by an operator for restarting winder units of the machine subsequent to breakage of yarn ends and manual tying of such ends, a conductor element spanning said machine lengthwise thereof beneath said levers and adapted to be engaged by any one of said levers upon depression thereof by the operator, and electrical circuit means including a digital counter connected with said conductor and grounded and energized for actuating said counter one count upon engagement of one of said levers with said conductor subsequent to the stopping of an associated winder unit of said machine.

2. In a textile winding machine for yarn, a plurality of yarn winding units adapted to be continuously driven in unison, each unit adapted to stop automatically upon breakage of said yarn at said unit, a restarting lever on said machine adjacent each unit to be actuated by an operator for restarting the unit after tying the ends of the broken yarn, a conductor on said machine in the path of movement of each lever and engaged thereby upon actuation of each lever by said operator, a counter device to record the number of knots tied in said yarn manually by the operator, and electronic means interconnecting said conductor and counter device and energized by engagement of each lever with said conductor during stoppage of the unit associated with each lever and including a time delay element rendering it impossible to actuate the counter device more than one count prior to the restarting of the stopped unit of said machine.

3. The invention as defined by claim 2, and wherein said electronic means comprises a cable connected with said conductor, a condenser connected with said cable, an adjustable potentiometer connected with said cable in advance of said condenser, a transistor connected with said condenser and rendered conducting by said condenser, a relay connected with the transistor, contact means for the counter device electrically connected with said relay and adapted to be closed thereby when the transistor causes energizing of the relay, and a source of power for said electronic means to constantly impress a low energy potential upon the same and electrically connected with said cable through said potentiometer, engagement of said lever with said conductor causing grounding of said potential and energizing of said electronic means.

4. The invention as defined by claim 3, and wherein said source of power is an alternating current source, a step-down transformer connected with said power source, and rectifier and filtering means connected with said transformer secondary coil.

5. An electronic knot tying counter attachment for a conventional textile manual winder having independently operable winder units and a corresponding number of restart levers each adapted to be individually depressed by an operator to restart one of said units, said attachment comprising a taut conductor spanning the front of the manual winder near and below the restart levers thereof and adapted to be engaged by such levers when they are depressed by the operator, a counter to record the tying of each knot in broken yarn upon depression of each lever, and electrical circuit means including an adjustable time delay element interconnecting said counter and conductor and being energized to advance the counter one digit only

upon engagement of each individual lever with said conductor during stoppage of the particular winder unit associated with such lever.

6. The invention as defined by claim 5, and wherein said circuit means embodies a condenser discharge circuit which when energized actuates said counter, and said time delay element is a variable resistance element connected with the condenser discharge circuit to regulate the time interval during which said circuit remains energized.

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