Oct. 14, 1969 S. C. KERSHAW 3,472,460

WINDING APPARATUS

Filed Nov. 9, 1967 2 Sheets-Sheet 1

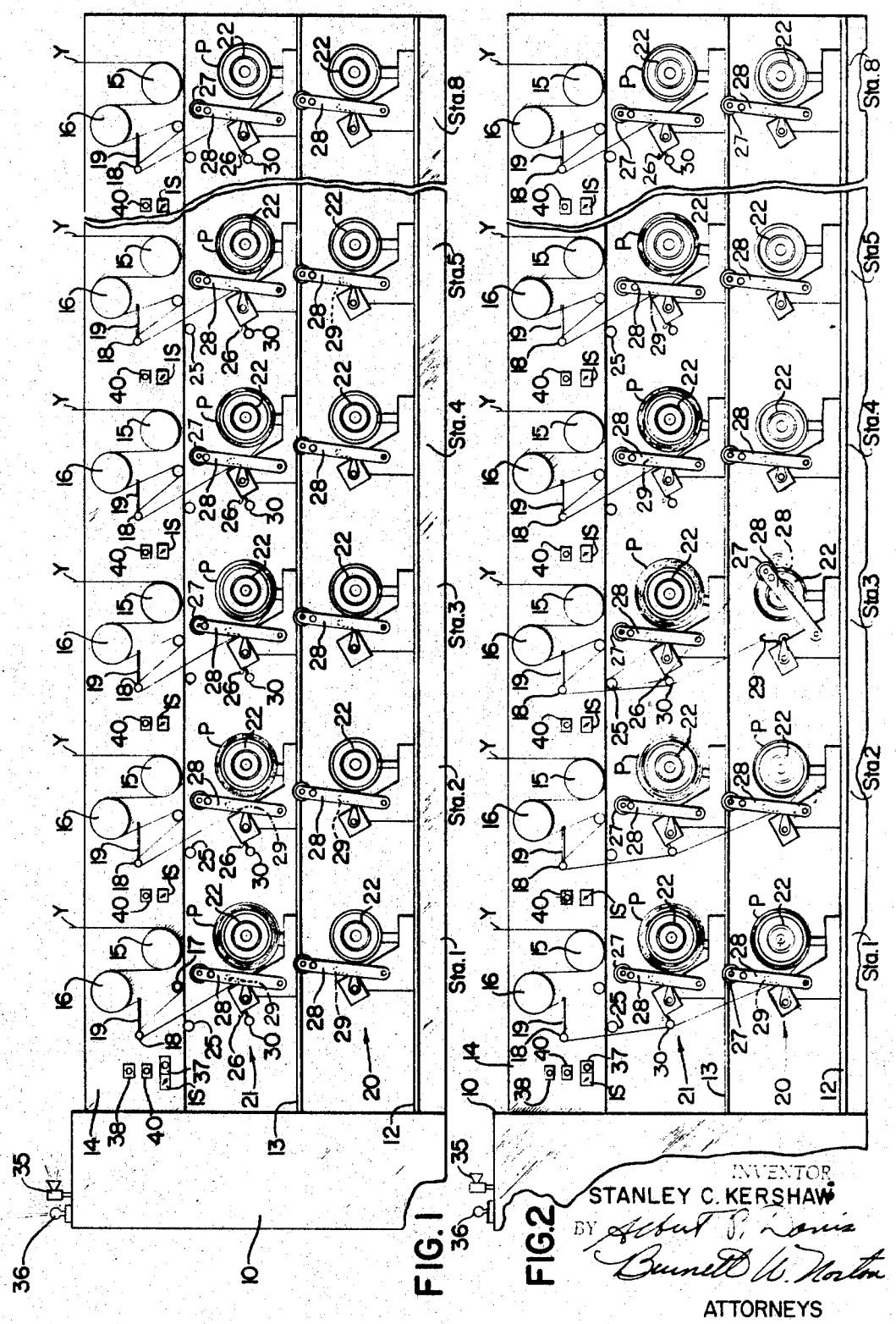


FIG. 1

FIG. 2

INVENTOR
STANLEY C. KERSHAW
BY Albert G. Davis
Burnett W. Norton
ATTORNEYS

Oct. 14, 1969 S. C. KERSHAW 3,472,460

WINDING APPARATUS

Filed Nov. 9, 1967 2 Sheets-Sheet 2

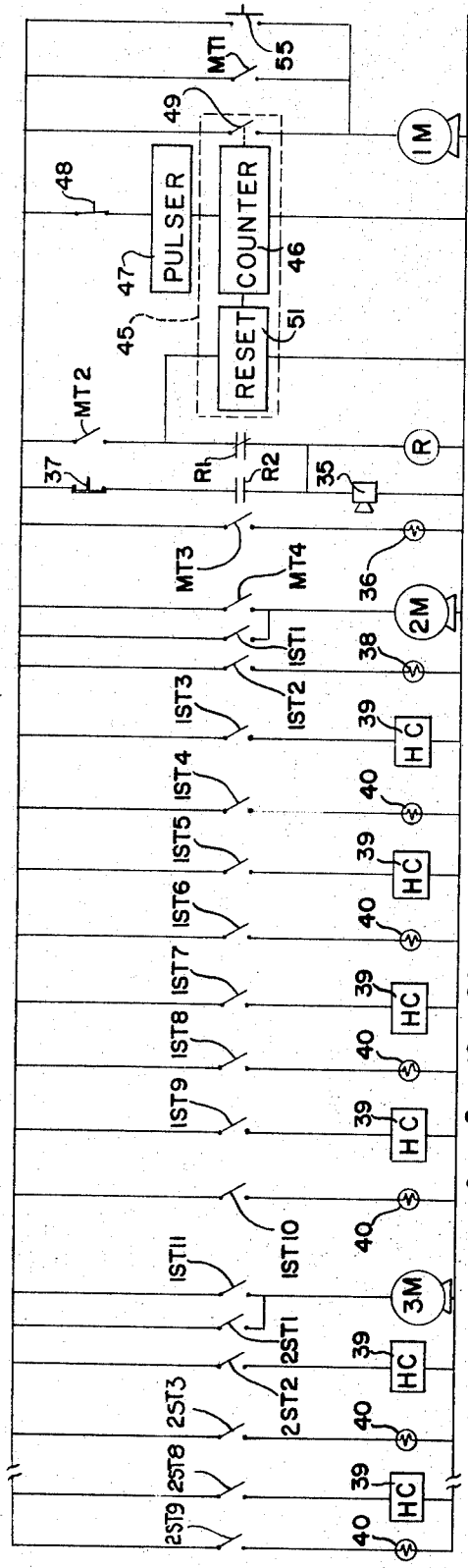


FIG. 3

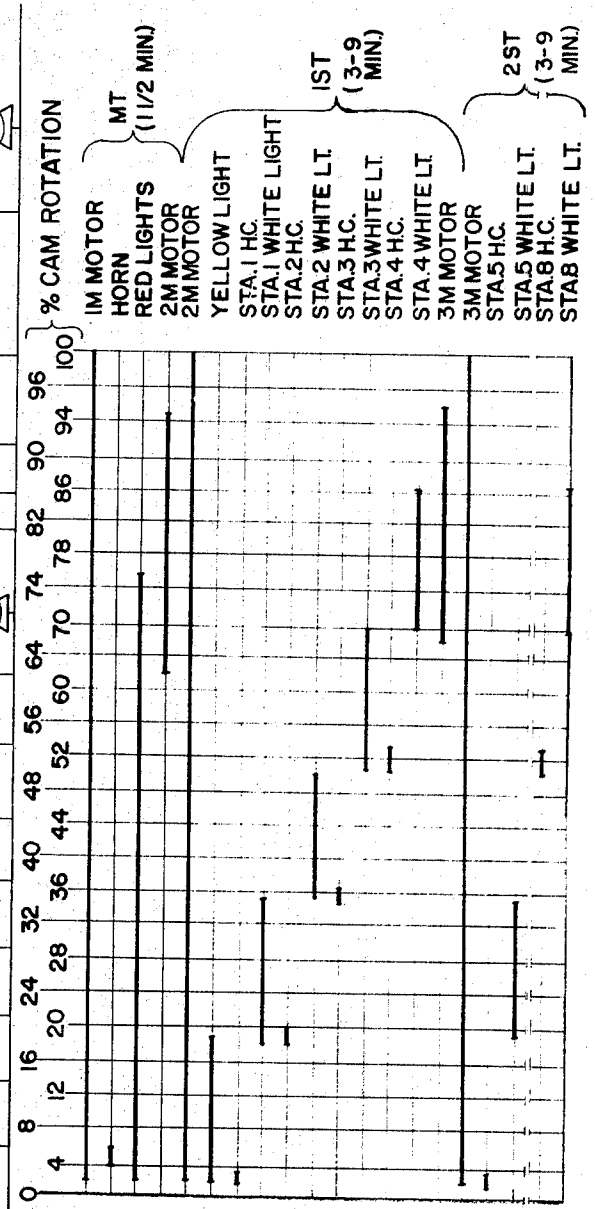


FIG. 4

INVENTOR.
STANLEY C. KERSHAW
BY Albert P. Davis
Burnett W. Norton
ATTORNEYS

United States Patent Office 3,472,460
Patented Oct. 14, 1969

3,472,460

WINDING APPARATUS

Stanley C. Kershaw, Lincoln, R.I., assignor to Leesona Corporation, Warwick, R.I., a corporation of Massachusetts

Filed Nov. 9, 1967, Ser. No. 681,763
Int. Cl. B65h 54/22
U.S. Cl. 242—18 6 Claims

ABSTRACT OF THE DISCLOSURE

Winding apparatus having a plurality of winding stations for concurrently winding packages of yarn. Each station has a pair of winding heads and during normal winding operation the packages are wound on an active one of the winding heads with a reserve one of the heads inactive. At each station, winding on the active head starts in a regular sequence and transfer of the yarn to the reserve head progresses in the same regular sequence from station to station so that the packages are of substantially identical size.

This invention relates to textile machinery and, more particularly, to winding apparatus for concurrently winding packages of substantially identical size.

As used herein the term "yarn" means all kinds of strand materials, either textile or otherwise, and the term "package" means the product of a winding machine whatever its form.

In certain facets of the textile industry it is highly desirable and far more profitable to use yarn packages each having substantially identical lengths of yarn. Two outstanding examples are in winding a beam or in forming a tow, both operations utilizing many packages in parallel so that if one of the packages runs out prematurely the remainder of the yarn on the other packages may be wasted.

Various attempts at providing packages with the same length of yarn, such as direct measurement of the length of yarn, or weighing the packages, or measuring the outside diameter of the packages, have not proved satisfactory, primarily because such expedients simply lack the accuracy desired.

The present invention is, in brief, directed to winding apparatus for concurrently winding a plurality of yarn copending Leesona Corporation, United States patent apparatus has a plurality of winding stations each in the form of a continuous winding machine as disclosed in a copending Leesona Corporation United States patent application Ser. No. 652,819, of John V. Keith, filed July 12, 1967 for "Textile Machinery." As disclosed therein, a winding station has a pair of winding heads and apparatus for transferring an advancing strand of yarn from an active one of the heads on which a package is being wound to a reserve one of the heads when the package is full.

In the present invention certain signalling and timing features are eliminated from the machine disclosed therein, and the winding rate of the heads are substantially identical. A control system provides regular winding intervals which determine the size of the packages, and signals are provided in a regular sequence to initiate operation of the reserve head and transfer mechanism at each winding station, thereby providing progressive transfer of yarn in a regular sequence from station to station.

It is a primary object of this invention to provide new and improved winding apparatus.

Another object of this invention is to provide new and improved winding apparatus for concurrently winding packages of substantially identical size.

Still another object is provision of new and improved

winding apparatus having a plurality of winding stations each with a pair of winding heads with an active one of the heads winding a package while a reserve one of the heads is inoperative during normal winding operation, with provision of a regular winding interval for all of the stations and signals in regular sequence for progressively initiating, in serial order of the stations, transfer of advancing strands of yarn, one at each station, from the active head to the reserve head as winding of the strand continues uninterrupted. A related object is provision of a signal which automatically starts operation of the reserve head at a station prior to a sensory signal to initiate operation of the transfer mechanism at the station. Another related object is provision for manually initiating the signal sequence.

These and other objects and advantages of the invention will be apparent from the following description and the drawings, in which:

FIG. 1 is a fragmentary, schematic elevational view of a preferred embodiment of the invention near the end of a normal winding interval;

FIG. 2 is a view similar to FIG. 1 but showing the apparatus during transfer of strands of yarn from active winding heads to reserve winding heads;

FIG. 3 is an electrical circuit diagram illustrating part of a control system of the apparatus; and

FIG. 4 is a cam diagram showing an operating sequence of the apparatus.

Referring to FIGS. 1 and 2 of the drawings, a winding apparatus as shown includes a control console **10** at one end of a series of winding stations identified from left to right as stations Sta. **1** through Sta. **5** and station Sta. **8** at the right end of the apparatus. Any number of such stations may be incorporated in the apparatus. A frame of the apparatus includes a lower platform **12** and an upper platform **13**, and at the top of the apparatus a panel **14**.

Each station is a winding machine generally of the type disclosed in the previously mentioned Leesona Corporation patent application. In brief, for each station there is mounted on the panel **14** a first godet roll **15** and a second godet roll **16** about which a strand of yarn Y passes in typical fashion before passing about a skewed guide roll **17** and then a wheel **18** on a compensator arm **19** from which the yarn is wound onto a rotating package P. Each winding station has a pair of winding heads including a lower head **20** mounted on the lower platform **12** and an upper head **21** mounted on the upper platform **13**. Each head has a rotatable spindle **22** on which the packages are wound. During normal winding operation the advancing strand of yarn Y is wound onto a package on one of these two heads, and as shown in FIG. 1, on the upper head **21** which is therefore designated the active head.

As a package P is being wound, the speed of the spindle **22** is reduced as the package grows in diameter to maintain the same lineal speed of the strand of yarn Y throughout the winding operation. This is accomplished through a mechanism described in the aforementioned patent application and including the compensator arm **19** which varies the spindle speed to maintain a constant tension level in the yarn passing over the compensator wheel **18**. The effective winding speed of all the heads (and therefore, the lineal speed of the advancing strands) is maintained the same by use of identical synchronous motors which drive the godet rolls **15** and **16**. As is well understood in the art, such motors operate at identical speeds when supplied with electric current at the same frequency.

When a package P is full at the upper (active) head **21**, a winding attendant re-routes the yarn Y (FIG. 2, Sta. 3) over a first crossover roll **25** and a threading bail

26, about a threading roll 27 on a transfer arm 28 of the reserve winding head (lower head 20), and about a return guide 29 and a second crossover roll 30 with the strand of yarn continuing to be wound onto the package P at the active head 21 and ready for transfer to the lower, reserve winding head 20. The lower (reserve) transfer arm is shown in an intermediate waiting position ready to be moved to a transfer position (phantom lines) for actually transferring the advancing strand to the lower (reserve) head. While not shown in the drawings, when transferring from a lower winding head 20 to an upper winding head 21, the strand of yarn Y is re-routed about the first crossover roll 25, a threading roll 27 on a transfer arm 28 of the upper head 21 and about a threading bail 29 of the upper head.

Between transfer operations, either all of the upper heads 21 or all of the lower heads 20 are active or reserve at the same time, and the reserve heads (whether the upper or lower heads of the winding stations) are inoperative. The control system described in the previously mentioned Leesona Corporation patent application provides for automatically starting the reserve head.

A regular winding interval for the active heads is provided by a control system shown in FIGS. 3 and 4. Near the end of such a winding interval, a signal, in the form of a horn 35 and a continuous blast of a red signal light 36, is provided to summons a winding attendant to prepare for transfer of the strands of yarn from the active to the reserve heads. The winding attendant depresses a push button switch 37 to turn off the horn. Thereafter, a yellow signal light 38 is illuminated at the first station Sta. 1, indicating to the operator to thread the strand of yarn at the first station for transfer from the active to the reserve head. In the illustrated embodiment, simultaneously with the yellow light signal 38, a signal is provided to a head controller 39 for initiating operation of the reserve winding head at the first station. A predetermined time after the yellow light signal 38, a signal is provided to initiate operation of the reserve head at Sta. 2 and a white light signal 40 is provided at the first station Sta. 1 indicating that the winding attendant should now operate the reserve head transfer arm 28 at the first station to transfer the strand of yarn from winding on the active head to winding on the reserve head, which now becomes the active head. The former active head, which now carries a full package P of yarn, is automatically stopped as a function of the machine described in the aforementioned patent application. Immediately upon transferring the yarn from the active to the reserve head at the first station, the winding attendant moves to the second station Sta. 2 and there threads the yarn for transfer from the active to the reserve head. When the white signal light 40 appears at the second station he completes the transfer by actuating the transfer arm 28 of the reserve head. The winding attendant proceeds to the next adjacent station (Sta. 3) and continues the procedure upon each white light signal 40 until the yarn has been transferred to the reserve head at the last station Sta. 8. The signals including the yellow light signal 38, the white light signals 40 and the signals to the head controller 39 initiating operation of the reserve heads are provided in a regular sequence, for example of 30 second intervals. The signal initiating operation of a reserve head occurs simultaneously with the white light signal to transfer yarn at the preceeding winding station, although this relationship may be varied as desired.

The operation of the winding machine is shown diagrammatically in FIG. 4. A control circuit is shown in FIG. 3 and includes a counter unit 45 such as type EVs 15.13–13/sec.–110 v. A.C. sold by Kessler-Ellis Products, a German firm having an office at Atlantic Highlands, N.J. As shown schematically in FIG. 3, the counter unit 45 includes a counter 46 which may be pre-set to count regular intervals as desired for winding full packages, for example 30 minutes. The counter 46 is connected in circuit with a suitable pulser 47 such as a reed switch actuated by an induction timing motor such as a Haydon motor series MP, 110 v., 60 cycle, 30 r.p.m. manufactured by General Time Corporation, of Thomaston, Conn. A manually operable switch 48 in this circuit may be opened to take the pulser 47 and counter 46 out of circuit, for reasons which will become apparent. At the end of a winding interval as regulated by the counter unit 45, the counter 46 operates to close a switch 49 which actuates a master timer. Thereafter, a reset device 51 of the counter unit 45 is actuated by the master timer to open the counter switch 49 and reset the counter which then proceeds to count another winding interval.

The master timer may be of any suitable type such as a multi-pulse repeat cycle timer MP–4–A6–07, manufactured by Eagle Signal Division of E. W. Bliss Co., Davenport, Iowa. This timer has four cams suitably mounted on a cam shaft for rotation therewith responsive to operation of a master timer motor 1M (FIG. 3). This motor 1M is connected in circuit with the counter unit switch 49 for operation when this switch closes at the end of a winding interval. Each of the four master timer cams has a lobe for actuating an operator of an electrical switch (designated MT1–MT4 in FIG. 3, and corresponding to associated cams one through four of the timer) and maintaining the switches actuated during the percent of rotation of the shaft as shown by the top four heavy lines in FIG. 4. By way of example, the master timer may operate for ninety seconds which is equivalent to one-hundred percent rotation of the cam shaft. As illustrated in FIG. 3, the counter switch 49 closes momentarily to actuate the motor 1M of the master timer and thereupon the first cam of the master timer closes the switch MT1 (2–100%) which provides a holding circuit maintaining the master timer motor 1M in operation. A second master timer cam momentarily closes a switch MT2 (4–6%) energizing a relay R in circuit with a normally closed relay contact R1 which then opens slightly after a second relay contact R2 in circuit with the signal horn 35 closes thus energizes the horn and providing a holding circuit for the relay R until the push button 37 is operated to open the circuit whereupon the relay is de-energized. A third master timer cam closes a switch MT3 (2–75%) energizing the red light signal 36, and a fourth master timer cam subsequently closes a switch MT4 (63–95%) energizing a motor 2M of a first station timer.

The control system further includes a pair of station timers which may be similar to the master timer and may operate to provide any desired regular sequence between transfer operation at the stations. These timers may be adjusted to operate over a span of 180–360 seconds for 100% cam shaft rotation. Any suitable type of timer may be used and in an apparatus with eight stations two station timers were used, both Eagle multi-pulse cycle timers type MP–10–AG–615, having ten cams each. (The cam diagram, FIG. 4, shows the first of the station timers as having eleven cams. This is solely a matter of convenience in illustrating the signal circuit in that the yellow signal light in the actual machine is connected in circuit with internal wiring of the first station, but could as well be incorporated into a station timer having eleven cams.) The master timer closes the switch MT4 in circuit with the first station timer motor 2M, as previously discussed, to place this motor in operation, whereupon a first cam of the first station timer closes a switch 1ST1 (2–100%) providing a holding circuit for the motor 2M. A switch 1ST2 closes (2–18½%) simultaneously with the switch 1ST1 to actuate the yellow signal light 38. Also simultaneously, a third cam closes a switch 1ST3 providing a signal to the head controller 39 of the first winding station Sta. 1 to place the reserve head at station No. 1 in operation. (This signal is fed to a suitable actuator, in lieu of the counter mechanism CM in FIG. 13 of the previously mentioned patent application, to operate switches

PC1 and PC2.) Thereafter a fourth cam closes a switch 1ST4 (18½–35%) after the desired interval in the regular sequence, to actuate the white signal light 40 at the first station Sta. 1, indicating to the winding attendant to immediately operate the transfer lever 28 of the reserve head, thereby transferring the strand of yarn from the active head to the reserve head. Simultaneously with closing of switch 1ST4, a fifth cam closes a switch 1ST5 (18½–20%) for providing a signal to the second winding station Sta. 2 for actuating its reserve head, as described with reference to the first winding station Sta. 1. Transfer is made at the second station when a sixth cam closes a switch 1ST6 to illuminate the white light signal 40. The third winding station reserve head is actuated and transfer made by operation of the seventh and eighth cams closing switches 1ST7 and 1ST8, respectively and the fourth station is actuated by cam operated switches 1ST9 and 1ST10. At a suitable time, as illustrated in FIG. 4 shortly before a station No. 4 white signal light 40 is actuated, a motor 3M of the second station timer is placed in operation by a first timer cam closing a switch 1ST11 (66–95%).

The previously described procedure is repeated with a first cam of the second station timer closing a switch 2ST1 to provide a holding circuit for the second station timer motor 3M whereupon in regular sequence the reserve head of the fifth station is actuated by a signal provided by closing of a second switch 2ST2 of the second station timer and thereafter closing of a third switch 2ST3 to illuminate the white light signal at the fifth station. This procedure continues until transfer has been made at all of the winding stations. It should be noted that the first station timer cam No. 11 closes the switch starting the second station timer motor so that the regular sequence of operation of the stations remains constant. Any number of station timers may be connected in the previously described series, depending upon the number of winding stations and the number of cams on these timers.

One method of placing the winding machine in operation is to open the pulser cut-out switch 48 to stop the counter unit 45 and operate a manual operating initial start switch IS at each station (see the previously mentioned patent application) to start each upper head 21 in operation at the discretion of the winding attendant. When all of the upper heads 21 are winding, a manually operated overriding switch 55 is held closed until the horn 35 sounds and then transfer is made in the regular sequence from the active to the inactive heads as controlled by the control system.

To summarize the operation of the winding machine, when the counter unit 45 has run through its preset regular interval timing period, the counter switch 49 closes to place the master timer motor 1M in operation whereupon the call signals (the red light signal 36 and the horn signal 35) are actuated, and the reset 51 for the counter 46 is actuated so that the counter begins counting another winding interval. The winding attendant then depresses the horn cut out push button 37 shutting off the horn signal 35. In due course the first station timer motor 2M is actuated and the master timer actuates yellow light signal 38 along with a signal to the head controller 39 actuating the reserve head at the first station Sta. 1. In regular sequence the white light signal 40 at the first station Sta. 1 is illuminated to signal for operation of the transfer arm 28 at the reserve head of the first station. This sequence continues until all of the stations have undergone transfer.

While this invention has been described with reference to a particular embodiment in a particular environment, various changes may be apparent to one skilled in the art and the invention is therefore not to be limited to such embodiment or environment except as set forth in the appended claims.

What is claimed is:

1. Winding apparatus for concurrently winding strands of yarn into packages of substantially identical size, comprising a plurality of winding stations, one adapted to receive each of the strands for winding the strand onto a package, said winding stations each including a pair of winding heads for alternately winding packages with an active one of the heads winding the package and a reserve one of the heads inoperative during normal winding operation, and transfer means operable for transferring the associated strand from the active head to the reserve head, signal means operable for providing signals in regular sequence at each of said stations to initiate operation of the associated transfer means and reserve head, and control means for operating the signal means sequentially from station to station at regular intervals to initiate said signals.

2. Apparatus as set forth in claim 1 in which at each of said stations said signal means provides a first of said signals to initiate operation of the reserve head prior to a second of said signals to initiate operation of the transfer means.

3. Apparatus as set forth in claim 1 in which the winding stations are in serial order and said signal means provides the signals to said stations in said serial order of said stations beginning at a first of said stations and progressing serially to each next adjacent station.

4. Apparatus as set forth in claim 1 in which said winding stations are side by side in serial order, said heads operate at the same winding rate, said transfer means is operable for transferring the associated strand while winding of the strand continues on one of the associated winding heads, said signal means provides the signals to said winding stations in said serial order of said stations beginning at a first of said stations and progressing serially to each next adjacent station, and said signal means provides the signal to initiate operation of the transfer means at a station following the signal initiating operation of the reserve head at the last said station.

5. Apparatus as set forth in claim 4 in which the signals to initiate transfer are sensory, and the signals to initiate operation of the reserve heads are provided for automatically initiating operation of the associated reserve head.

6. Apparatus as set forth in claim 4 including means for overriding said control means and initiating operation of said signal means.

References Cited

UNITED STATES PATENTS

2,214,332	9/1940	Kline.	
2,946,526	7/1960	Kuroiwa et al.	
3,174,700	3/1965	Lemaire	242—18
3,394,895	7/1968	Hogg	242—18

NATHAN L. MINTZ, Primary Examiner