United States Patent [19]

Nelson

[11] **3,735,576**

[45] **May 29, 1973**

[54] **SPINNING SYSTEM**

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[73] Assignee: **Leesona Corporation,** Warwick, R.I.

[22] Filed: **Apr. 30, 1971**

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[52] **U.S. Cl.** **57/53**

[51] **Int. Cl.** **D01h 9/10**

[58] **Field of Search** ..... 57/34 R, 34.5, 53, 57/56, 78; 242/35.5, 35.6, 37

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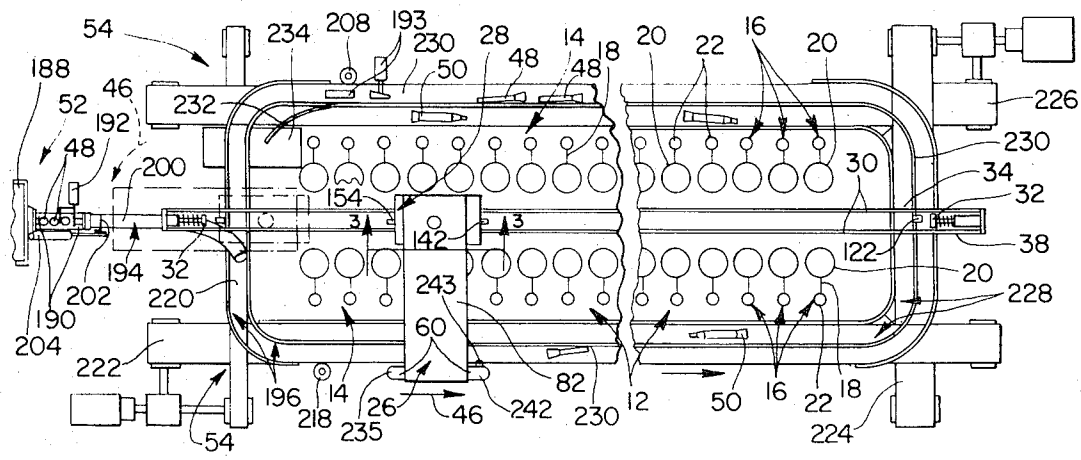
Primary Examiner—Werner H. Schroeder

Attorney—Albert P. Davis and Burnett W. Norton

[57] **ABSTRACT**

An automatic spinning system has at least one spinning frame with opposite banks of spinning stations. A tractor carries a tender capable of randomly servicing the spinning stations. The tractor is mounted for back and forth movement between opposite ends of a track above the banks of spinning stations. The tender is mounted on the tractor for swinging movement about the ends of the spinning frame from one of the banks of spinning stations to the other bank when the tractor is at either of the opposite ends of its track. Thus, the tender patrols the stations as it travels in one direction along a continuous path about the banks of spinning stations, and is capable of randomly servicing the spinning stations. Either a broken strand of yarn or a full bobbin at a station requiring servicing is sensed by operating mechanism for stopping the tender in servicing orientation with the station requiring servicing, whereupon the tender doffs the bobbin from the station spindle and donns an empty bobbin and starts the strand winding onto the empty bobbin. Empty bobbins are conveyed to the tender and filled bobbins are conveyed from the tender as they are doffed. If desired, the tender may be equipped with a system for ridding the spinning frame of lint.

7 Claims, 7 Drawing Figures



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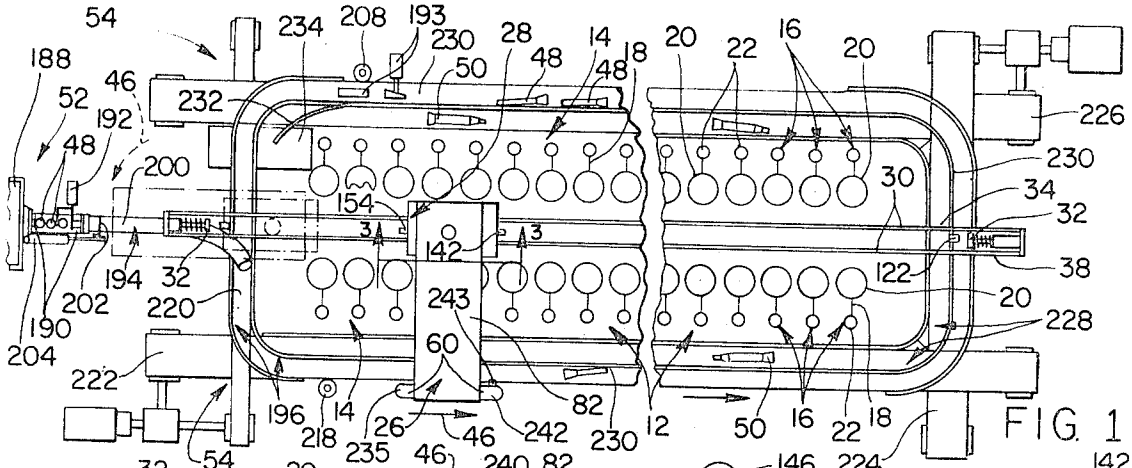


FIG. 1

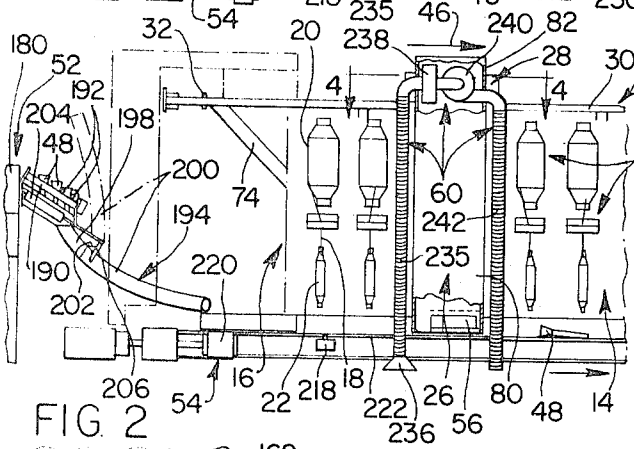


FIG. 2

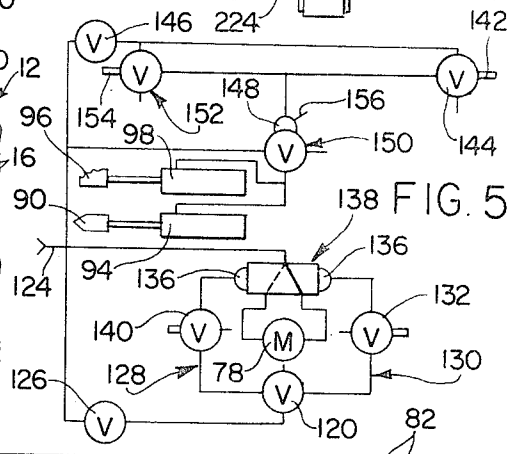


FIG. 5

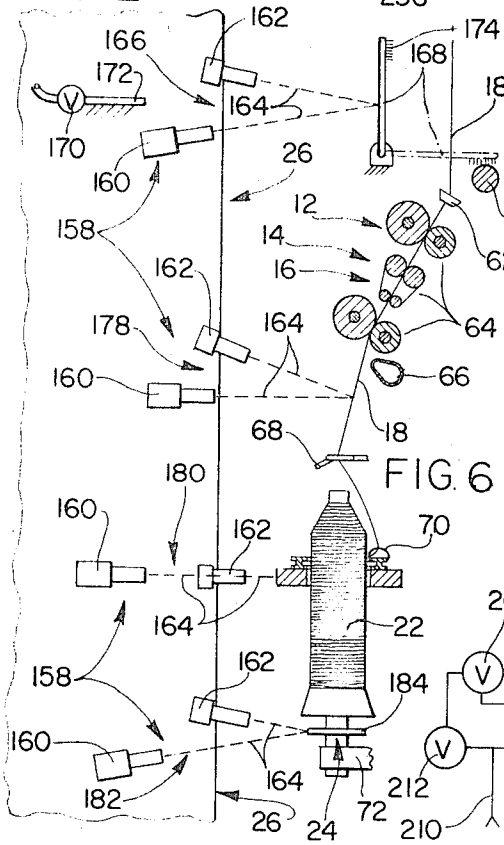


FIG. 6

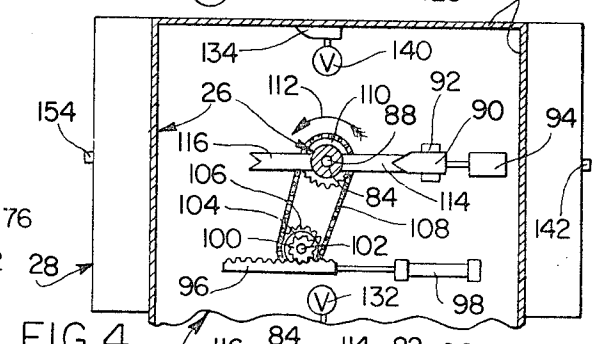


FIG. 4

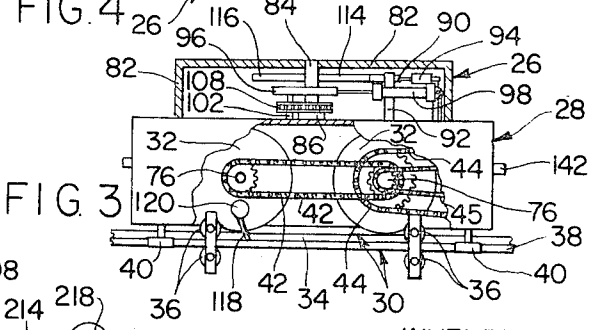


FIG. 3

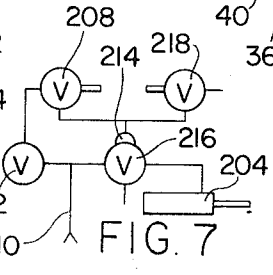


FIG. 7

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SPINNING SYSTEM

This invention relates to a spinning system and, more particularly, to a system for automatically servicing spinning stations.

As used herein the term "bobbin" means any core or other member on which yarn is or may be wound so that it may be readily moved from place to place. The term "filled bobbin" means a bobbin having a winding of yarn thereon, whether full or partially full. The term "empty bobbin" means a bobbin devoid or substantially devoid of any yarn. The term "yarn" is employed in a general sense to apply to all kinds of strand material, either textile or otherwise.

Various automatic systems have been proposed for servicing one or more spinning frames. One such system is described in U.S. Pat. No. 3,403,866, granted Oct. 1, 1968, in which a servicing tender provides back and forth patrolling along a bank of spinning stations and stops at any station requiring servicing. The bobbin being wound at the station is doffed, an empty bobbin is donned, and the strand of yarn is started winding onto the newly donned bobbin, whereupon the tender continues its back and forth patrolling of the stations. Other systems provide a pair of tenders, one for servicing each of opposite banks of spinning stations, with the tenders mounted on a common carriage which may move back and forth along a spinning frame or a row of frames, or may move along a continuous path along side by side spinning frames separated by an aisle between the frames. Such a dual tender system has an obvious disadvantage in that when one of the two tenders is servicing a spinning station, the other tender is generally idle, thus substantially increasing equipment costs per spinning station serviced in a given time period. Furthermore, continuous systems of this type limit the overhead clearance of the aisle between the spinning frames and additionally are more complicated and expensive to install, in part because of having to bridge the aisle with tracks for carrying the tenders, and may be hazardous to personnel because of the servicing equipment crossing the aisle. Additionally, transfer of bobbins to and from the tenders is complicated and impractical. In such systems the tenders usually move to a fixed location for receiving and delivering bobbins. In general, it is preferable to continuously transfer bobbins to and from the tender or tenders rather than to store large quantities of bobbins which would require increasing the overall size and operating weight of the tender or tenders. Systems have been proposed in which a servicing tender travels in a continuous path around opposite banks of stations. The tender is generally not required to supply or remove bobbins from the stations, or to stop at the stations, but rather it generally provides limited servicing or merely initiates operation of servicing apparatus forming part of each station, as the tender continues its movement, and normally such servicing is in sequential order from adjacent station to adjacent station.

It is a primary object of this invention to provide a new and useful spinning system. A related object is provision of such a system for automatically servicing spinning stations.

A more specific object is provision of a new and useful automatic spinning system capable of randomly servicing spinning stations of at least one spinning frame having opposite banks of spinning stations, with servicing apparatus patrolling the stations while moving in one direction along a continuous path past one of the banks of stations and then along the opposite one of the banks of stations and, responsive to any of the stations requiring servicing, for temporarily stopping in servicing orientation with the station requiring servicing. Related objects include: servicing the stations, for example, by doffing and donning bobbins and starting the strand winding onto the newly donned bobbin at the station being serviced; conveying empty bobbins to the servicing apparatus and conveying filled bobbins from the servicing apparatus; stopping the servicing apparatus at a station requiring servicing responsive, for example, either to a full bobbin at the station or to the strand failing to be advanced at the station; and mounting the servicing apparatus for swinging movement from one bank to the other at each of the opposite ends of the spinning frame or frames.

The invention, in brief, is directed to an automatic spinning system capable of randomly servicing spinning stations of at least one spinning frame having opposite banks of spinning stations. A servicing tender is mounted for swinging movement about the ends of the spinning frame (or frames) from one of the banks to the other bank so that the tender travels in a continuous path about the spinning frame (or frames) in a forward direction during its patrolling movement. Responsive to a spinning station requiring servicing, for example because the bobbin being wound at the station is fully filled, or because the strand is not being advanced to the bobbin, the tender is automatically stopped in servicing orientation with the spinning station. Upon stopping at a spinning station, the tender automatically doffs the bobbin at the station and donns an empty bobbin, and then starts the strand winding onto the newly donned bobbin, whereupon patrolling movement of the tender is resumed. Empty bobbins are conveyed to the tender and filled bobbins are conveyed from the tender, thus providing a continual flow of bobbins.

These and other objects and advantages of the invention will be apparent from the following description and the accompanying drawing:

FIG. 1 is a fragmentary, schematic plan view of a preferred embodiment of an automatic spinning system, with parts omitted for clearer illustration;

FIG. 2 is a fragmentary, schematic side view of the left end of the system shown in FIG. 1, with parts broken and omitted for clearer illustration;

FIG. 3 is an enlarged, schematic side sectional view, taken generally along the line 3—3 in FIG. 1, with parts broken away and removed to illustrate a portion of operating mechanism of a tractor and a servicing tender of a spinning system;

FIG. 4 is an enlarged, schematic plan sectional view, taken generally along the line 4—4 in FIG. 2, illustrating another portion of the operating apparatus of the tractor and tender;

FIG. 5 is a simplified pneumatic diagram of an operating circuit for the tractor and tender;

FIG. 6 is a diagram of a photo-responsive sensor system for initiating servicing operation of the tender; and

FIG. 7 is a simplified pneumatic diagram of an operating circuit for a portion of an empty bobbin system.

Referring generally to FIGS. 1 and 2 of the drawing, one or more conventional spinning frames 12 may be provided and, as illustrated in FIG. 1, at least a pair of spinning frames 12 are aligned end to end. Each spinning frame 12 has opposite banks 14 of spinning sta-

tions 16. At each station 16 a strand 18 is unwound from a roving or supply package 20 and is spun as it is wound onto a bobbin 22 rotated by a spindle 24 (FIG. 6). Apparatus for servicing the stations 16 is in the form of a tender 26 which is pivotally suspended from a carrier, here in the form of a tractor 28 mounted on tracks 30 for movement back and forth along a path between dash-pot type bumpers 32 at opposite ends of the tracks 30.

With reference to FIG. 3, the tractor 28 is mounted on its tracks 30 by tandem driven traction wheels 32 riding on one rail 34 of the tracks 30, and guide wheels including pairs 36 of upper and lower guide wheels engaging upper and lower faces of a second rail 38 of the tracks, and pairs 40 of inner (not visible) and outer guide wheels engaging inner and outer faces of the second rail 38. The traction wheels 32 are drivingly connected by a chain drive 42, and are suitably driven by a chain drive 44 for propelling the tractor 28 back and forth along its tracks 30. Another drive 45 provides for stopping the tender in servicing orientation with any of the spinning stations 16 requiring servicing, as will be described later.

As the tractor 28 approaches either end of its tracks 30, for example, the right end of the tracks as indicated by the directional arrows 46 in FIGS. 1 and 2, the tractor 28 is brought to a stop against the adjacent bumper 32. Mechanism shown in FIGS. 3 and 4 then swings the tender 26 counterclockwise about the end of the spinning frame 12 from one bank 14 of the spinning stations 16 to the other bank 14, and the tractor 28 moves toward the other end of its tracks 30 so that the tender 26 continues patrolling the bank of spinning stations while moving only in a forward direction along a continuous path. A fluid powered system (FIG. 5) provides the motive power for driving the tractor 28 back and forth along its tracks and for swinging the tender 26 about the ends of the spinning frame 12.

When the tender 26 comes upon an operational spinning station 16 requiring servicing, a sensing system shown in FIG. 6 initiates a work cycle of the tender by temporarily stopping the tractor 28 and positioning the tender 26 in servicing orientation with the station 16 requiring servicing. Upon completion of a servicing cycle, the tender 26 resumes patrolling the spinning stations 16.

With reference to FIGS. 1 and 2, throughout operation of the spinning system, empty bobbins 48 are conveyed to the tender 26 and filled bobbins 50 (FIG. 1, only) are removed from the tender. Empty bobbins 48, for delivery to the tender, may be stored in a jumbled condition in a hopper assembly 52 which orients and delivers the jumbled bobbins to a conveyor system 54 encircling the spinning frame. When the tender 26 requires an empty bobbin 48, suitable bobbin receiving apparatus on the tender is automatically operated to open a door 56 (FIG. 2, only) for removing an empty bobbin 48 from the conveyor system 54. Filled bobbins 50 are doffed from the spinning stations 16 and are delivered to the conveyor system 54 for transfer to a suitable receptacle 58 (FIG. 1, only) or onto a conveyor (not shown).

In order to prevent lint from collecting on the spinning stations 16 and about the bottom of the spinning frame 12, a cleaning vacuum and blower mechanism 60 (FIGS. 1 and 2) is preferably provided for removing and collecting the lint.

With reference to FIGS. 1, 2 and 6, and as previously noted, a plurality of spinning frames 12 (FIG. 1) are arranged end to end in a row and each spinning frame has opposite banks 14 of spinning stations 16. At each station 16 the strand 18, initially in the form of a roving, is unwound from the supply package 20 and is advanced downwardly through a guide 62 (FIG. 6) and a set of drafting rolls 64 and past an inlet in a vacuum duct 66 for removing the roving in the event that it breaks downstream of the drafting rolls. Under normal conditions, the strand 18 continues to be advanced downwardly from the drafting rolls 64 and through a lower guide 68 (FIG. 6) and then a ring traveler 70 which circles a bobbin 22 as the resultant yarn is wound onto the bobbin which is rotated by the spindle 24 driven as by a belt drive 72.

The tractor tracks 30 are supported in any suitable manner, for example by supports 74 (FIG. 2) secured to the spinning frames 12 and are generally centered above the opposite banks 14 of spinning stations 16. The pairs 36 and 40 of guide wheels which engage the rail 38 of the tracks 30 are journaled on fixed brackets. Referring to FIG. 3, the traction wheels 32 ride on the other rail 34 of the tracks 30 and are fixedly secured to axles 76 journaled on the tractor 28. The chain drive 44 for the traction wheels 32 includes a sprocket (FIG. 3) fixed to one of the axles 70 and a chain from a reversible pneumatic motor 78 (FIG. 5) on the tractor 28 for moving the tractor back and forth between the opposite ends of its track 30. The tender 26 has a generally vertical body 80 and a generally horizontal supporting portion 82 extending from the top of the body 80. The supporting portion 82 is fixed to a generally vertical pivot shaft 84 (FIGS. 3 and 4) which is journaled, as at 86 (FIG. 3), on the top of the tractor 28. Electric power and compressed air may be supplied to the tractor 28 in a suitable manner, for example as shown in the previously noted U.S. Pat. No. 3,403,866, and from the tractor 28 to the tender 26 through a commutator (not shown) and an air swivel connector (not shown) connected with an air line 88 (FIG. 4) in the pivot shaft 84.

After the tractor has arrived at either end of its tracks 30, a tender position retaining lock 90 (FIGS. 3 and 4), which is slidably mounted in a block 92 atop the tender 28, is released by retraction of a spring returned piston rod of a pneumatic cylinder 94 mounted atop the tractor 28. A rack 96, suitably mounted on the tractor 28, is operated by retraction of a spring returned piston rod of a pneumatic cylinder 98 mounted on the tractor, to rotate a pinion 100 (FIG. 4) fixed atop a shaft 102 suitably journaled on the tender 28, for operating a one-way clutch 104 on the shaft 102 to rotate a chain sprocket 106 (FIG. 4) which, through a chain 108 drivingly meshed with a sprocket 110 fixed to the tender shaft 84, rotates the tender 180° counterclockwise, as indicated by the arrow 112 in FIG. 4. The lock 90 seats in a notch in an arm 114 fixed to the tender shaft 84, to retain the tender 26 properly positioned along the bank 14 of spinning stations 16. A second arm 116 on the shaft 84 extends diametrically oppositely from the arm 114, and has a notch engaged by the lock 90 when the tender 26 is rotated at the opposite end of its track 30 to again retain the tender properly positioned along the other bank of spinning stations. Upon return of the piston rod of the rack cylinder 98, the pinion 100 is rotated but because of its connection through the one-

way clutch **104** with the sprocket **106**, this sprocket remains stationary.

Movement of the tractor **28** back and forth along its track **30**, and reversal of its direction of movement at opposite ends of its track, as well as swinging of the tender **26** about the ends of the spinning frames **12**, is controlled by a pneumatic system shown in greatly simplified form in FIG. **5** and including the previously noted pneumatic components (FIGS. **3** and **4**). As the tractor approaches either end of its track **30**, here the right end, an actuator **118** (FIG. **3**) of a pilot air reversing valve **120** (FIGS. **3** and **5**) engages an abutment **122** (FIG. **1**) fixed intermediate the track rails **34** and **38** to reverse the flow of pilot air received from a source of supply **124** (FIG. **5**) and passing through a pressure regulating valve **126**. As the actuator **118** engages the abutment **122**, the pilot air is shut off and vented from one branch **128** connected to the reversing valve **120** and is directed into another branch **130**. A normally closed valve **132** (FIGS. **4** and **5**) in the branch **130** is mounted on the tractor **28** and has an actuator engaged by a cam **134** on the tender **26** as the tender is swung about the end of the spinning frame, thus opening the valve **132** so that pilot air is applied to one of opposite air pilots **136** of a slide valve **138** which thereupon reverses the application of line air pressure to the motor **78** for reversing operation of the motor and thereby reversing the direction of movement of the tractor **28**. Thus, when the reversing valve **132** is reversed through engagement of its actuator **118** with the abutment **122** along the tractor track **30**, the air motor **78** keeps operating in the same direction it had been operating as the tractor **28** approached the end of the track, and therefore stalls and retains the tractor **28** urged against the bumper **32** until the tender **26** has been swung about the end of the spinning frame. The other branch **128** from the reversing valve **120** is a duplicate of the branch **130**, previously described, and is connected with the other air pilot **136** of the slide valve **138** through its cam operated shut-off valve **140**, which is mounted on the tractor **28** opposite the previously noted valve **132**.

As the tender engages the bumper **32** at the end of its track **30**, an actuator **142** (FIGS. **1**, **3** and **4**) of a normally closed pilot air valve **144** (FIG. **5**) is opened to provide pilot air passing through a pressure regulating valve **146** from the air supply line **124** to a vented air pilot **148** of a normally closed vented valve **150** which is thereupon opened to provide line air pressure to the lock cylinder **94** and the rack cylinder **98**, thus releasing the lock **90** and operating the drive rack **96** to swing the tender **26** on its shaft **84** from one bank **14** of spinning stations **16** to the other bank **14**. A similar valve **152** and its actuator **154** is mounted at the opposite end of the tractor to engage the left hand bumper **32**, and this valve **152** is connected between the regulating valve **146** and the vented air pilot **148**.

As the tender swings about the right end of the row of spinning frames **12**, the cam **134** on the tender **26** engages the actuator of the previously noted shut-off valve **132** in the branch **130** between the reversing valve **120** and the air pilot **136** of the slide valve **138**, thus reversing the application of line pressure from the source **124** to the motor **78** for reversing the direction of rotation of the motor and therefore the direction of movement of the tractor **28** along its track **30**. As soon as the tender moves away from engagement with the bumper **32**, the bumper engaging actuator **142** of the valve **144** is released to shut off pilot air from the air pilot **148** of the cylinder control valve **150**. Thus a small vent **156** in the air pilot **148** now releases the pilot air so that the valve **150** closes and vents the cylinders **94** and **98**, whereupon the lock **92** is engaged with the notch in the arm **114** and the rack **96** is returned to its initial position.

THE SIGNALLING SYSTEM

With reference to FIG. **6**, in order to initiate a work cycle of the tender **26** when it comes upon a spinning station **16** requiring servicing, an optical-electronic signalling system is provided on the tender. The signalling system illustrated in FIG. **6** is greatly simplified to more distinctly explain the operation of the spinning system. The signalling system may be considered as including four phototransducer units **158** each having at least one phototransducer **160** and a suitably light source **162** for projecting a beam of light **164** reflected from a target to the associated phototransducer **160**. All of the units **158** are suitably operatively mounted on the tender **26**.

As is fully disclosed in U.S. Pat. No. 3,498,039, granted Mar. 3, 1970, and with continued reference to FIG. **6**, the units **158** include an operational phototransducer unit **166** responsive to a target in the form of a roving breaker **168** at each spinning station **16** for providing an operational signal when the station is in operational condition. The roving breaker **168** is pivoted to a fixed portion of its station **16** and is normally maintained in a vertical position in which it provides a target from which the beam of light **164** from the light source **162** is reflected to the phototransducer **160**. As controlled by a programmer (not shown) and an overall control system shown in the previously noted patent, U.S. Pat. NO. 3,403,866, if after two servicing attempts the tender **26** is unable to place the spinning station **16** in operating condition, a valve **170** is opened and a jet of air is discharged from a nozzle **172** on the tender **26** and against the roving breaker **168** to pivot the roving breaker downwardly to the dashed line position in FIG. **6**, thus engaging the strand **18** of roving with pins **174**, or other suitable means, on the free end of the roving breaker which comes to rest on a stationary bar **176** of the spinning station, thus causing the roving to be broken above the drafting rolls **64**. When the tender **26** passes a station at which the roving breaker **168** is in its down position, the control circuit is such that the tender by-passes the station until it is again placed in operational condition by a spinning attendant.

Two other of the phototransducer units **158** (FIG. **6**) provide servicing signals, either of which, in conjunction with the previously discussed operational signal, initiates a work cycle of the tender. The first of these units is a yarn present phototransducer unit **178** which initiates a servicing signal only when a target in the form of the advancing strand **18** is not present, that is, when the strand **18** is not being advanced or is not present between the drafting rolls **64** and the lower guide **68**. The other of the servicing signal phototransducer units is a full bobbin phototransducer unit **180**. This unit is responsive to a target, in the form of a fully wound bobbin **22**, for providing a servicing signal which, again in conjunction with the operational signal, initiates a work cycle of the tender.

The phototransducer units **158** include a braking and orienting system disclosed in a co-pending Leesona

Corportion U. S. Pat. appliation Ser. No. 102,659, filed Dec. 30, 1970, and incorporated by reference. The fourth unit **182** provides a signal when the tender **26** is proximate servicing orientation with a spinning station requiring servicing. This unit is of the null type and is responsive to reflection of a ray of light from a target in the form of a brake drum **184** of the spindle **24** only when the tender is proximate servicing orientation with the spinning station **16** requiring servicing.

Reference may be had to the above noted patent application Ser. No. 102,569, for a complete discussion of a system for stopping the tender in servicing orientation with a spinning station. In brief, with reference to FIG. **3**, this system includes the chain drive **45** having a sprocket fixed to one of the traction wheel axles **76.** An alternate orienting system is disclosed in the previously noted, U.S. Pat. No. 3,403,866.

After successfully servicing a spinning station, or after a second unsuccessful attempt to service the spinning station, the tractor **28** is again started to resume the patrolling movement of the tender **26.**

The system for providing empty bobbins **48** to the tender **26** and for removing doffed (usually filled) bobbins **50** from the tender is shown in FIGS. **1** and **2.** The empty bobbins **48** are deposited in the bobbin hopper assembly **52,** as is fully disclosed in a co-pending Leesona Corporation U. S. Pat. application Ser. No. 789,283, filed Jan. 6, 1969, and incorporated by reference. Briefly, the empty bobbins **48** are deposited in a hopper **188** in a jumbled condition and are then oriented and depositied on rotating declining rods **190** having an escapement mechanism **192** at their lower ends. When the conveyor system **54** has space for an empty bobbin **48,** a sensing apparatus **193** (FIG. **1**) operates the escapement mechanism **192** to release a bobbin, as is fully disclosed in another co-pending Leesona Corporation patent application Ser. No. 863,858, filed Oct. 6, 1969, and incorporated by reference. When the escapement **192** is opened, the lowermost empty bobbin **48** on the rods **190** drops through a curved tube **194** and onto an empty bobbin conveyor **196** of the conveyor system **54.** The tube **194** has an upper section **198** (FIG. **2**) fixedly connected with the hopper **158,** and a lower section **200** connected by a hinge **202** with the upper section **198.**

In order to swing the lower section **200** of the tube **194** out of the way of the tender **26** as the tender swings about the adjacent end of the spinning frame **12,** air cylinder **204** is secured to the hopper **188** and has the free end of its spring returned piston rod pivotally connected to a lever **206** (FIG. **2**) fixed to and extending upwardly from the lower section **200** of the tube **194.** The cylinder **204** is operated to raise the lower section **200** of the tube as a cam (not shown) on the tender **26** engages a spring returned actuator of a normally closed valve **208** (FIGS. **1** and **7**), suitably fixed relative to the adjacent spinning frame, to open the valve **208.** Opening of the valve **208** pass air from a source of supply **210** and through a regulating valve **212** to an air pilot **214** of a normally closed and vented valve **216,** to open the valve **216** and apply line air pressure to the cylinder **204.** After the tender **26** has been swung about the end of the spinning frame **12,** the tender engages a spring returned actuator of a normally closed valve **218** (FIGS. **1, 2** and **7**), also fixed relatively to the spinning frame **12,** to open the valve **218,** thus venting the air pilot **214** and closing the valve **216** to vent the tube cylinder **204.**

The empty bobbin conveyor **196** is also fully described, in principal, in the previously noted patent application Ser. No. 863,858, and in brief includes four conveyor belts **220, 222, 224** and **226** (FIG. **1**), each suitably mounted and driven to convey the empty bobbins **48** around the row of spinning frames **12.**

For receiving the bobbins from the empty bobbin conveyor **196,** the tender **26** may be provided with the door **56** (FIG. **2**) which is swung outwardly across the empty bobbin conveyor when the tender requires a bobbin, as is disclosed in a co-pending Leesona Corporation U.S. Pat. application Ser. No. 879,857, filed Nov. 25, 1969, incorporated by reference. However, any suitable means may be provided on the tender **26** for receiving the empty bobbins from the conveyor. In any suitable manner known in the art, the empty bobbins **48** are donned onto the spindle **24** of the spinning station **16** being serviced, after a bobbin **50** has been doffed from the spindle. The doffed bobbins **50** are dropped through a chute (not shown) in the tender and onto a filled bobbin conveyor **228** in the manner disclosed in the previously noted U.S. Pat. application Ser. No. 863,858. However, in the present system, the conveyor belts **220–226** are sufficiently wide to carry, side by side along the banks **14** of spinning stations **16** and about the end of the spinning frame **12** remote from the empty bobbin hopper **188,** both the empty bobbins **48** and the filled bobbins **50.** The empty bobbin conveyor **196** and the filled bobbin conveyor **228** are separated by a continuous wall **230** and at the end of the filled bobbin conveyor **228** a deflector **232** (FIG. **1**) is fixed to the wall **230** and extends across the belt for deflecting the filled bobbins **50** into a suitable receptable **234** or onto another conveyor (not shown).

The cleaning system **60** is shown in FIGS. **1** and **2,** wherein an air inlet is in the form of a flexible tube **235** extends from a free end of a lint intake **236** (FIG. **2**) proximate the bottom of the spinning frames **12,** and terminates in a collector **238** fixed to the tender **26.** The collector **238** in turn is connected with a blower **240** (FIG. **2**). Air passing through the collector **238** is emitted from the blower into a tube **242** depending from the top of the tender **26** to a closed end proximate the bottom of the spinning frames **12,** and has a plurality of vertically spaced nozzles **243** (FIG. **1**) for ejecting jets of air against appropriate portions of the spinning stations **16** for ridding the stations of lint.

To summarize the operation of the spinning system, the tractor **28** travels back and forth along its track **30** and upon coming to either end of the track it hesitates while the tender **26** is swung about the adjacent end of the row of spinning frames **12.** As the tender **26** is swung about the end of the row of spinning frames at the empty bobbin hopper **188,** the lower portion **200** of the empty bobbin delivery tube **194** is swung upwardly to permit the tender to clear the tube. The intake tube **235** and blower tube **242** of the cleaning system **60** glide across the belts **220–226** and other equipment at the ends of the row of spinning frames **12.**

When the tender **26** comes upon a station **16** requiring servicing, the signal system (FIG. **6**) initiates the work cycle of the tender if the spinning station is operational. Upon initiation of the work cycle, the braking and orienting system

(FIG. 3) is actuated to position the tender 26 in servicing orientation with the spinning station 16 requiring servicing. The tender 26 then doffs the bobbin 50 from the spinning station spindle 24 (FIG. 6) donns an empty bobbin 48 onto the spindle, and starts the strand 18 winding onto the empty bobbin. Empty bobbins 48 are fed from the empty bobbin hopper 188 (FIGS. 1 and 2) and through the delivery tube 194 onto the empty bobbin conveyor 196 responsive to demand of the conveyor, as sensed by the sensing apparatus 193. The swinging door 56 on the tender 26 is opened to receive an empty bobbin 48 responsive to the demand of the tender for a bobbin. Bobbins 50 doffed from the spinning stations 16 are deposited by the tender 26 onto the filled bobbin conveyor 228 from which they are deposited in the receptacle 234.

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. Apparatus for servicing opposite banks of strand processing stations positioned along a strand processing machine comprising, means forming a continuous looped path along said opposite banks of said strand processing stations and completely about said machine, tender means for servicing said stations, tractor means for moving said tender means proximate to each of said stations, motive means for reciprocating said tractor means along a predetermined path between opposite ends thereof to thereby move said tender means, pivot means connecting said tender means with said tractor means, and operating means for moving said tender means around an end of said machine on said pivot means when said tractor means is proximate an end of said predetermined path.

2. Apparatus as set forth in claim 1 wherein said tender means includes means for doffing and donning bobbins and starting said strand winding onto the donned bobbin at the station being serviced.

3. Apparatus as set forth in claim 2 including means for conveying bobbins to said tender means, said tender means including means for receiving said bobbins from said conveying means.

4. Apparatus as set forth in claim 2 including means for conveying bobbins from said tender means, said tender means including means for delivering bobbins to the conveying means.

5. Apparatus as set forth in claim 3 including means for conveying bobbins from said tender means, said tender means including means for delivering bobbins to said conveying means.

6. Apparatus as set forth in claim 5 wherein said tractor means is operable in response to said strand failing to be advanced at said station requiring servicing or to a full bobbin at said station requiring servicing to stop said tender means at said station requiring servicing.

7. Apparatus as set forth in claim 1 wherein said predetermined path is positioned above and intermediate said opposite banks of strand processing stations, bumper means positioned at each of the opposite ends of said path, said tractor means abutting against said bumper means when the tractor means reaches each end of said predetermined path, said bumper being operable to initiate movement of said operating means to move said tender around an end of said machine.

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