United States Patent

[11] 3,538,990

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[54] BOBBIN ORIENTING INSTALLATION

22 Claims, 24 Drawing Figs.

[52] U.S. Cl. 198/33, 221/10
[51] Int. Cl. B65g 47/24, G07f 11/00
[50] Field of Search ..... 198/33(R1); 221/167, 169, 10; 193/43(B)

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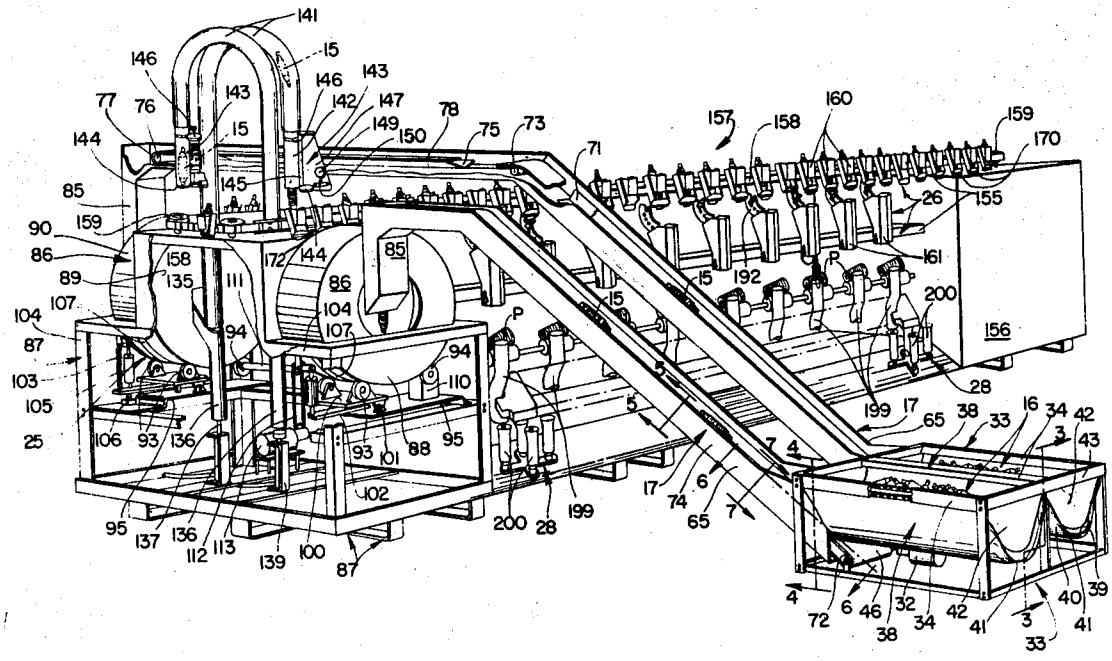
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Sheets 1—2 of dwg. pertinent; cols. 3—6 of spec only are relevent.

Hopper Feeds (Bulletin): pp. 13—14; Mach. Publ. Co., Ltd. Copy in group 313; class 198-33(RI).

Primary Examiner—Edward A. Sroka
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ABSTRACT: A textile mill installation and apparatus for simultaneously handling various types of filled yarn bobbins. The filled bobbins are stored in a yarn spinning or twisting processing area. Each type of filled bobbins is stored in a jumbled condition in a separate storage bin at the processing area and is automatically conveyed to bobbin orienting equipment at the winding area. The various types of oriented bobbins are selectively distributed to winding stations using a particular one of the types of bobbins to wind the packages. Once the various types of jumbled bobbins have been deposited in their respective storage bins, the entire operation of orienting and distributing the bobbins is automatic. The apparatus includes a storage bin conveyor which cooperates with a delivery conveyor in avoiding scuffing and undesirable interference of the bobbins while conveying the bobbins from the processing area to the orienting equipment which automatically orients both partially and fully filled bobbins. Finally, a distributing system receives the various types of the oriented bobbins and simultaneously and automatically distributes each type of bobbin to winding stations using that type of bobbin.



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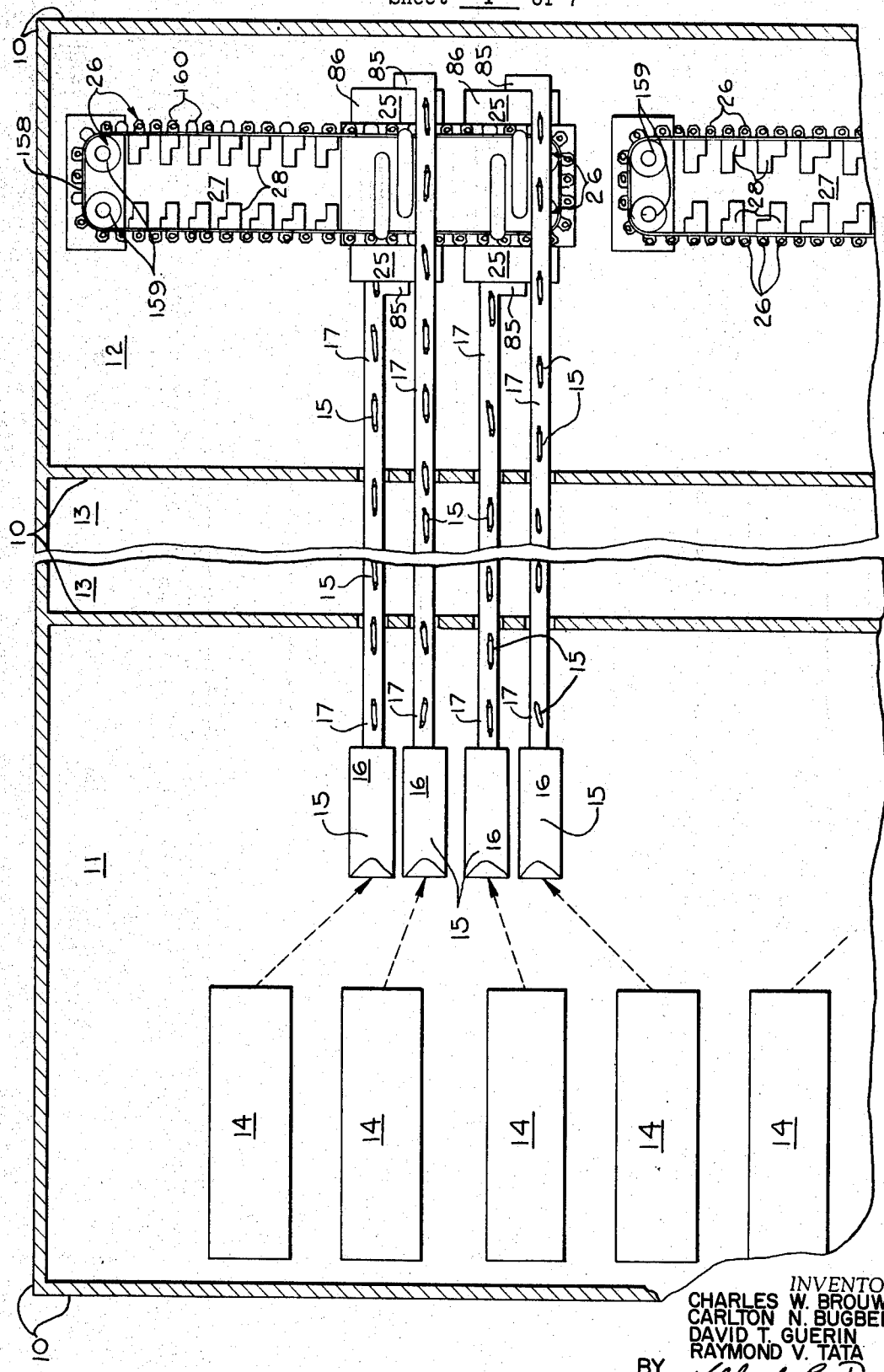


FIG. 1

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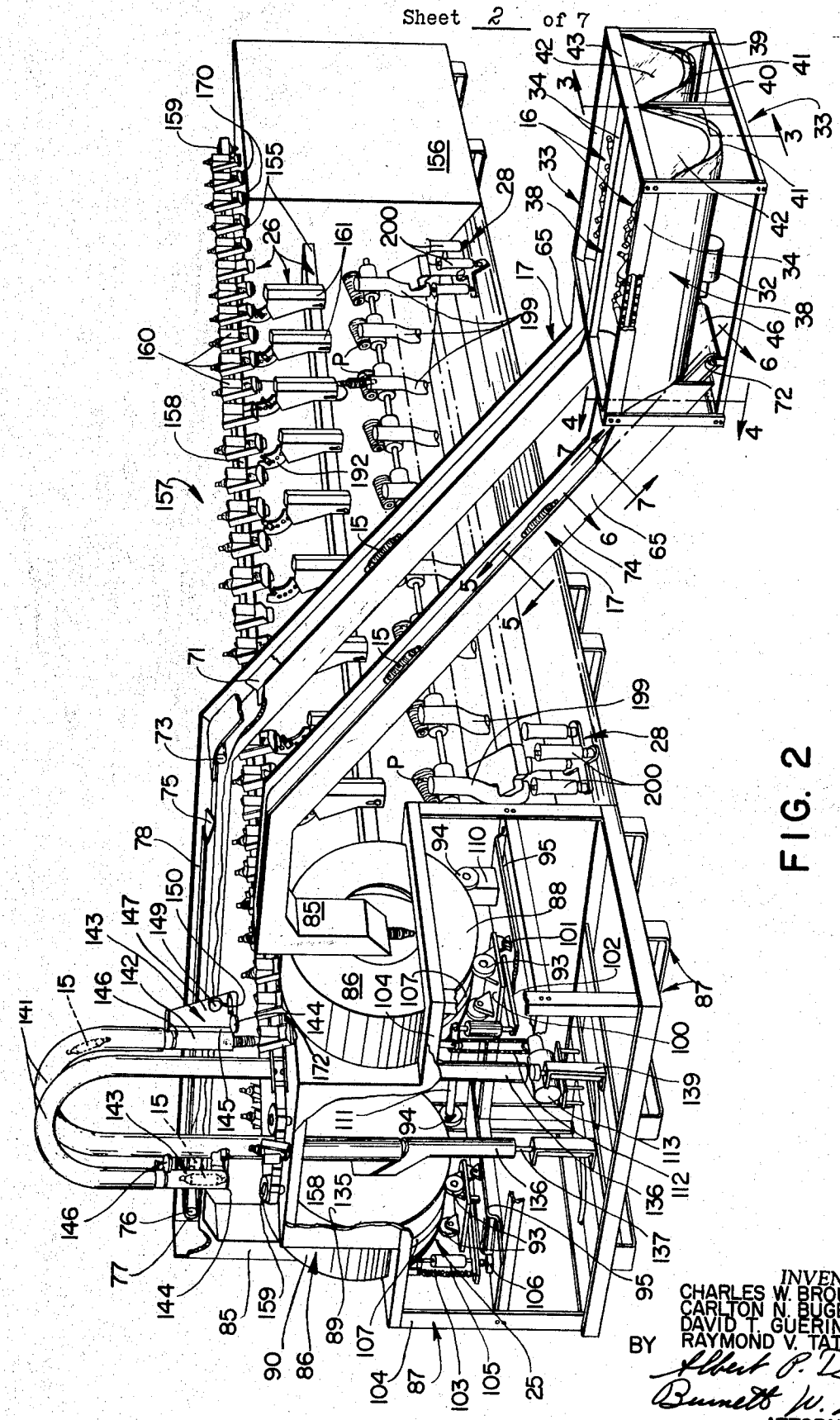


FIG. 2

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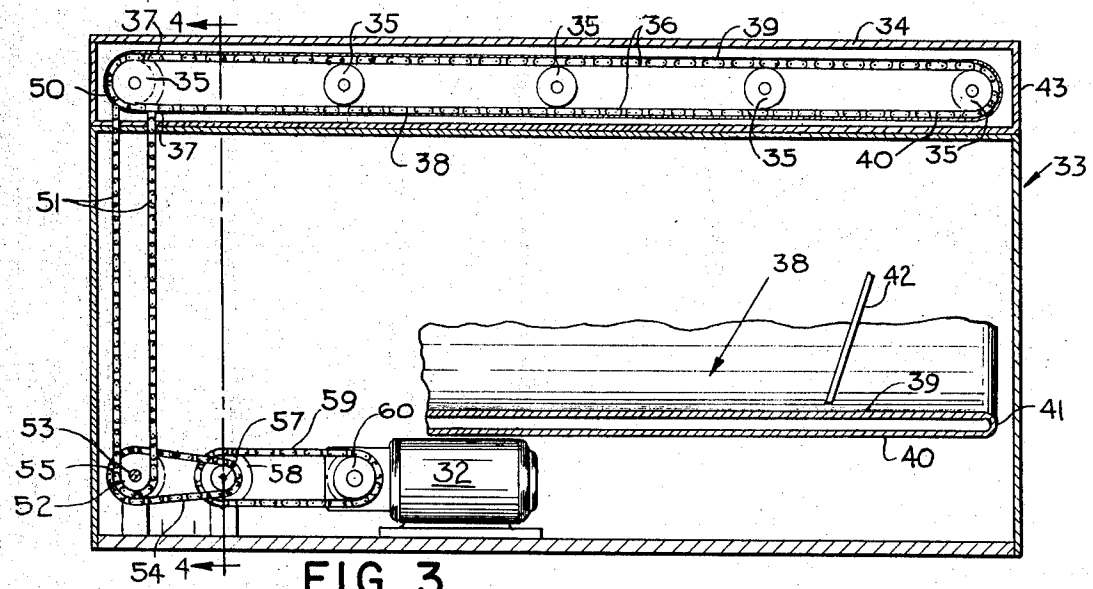


FIG. 3

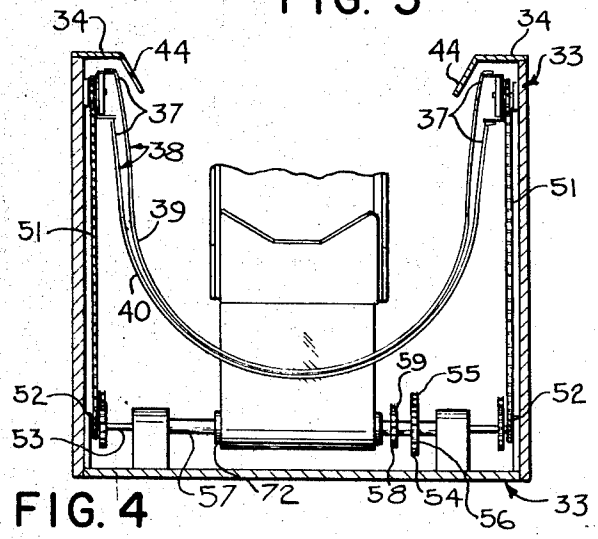


FIG. 4

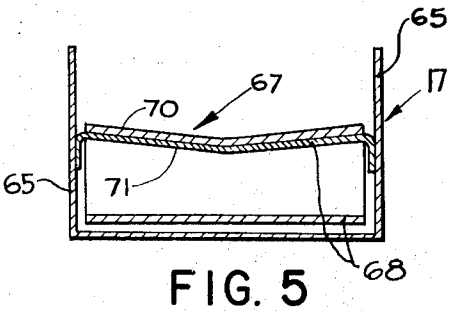


FIG. 5

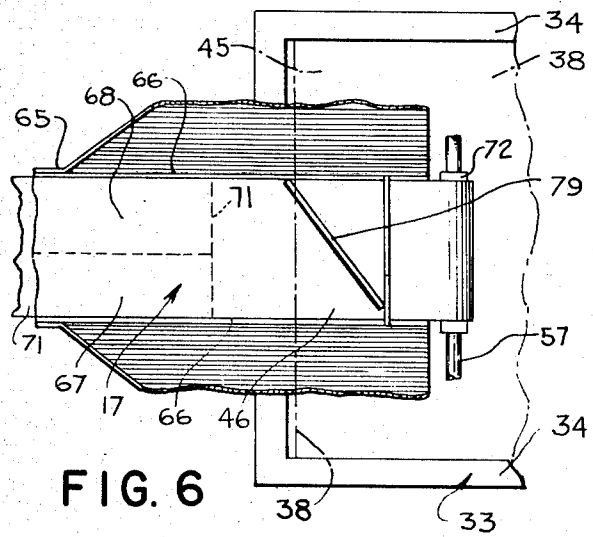


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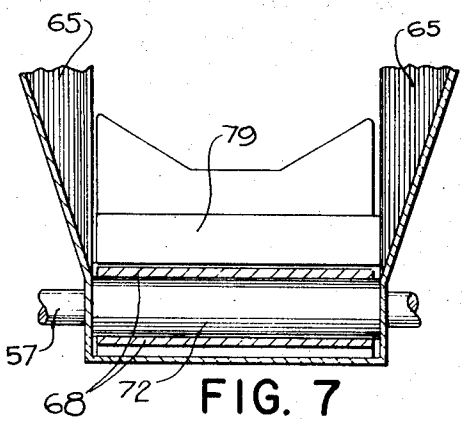


FIG. 7

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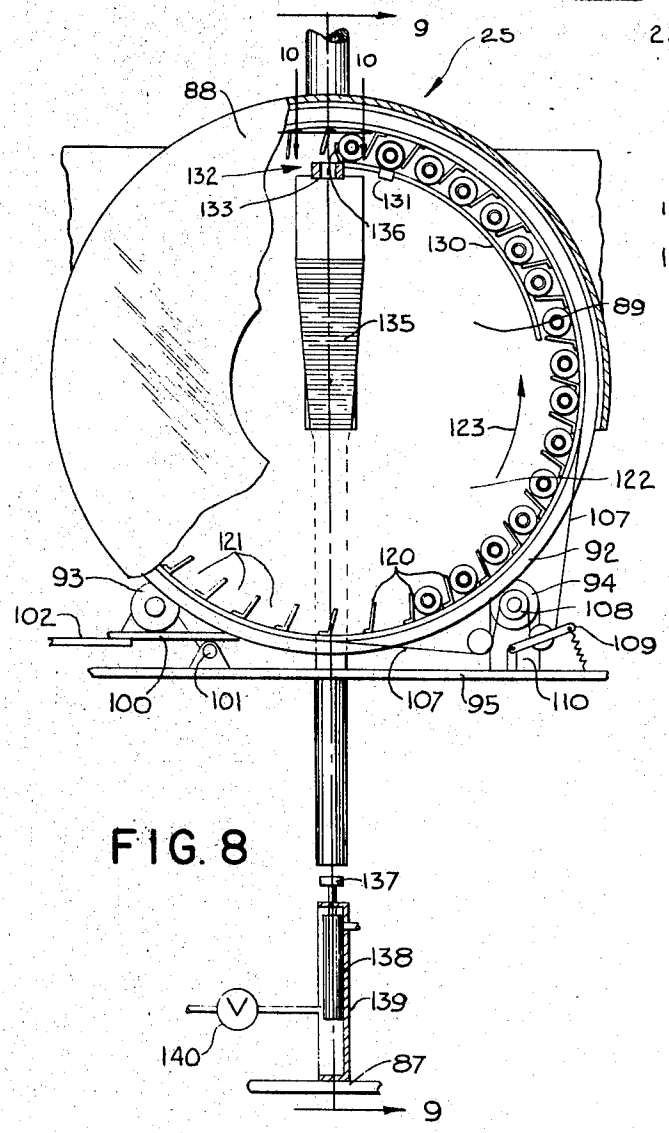


FIG. 8

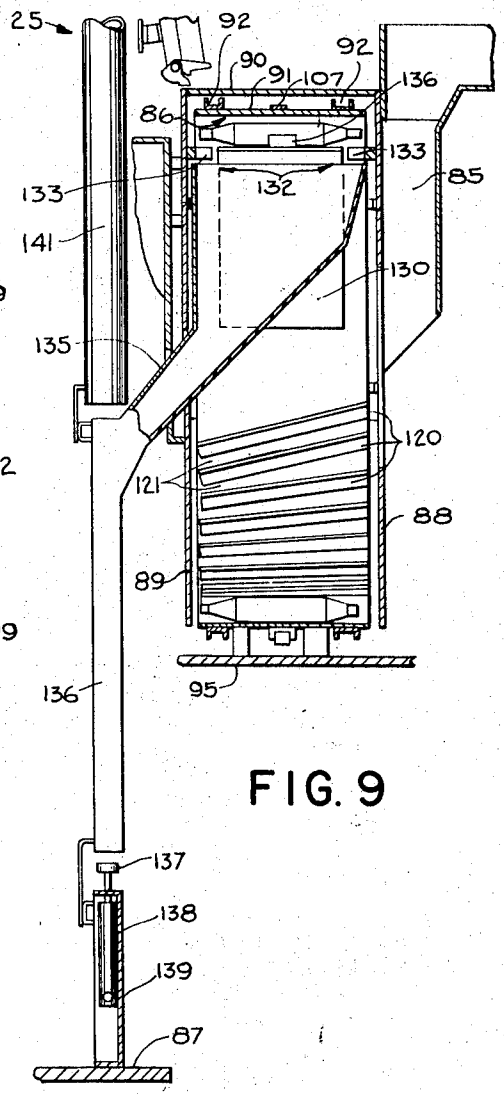


FIG. 9

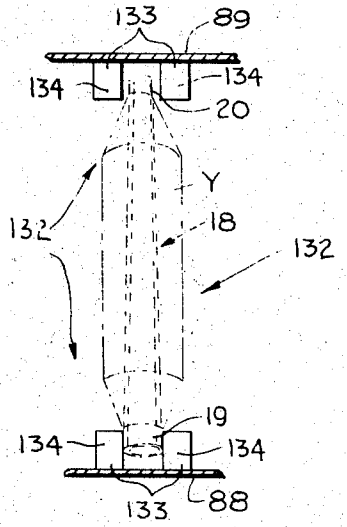


FIG. 10

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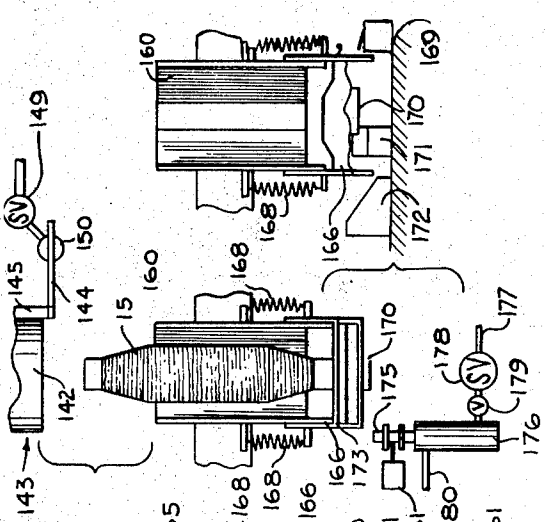


FIG. 11

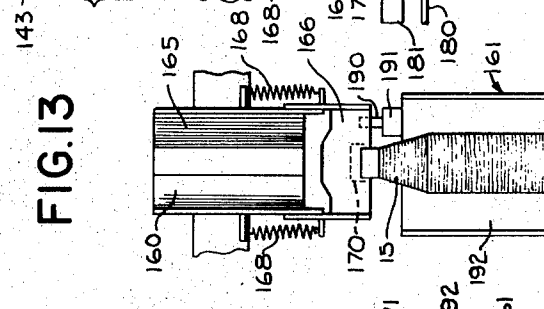


FIG. 12

FIG. 13

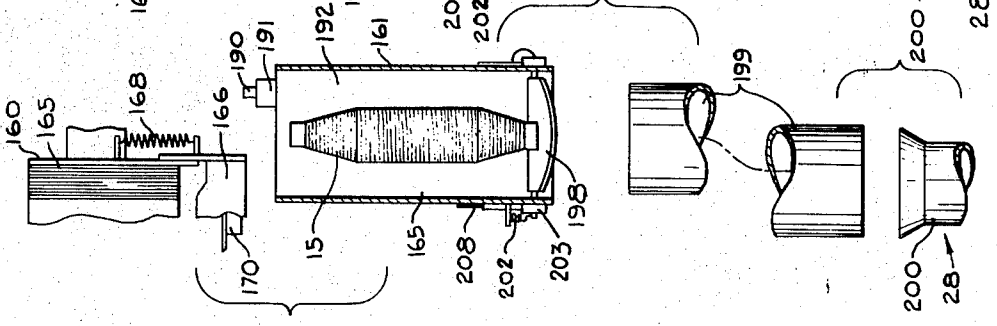


FIG. 14

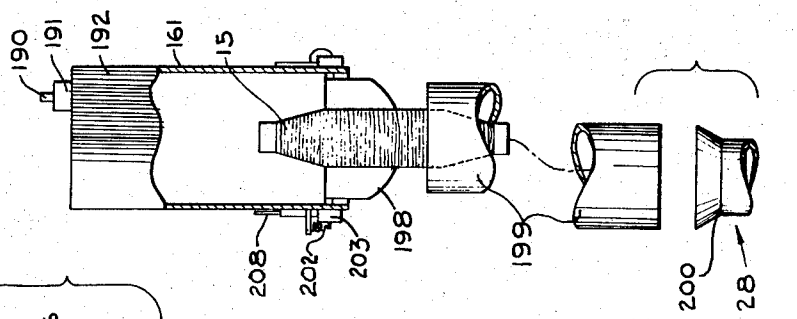


FIG. 15

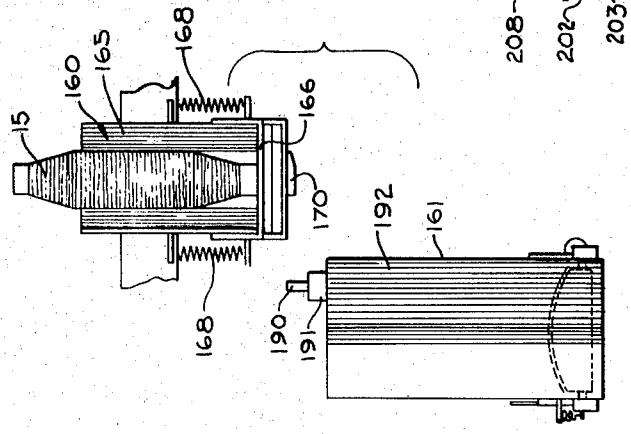


FIG. 16

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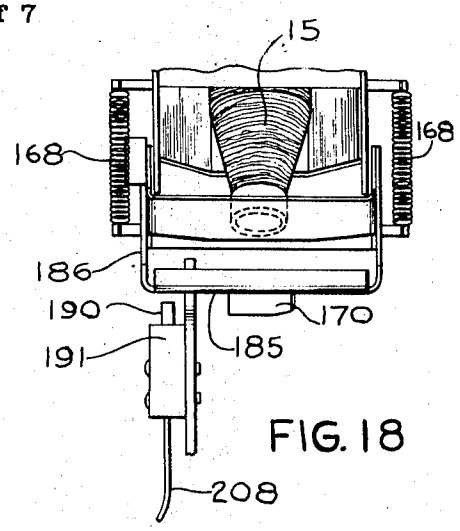


FIG. 18

FIG. 17

FIG. 19

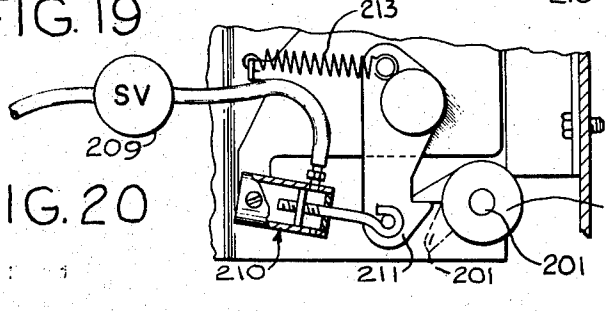


FIG. 20

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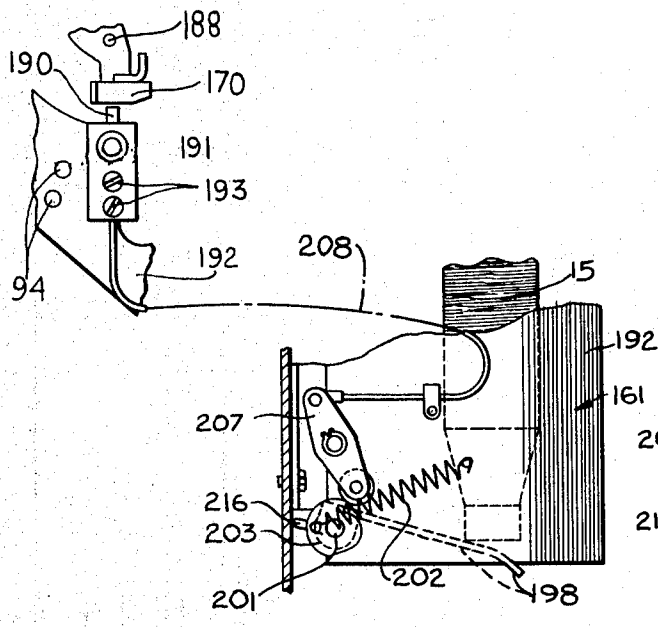


FIG. 21

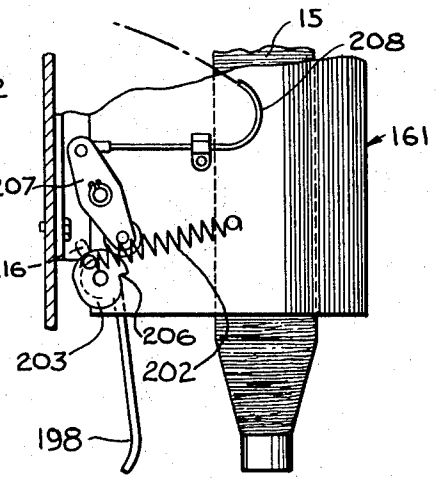


FIG. 22

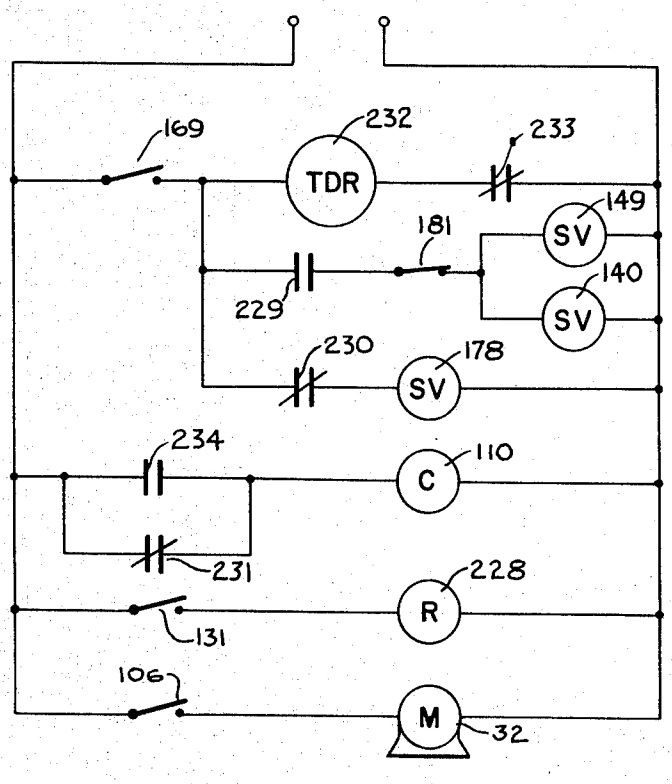


FIG. 24

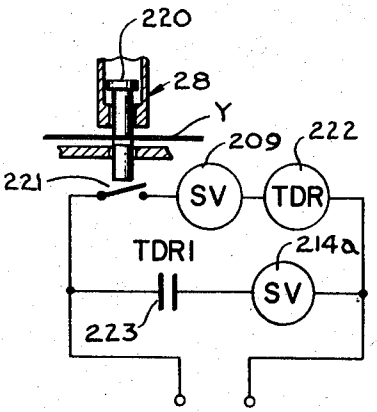


FIG. 23

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BOBBIN ORIENTING INSTALLATION

This invention relates to a textile mill installation and apparatus and, more particularly, to such an installation and apparatus which is particularly suited for handling filled yarn bobbins.

As used herein the term "bobbin" means any core or other member on which yarn is wound so that it may be 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 "various or different types of bobbins" means bobbins having different cores, or different yarn, or both different cores and yarn. The term "yarn" is employed in a general sense to apply to all kinds of strand material, either textile or otherwise.

As various types of filled yarn bobbins are doffed from spinning or twisting machine, they are commonly collected and stored in boxes at the processing area. These boxes of bobbins are then carted to a winding area where they are usually dumped into another cart. A winding machine attendant moves the cart about the winding machine and orients and inserts the individual bobbins at winding machine stations. Often a single winding machine will be simultaneously used for winding various types of yarn at its stations so that the attendant must also select the correct type of bobbin for loading into each station. The labor cost of such an operation is considerable because of the number of people required, and there is a considerable chance of mistakes in selecting the correct type of bobbin and orienting the bobbin as well as likelihood of scuffing the yarn.

Various attempts at automatically handling such yarn bobbins have had little, if any, commercial success. Various proposed machines for orienting filled bobbins for delivery to winding station generally result in rough handling of the bobbins and requires some preorientation, such as cording of the bobbins. Part of the difficulty encountered with such attempted systems is that the bobbins may telescope together and require special handling to separate them before the bobbins can be oriented. Then too, scuffing and other damage to the filled bobbins is always a problem and, most orienting equipment is entirely unsuited for handling both full and partially full bobbins which occur from time to time in doffing of the spinning or twisting machine.

The invention is, in brief, directed to an automatic installation and apparatus for segregating and orienting filled yarn bobbins for acceptance by winding machine stations. The oriented bobbins are automatically delivered to a distributing system which feeds the bobbins to the winding stations.

It is a primary object of this invention to provide a new and improved textile mill installation and apparatus for orienting bobbins.

Another object of this invention is to provide a new and improved bobbin orienting apparatus operable for orienting filled bobbins for acceptance by winding stations of a winding machine.

Another object of this invention is provision of new and improved bobbin orienting apparatus for effectively preventing scuffing and other damage to the bobbins as they are oriented for subsequent use.

A further object of this invention is provision of new and improved bobbin orienting apparatus for automatically orienting bobbins and effectively preventing the bobbins from telescoping and the yarn from scuffing.

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

FIG. 1 is a fragmentary plan layout of a textile mill installation for handling various types of bobbins stored in a bobbin processing area and used in a winding area remote from the processing area;

FIG. 2 is a perspective view of a prototype apparatus generally suitable for use in the installation shown in FIG. 1, with parts broken away and removed for clearer illustration;

FIG. 3 is an enlarged, fragmentary, schematic vertical sectional view taken generally along the line 3–3 in FIG. 2;

FIG. 3 is an enlarged, fragmentary, schematic vertical sectional view taken generally along the line 3–3 in FIG. 2;

FIG. 4 is an enlarged, fragmentary, schematic vertical sectional view taken generally along the line 4–4 in FIG. 2 (and also in FIG. 3);

FIGS. 5—7 are enlarged, fragmentary, schematic sectional views taken generally along the lines 5–5 through 7–7, respectively, in FIG. 2;

FIG. 8 is an enlarged, fragmentary, schematic side view of a portion of the apparatus shown in FIG. 2, with parts broken away and removed for clearer illustration;

FIG. 9 is a fragmentary vertical sectional view taken generally along the line 9–9 in FIG. 8;

FIG. 10 is an enlarged, schematic sectional view taken generally along the line 10–10 in FIG. 8;

FIGS. 11—16 are enlarged, fragmentary schematic elevational views of a portion of a bobbin distributing system shown in FIG. 2, these FIGS. illustrating progressive steps in the operation of the distributing system, with parts broken away and removed for clearer illustration;

FIG. 17 is an enlarged, fragmentary schematic elevational view of one side of a portion of the distributing system shown in FIG. 2 and in FIGS. 11—16 with parts broken away and removed for clearer illustration;

FIG. 18 is a fragmentary vertical sectional view taken generally along the line 18–18 in FIG. 17;

FIG. 19 is a fragmentary, schematic rear view of a portion of the apparatus shown in FIG. 17;

FIG. 20 is a fragmentary, schematic side view of the opposite side of a portion of the apparatus shown in FIG. 17;

FIG. 21 is a fragmentary, schematic, compressed side view similar to FIG. 17 showing the apparatus in a different operating position, with parts broken and removed for clearer illustration;

FIG. 22 is a fragmentary, schematic side view similar to FIG. 21 with the apparatus in still another operating positions;

FIG. 23 is a diagram illustrating a portion of a control system for the installation shown in FIG. 1 and the apparatus shown in FIG. 2; and

FIG. 24 is a diagram of another portion of the control system.

Referring to the drawings, FIG. 1 shows a plan layout of a portion of a textile mill in which suitable partitions 10 separate a yarn processing area 11 and a yarn winding area 12 remote from the processing area 11. As illustrated, one or more other work areas 13 may separate the yarn processing area 11 and the yarn winding area 12 as often occurs in typical textile mills. As is common practice, a number of yarn processing machines 14, such as spinning frames or twisters, are installed in the processing area 11 for handling various types of yarn which is wound onto bobbins 15. The installation shown in FIG. 1 is capable of simultaneously handling four different types of bobbins. More or less types may obviously be handled. As the various types of filled bobbins 15 are doffed from the processing machines 14, each type is deposited in a separate storage bin 16 where the bobbins remain until they are required in the winding area 12.

As any particular type of bobbin 15 is required in the winding area 12, it is moved out of its storage bin 16 and onto a delivery conveyor 17, one for each bin 16. Each delivery conveyor 17 cooperates with its associated bin 16 in separating any telescoped bobbins 15 and effectively preventing the bobbins from telescoping as they are moved to the winding area. A typical bobbin 15 may be seen in FIG. 10 and includes a hollow bobbin core 18 having a large end 19 and a smaller opposite end 20 capable of telescoping into the hollow of the large end 19. Yarn Y (FIG. 10) is wound on an outer frustoconical surface of the core and is spaced inwardly of the opposite ends 19 and 20. In order to expedite doffing at the spinning or twisting machines 14, the filled bobbins 15 are stored in the bins 16 in a jumbled condition, that is, with no prescribed orientation between the bobbins.

The delivery conveyors 17 carry the bobbins 15 from the processing area 11, through any intermediate areas 13, to the

winding area 12 and discharges the bobbins into bobbin orienting apparatus 25, one such apparatus associated with each conveyor 17 for handling one type of bobbin.

Each orienting apparatus 25 receives its bobbins 15 in jumbled condition and delivers the bobbins with their large ends 19 downward to distributing apparatus 26 associated with a winding machine 27 which uses the bobbin 15 to wind packages P, as is well known in the art. The distributing apparatus 26 receives the various types of bobbins 15 from each of the orienting apparatuses 25 and delivers the correct type of bobbin 15 to winding spindles or stations 28 of the winding machine 27.

Thus, the various types of bobbins 15 may each be stored in jumbled condition in the processing area 11 and conveyed in jumbled condition from the processing area to the bobbin orienting equipment 25 in the winding area 12 where the bobbins are oriented as required for use by the winding machine 27. It is often desirable to simultaneously wind various types of yarn on a winding machine 27, and the bobbin distribution system or apparatus 26 provides for a completely automatic distribution of the bobbins to the winding machine.

In FIG. 2 a prototype apparatus suitable for use in the installation shown in FIG. 1 is illustrated. For simplicity of illustration this apparatus is shown for simultaneously handling two types of bobbins 15, but any number of types may be processed simultaneously. The filled bobbins 15 are deposited in jumbled condition in the storage bins 16 which are also conveyors, one type of bobbin 15 in each of the bins. The bins may be identical in construction and, as illustrated, each is operated by its own motor 32 for conveying the stored bobbins out of the bin.

Each storage bin 16, as shown in FIGS. 2, 3 and 4, comprises a suitable frame 33 including opposed longitudinal upper members 34 each carrying a set of chain sprockets 35 generally horizontally aligned. Each set of sprockets 35 carries a continuous chain 36. Opposite edge portions 37 of a continuous bobbin receiving conveyor belt 38 are attached, one to each of the chains 36 so as to provide an upper conveyor belt run 39 and a lower run 40 having opposite ends with returned portions 41 at opposite ends of the belt 38. The upper and lower runs of the belt 38 form a deep sag, illustrated at a depth about the same as the width of the belt between the chains 36. A rigid tongue 42 (FIGS. 2 and 3) is secured to a rear upper cross member 43 of the frame 33 and depends at a slight angle from the vertical, into the sag of the conveyor belt 38 and conforms generally to the configuration of the belt when the conveyor belt is loaded with jumbled bobbins 15. This tongue 42 declines from the frame member 43 inwardly of the adjacent return portion 41 of the belt 38 so that bobbins cannot drop off the adjacent end of the belt. Beveled flanges 44 of the upper side frame members 34 cover the belt edges 37 and the chains 36. A discharge end 45 of the belt 38 is opposite the tongue 42 and is positioned above a bobbin receiving end 46 of the delivery conveyor 17 for passing bobbins from the bin 16 onto the delivery conveyor.

The upper run 39 of the bin conveyor belt 38 is moved away from the tongue 42 toward the discharge end 45 of the bin by operation of its supporting chains 36 (FIG. 3) which are driven by their sprockets 35 at the discharge end of the conveyor. Each driven sprocket 35 is mounted for rotation with a concentric upper drive sprocket 50 driven by a vertically disposed continuous chain 51 engaging a lower drive sprocket 52 at the bottom of the frame 33. The lower drive sprockets 52 are mounted for rotation with a common shaft 53 journaled on lower members of the frame at the discharge end of the bin. This shaft 53 is driven by a suitable chain drive 54 including another, larger sprocket 55 on the shaft 53 connected with a smaller sprocket 56 on a delivery conveyor roller shaft 57 suitably journaled on the lower frame members. The delivery conveyor shaft 57 carries another sprocket 58 which forms part of a chain drive 59 from a sprocket 60 on a drive shaft of a gear box of the motor 32 mounted on the lower frame members.

Once the bobbins 15 are deposited on the belt 38 of the storage bin 16, the bobbins move as a mass and there is substantially no relative movement between adjacent bobbins or between the bobbins and the bin conveyor belt.

The delivery conveyor (FIGS. 2 and 6) has a frame 65 and mounted thereon between opposed bobbin retaining walls 66 is a continuous bobbin receiving belt 67 having a high friction surface 68 such as foam rubber or the like, such that the bobbins 15 do not slide on this belt.

An upper run 70 of the delivery belt 67 rides on and conforms to the shape of a first upwardly opening V-shaped support 71 which is slightly spaced from a drive roller 72 fixed to the shaft 57 and from an idler roller 73 (FIG. 2) at the top of an inclined portion 74 of the conveyor, and on a second V-shaped support 75 which is slightly spaced from the idler roller 73 at the top of the incline and a second idler roller 76 at a discharge end 77 of a horizontal upper run 78 of the delivery belt. Thus, if a bobbin 15 is disposed to roll on the inclined portion 74 of the delivery belt it will roll toward the center of the belt and align itself with the belt. Should a bobbin roll downwardly on the inclined portion 74 of the delivery belt 67 toward its receiving end 46 below the bin conveyor belt 38, a diagonal member 79 (FIG. 6) is fixedly secured to the conveyor frame 65 slightly above the upper run of the delivery belt, and is positioned to cant the bobbin 15 so that the bobbin can not fall off this end of the belt and will be carried with the belt rather than rolling on the belt.

As the bobbins are discharged from the bin 16 they pass downwardly at an incline about a bobbin length and onto the upwardly inclined portion 71 of the delivery conveyor 17. Thus, any telescoped bobbins 15 in the bin 16 tend to separate as they pass from the bin to the delivery conveyor. Furthermore, the drive ratio of the bin conveyor belt 38 to the delivery conveyor belt 67 is preferably 1:10, or other suitable ratio, such that the delivery conveyor belt 67 travels at a substantially higher linear speed than the bin conveyor belt 38. Therefore, as the first of a pair of telescoped bobbins passes onto the delivery conveyor belt 67 it tends to move away from the other telescoped bobbin which is still on the bin conveyor belt and thus separates from the other bobbin.

When the associated orienting apparatus requires bobbins, the bin 16 and delivery conveyor 17 are operated and bobbins 15 pass from the discharge end 77 of the delivery conveyor belt 67 to the orienting apparatus 25 and, more particularly, downwardly through a chute 85 and into a bobbin orienting drum 86 as may best be seen in FIGS. 2, 8, and 9.

A frame 87 (FIG. 2) of the orienting apparatus fixedly mounts a front bobbin inlet wall 88 and rear bobbin outlet or end wall 89 of the drum. A cylindrical housing 90 is fixedly secured to upper portions of these end walls. A rotatable cylindrical drum sidewall member 91 is positioned between these end walls 88 and 89 and within the housing 90 and carries a pair of circumferentially extending tracks 92 fixed to its outer surface. Each track 92 is received by two circumferentially spaced wheels 93 and 94 mounted on a drum base 95 fixedly secured to the orienting apparatus frame 87. As herein illustrated, each of the circumferentially spaced wheels are opposite similar wheels which receive the other track. One pair of the opposed wheels 94 is suitably journaled on the base 95. A second pair of opposed wheels 93 is journaled on a carriage 100. This carriage 100 is pivotally mounted by a pin 101 at one end on the base 95 and, as shown in FIG. 2, has a rigid tongue 102 fixed to and extending from an opposite end. A free end of this tongue is supported by a tension spring 103 depending from a member 104 of the orienting apparatus frame 87. A dash pot 105 smooths the action of the carriage and tongue. When this tongue 102 is depressed it engages an actuator of a switch 106 connected in circuit with the drive motor 32 of the associated bin 16 and delivery conveyor 17 to stop this motor and thus to stop delivery of bobbins to the drum 86. Thus, as bobbins are deposited in the drum 86 the weight of the drum increases and eventually causes the switch 106 to be actuated, stopping the motor and therefore delivery of bobbins.

The cylindrical drum sidewall member **91** is rotated by a belt **107** extending circumferentially about the drum and about a drive wheel **108** journaled on the base **95**. An idler pulley assembly **109** (FIG. **8**) maintains the drive belt **107** taut. The drive wheel **108** is driven through a suitable electrically actuated clutch **110**, mounted on the base **95**, by means of a shaft **111** constantly driven by a chain drive **112** from a continuously operating motor **113**. This shaft **111** carries a similar drive wheel and clutch for the other orienting drum.

A plurality of flights or flanges **120** extend generally transversely across the inner surface of the rotatable sidewall **91** and spaced apart sufficiently for receiving but a single filled bobbin **15** longitudinally aligned in a channel **121** defined by adjacent flanges **120**. The stationary end walls **88** and **89** of the drum are spaced apart sufficiently so that but one bobbin **15** can be received lengthwise therebetween. As the bobbins are deposited from the delivery conveyor **17** through the chute **85** and into a hopper portion **122** (FIG. **8**) of the drum between the end walls **88** and **89** and in the lower portion of the drum inwardly of the flanges **120**, the bobbins **15** tumble slightly until they are received in one of the upwardly opening channels **121** at a lower portion of the drum.

As the sidewall member **91** is rotated, counterclockwise as shown by the arrow **123** in FIG. **8**, the bobbins in the channels **121** are conveyed upwardly and any bobbins **15** not in a channel but carried along with the sidewall member **91** will fall toward the lower portion of the drum **86** to be subsequently received in a channel **121**. As may best be seen in FIG. **9**, the channels are disposed so that as they are ascending, and as they pass through an intermediate position in which they open downwardly so the bobbins could fall out of the channels, the channels **121** decline across the sidewall member **91** and, as the sidewall member continues to move upwardly the bobbins carried by the channels roll against a generally cylindrical guide member **130** in the upper portion of the drum between the intermediate position and a discharge position of the channels at the top of the drum. This guide member is secured to the stationary end walls **88** and **89** of the drum and the bobbins are therefore caused to roll on the guide member. Because of the inclination of the flanges **120**, as the bobbins **15** roll on the guide member **130** they move in the direction of the declination and against the rear outlet or end wall **89**. Normally the cylindrical sidewall member **91** continues to rotate until a bobbin carried in one of its channels engages a switch actuator to close a switch **131** secured to the guide member **130** at the top of the drum and just inwardly of the upper end of the guide member. Closing this switch **131** causes the clutch **110** to disengage thereby stopping rotation of the sidewall member **91**.

When a bobbin **15** is required, the sidewall member **91** is again rotated (through operation of a control system to be described) and deposits the bobbin **15**, which had been depressing actuator of the switch **131**, into a gauging assembly **132**. The gauging assembly **132** is shown in FIGS. **8**, **9**, and **10** and includes a pair of opposed gauges **133**, one secured to each of the stationary sidewalls **88** and **89**. The top surfaces of the gauges are generally coplanar with the top surface of the guide member **130**. The gauges **133** each include a pair of abutments **134** (FIG. **10**) spaced apart sufficiently to pass only the small end **20** of the bobbin **15** but not the large end **19** of the bobbin. Therefore, the small end **20** of the bobbin falls between the adjacent gauge abutments **134** and the bobbin **15** pivots downwardly with its large end **19** supported on the other gauge **133** so that the bobbins pass out of the drum **86** through a discharge chute **135**, opening through the drum end wall **89**, always with their small end **20** first. A resilient finger **136** is mounted on and extends upwardly from the upper end of the guide member **130** to lift any partially full bobbins **15** so that they will be properly positioned for receipt by the gauges **133**.

The discharge chute **135** declines into a generally vertical tube **136** which is open at its bottom end so that the small end **20** of the bobbin **15** comes to rest on the upper face of a plunger or platform **137** of a double acting accelerator drive cylinder **138** suitably mounted on a post **139** on the orienting apparatus frame **87**. The bobbin **15** remains seated on the plunger **137** until another bobbin **15** is required by the distributing apparatus **26**, whereupon the accelerator cylinder **138** as actuated by operation of a solenoid valve **140** (FIGS. **8** and **24**) to drive its plunger **137** upwardly. The plunger is returned, upon release of the valve **140** by low air pressure (about 10 p.s.i.) introduced at the top of the cylinder. The plunger **137** (FIGS. **2** and **9**) accelerates the bobbin **15** through the vertical tube **136** and into and through a rigid arcuate inverting tube **141** terminating in a downwardly opening tube **142** of a bobbin holder **143** (FIGS. **2** and **12**) which is closed at its bottom end by a gate **144** (FIG. **2**) which receives the bobbin **15**. This gate **144** is fixedly mounted at the lower end of a vertical shaft **145** which carries a similar gate **146** at its upper end, the two gates **144** and **146** being disposed so that when the lower gate **144** is closed the upper gate **146** is open. The shaft **145** is journaled on a fin **147** fixed to the tube **142**. The lower gate **144** is connected with a plunger of an actuating cylinder **150** which is operated when a solenoid valve **149** is energized, to open the lower gate **144** and close the upper gate **146**, and when valve **149** is deenergized and the operating pressure is thus released the cylinder returns the lower gate **144** to closed position and the upper gate to open position. A return spring or a double acting cylinder may be used to return the gates. A bobbin **15** is dropped from the gate **144** substantially simultaneously with accelerating of another bobbin **15** by the accelerator cylinder **138**. Normally a bobbin **15** passing through the arcuate tube **141** drops directly onto the lower gate **144** ready for discharge from the orienting apparatus **25** to the distributing system **26**, but a partially full bobbin **15** or other light bobbin may move more rapidly and be momentarily retained on the closed upper gate **146** before dropping to the lower gate **144** for later discharge to the distributing conveyor **26**.

With reference to FIGS. **1**, **2**, and **11**—**17**, the distributing system **26** includes a frame **155** mounted on the orienting frame **87** and on a frame of the winding machine **27** within a console **156**. The distributing system also includes a distributing conveyor **157**, in the form of a continuous belt **158** which has pairs of upper and lower wheels guided in horizontal tracks **159***a* (FIG. **17**) and about pairs of pulleys **159** mounted on the distributing frame **155** at either end of the belt **158**. The belt carries sets each including a plurality of bobbin receiving buckets **160**, one set for each type of bobbins being handled. The buckets **160** of each set are preferably alternated on the belt **158** with buckets of the other sets. These buckets **160** cross open tops of bobbin receivers **161** secured to the distributing frame **155**. A bobbin receiver **161** is positioned above each of the winding machine stations **28**.

Each bucket **160** has a body **165** and a bobbin retaining gate **166** which pivots about horizontal studs **167** (FIG. **17**) mounted on the body **165** for movement of the gate **166** from an upper closed position for retaining a bobbin **15** in the body **165**, to a lower open position for discharging the bobbin into a receiver **161**. A pair of overcenter springs **168** (FIGS. **17** and **18**), one on either side of each bucket and secured to the bucket body **165** and to the gate **166** maintains the gate **166** closed and upon slight opening movement of the gate causes the gate to move rapidly to open position. When one of the buckets **160** is empty its gate **166** therefore remains open and passes across an actuator of an associated switch **169** (FIGS. **11** and **24**) on the distributing conveyor frame **155**, just upstream of the associated bobbin holder **143** from which the empty bucket **160** is to receive a bobbin **15**. A cam **170** (FIGS. **2**, **11**—**14** and **16**—**18**) on the empty bucket gate **166** closes this switch **169** which actuates the solenoid valve **149** of the associated holder **143**, actuating cylinder **150** to open the lower holder gate **144** and discharge a bobbin **15** into the bucket **160** whose gate **166** has just been closed by closing cams **171** and **172** (FIGS. **2** and **11**) on the distributor conveying frame **155** downstream of the switch **169**. These cams **171** and **172** may best be seen in FIG. **11**. A first of these closing

cam **171** engages the bucket cam **170** to urge the gate **166** toward closed position and when the gate is partially closed a side edge **173** (FIG. **12**) of the gate engages the second closing cam **172** which moves the gate overcenter whereupon the springs **168** fully close the gate. Thus, with the bucket gate **166** closed, the lower gate **144** of the holder **143** opens and a bobbin **15** drops into the bucket **160** as shown in FIG. **12**.

If for any reason a bobbin **15** is not in the holder **143** for delivery to the empty bucket **160**, an abutment pin **175** (FIG. **12**) is moved upwardly to engage the bucket cam **170** and again open the bucket gate **166** so that the next time the bucket **160** passes the holder **143** it may again actuate the switch **169** and cause the holder **143** to deliver a bobbin **15**. This abutment pin **175** is the free end of a plunger of a double acting actuating cylinder **176** having a high pressure air line **177** (80 p.s.i.) connected through a normally closed solenoid valve **178** and a reverse flow metering valve **179** into the end of the cylinder **176** opposite the plunger to move the plunger to extended position when the solenoid valve is opened. Low pressure air (10 p.s.i.) is applied, through a supply tube **180**, to the opposite end of the cylinder to return the plunger, and slow plunger return is assured by the metering valve **179** so that the plunger remains extended for a period just sufficient to reopen the gate **166** of the empty bucket **160**. A switch **181** (FIGS. **12** and **24**) opens when the plunger is extended to prevent operation of the accelerator valve **140** and holder valve **149**, as will be described more fully.

There is a separate actuating switch **169** (FIG. **11**) and set of closing cams **171** and **172** for each bobbin holder **143** of each section of associated orienting apparatus, that is, for each type of bobbin **15** being handled. The cams **170** on the bucket gates **166** are adjustable to fixed positions, one such position for each type of bobbin **15** being handled. With reference to FIGS. **17** and **18**, these cams **170** are fixed on the bights **185** of U-shaped bails **186**. Free ends of the bail **186** are pivotably mounted on the respective gate by studs **167**, and have bolt holes **188**, one for each type of bobbin to be handled. These holes **188** are in a circular pattern concentric with the rivets **187**, and each hole may be aligned with a threaded bolt hole in the bucket gate **166** to receive a bolt **189** and secure the bail **186** and the cam **170** in adjusted position.

The bucket **160** now carries its bobbin **15** until one of the winding stations **28** of a winding section which uses this type of bobbin demands another bobbin. When this occurs a delivery abutment pin **190** (FIGS. **13—18**), slidably mounted in a body **191** adjustably secured on a body portion **192** of the bobbin receiver **161**, is raised to engage the bucket gate cam **170** and open the gate **166** as shown in FIG. **13**. A pair of bolts **193** secure each body **191** to an arm of the associated receiver body, and these bolts may mate with any of a plurality of sets of threaded bores **194**, one set corresponding to each type of bobbin. Thus these pins **190** and gate cams **170** may be adjusted not to interfere with similar components of other sections handling different bobbins. When the pin **190** opens the gate **166**, the bobbin **15** drops into the receiver **161**, and onto a receiver gate **198** which hold the bobbin until the associated winding station **28** again requires a bobbin, whereupon the receiver gate **198** opens (FIG. **15**) and the bobbin **15** is discharged through a tube **199** and into a creel **200** of the winding station **28**. This creel **200** is part of the winding station **28**, and may be of the type provided in Winding Machine No. 644 manufactured by Leesona Corporation, Warwick, Rhode Island, and a suitable winding station control is disclosed in a Leesona Corporation U.S. Pat. No. 3,081,045 granted to Thomas E. Pitts and Carlton A. Steele on Mar. 12, 1963.

As the bobbin **15** passes from the bucket **160** into the receiver **161**, it engages the receiver gate **198** which is fixed to a shaft **201** journaled in the receiver body **192** and held in position by an overcenter spring **202** secured to a cam **203** and to the body **192** of the receiver **161** to maintain the gate **198** in a waiting position inclined slightly upwardly from the shaft **201** as shown in FIGS. **13**, **16** and **17**. This gate moves overcenter as the bobbin engages the gate and the weight of the bobbin moves the gate to a bobbin holding position shown in FIGS. **14** and **21**. In moving to a bobbin holding position, the receiver gate **198** which is fixed to the shaft **201** journaled in the receiver body **192**, causes rotation of the shaft **201** and the cam **203** secured to an outer end of the shaft moves the cam to the position shown in FIG. **21**. This movement of the cam **203** causes an abutment **206** on the cam to move a pivoted lever **207** from the position shown in FIG. **17** to the position shown in FIG. **21** and such movement is transmitted through a cable **208** to lower the bucket opening pin **190** so that subsequent buckets **160** will not be opened to discharge a bobbin **15** into this now full receiver **161**. When the winding station **28** requires another bobbin **15**, it produces a signal (to be described) which operates a solenoid valve **209** (FIGS. **20** and **23**) to actuate a small cylinder **210** on a side of the receiver body **192** opposite the previously described cam **203** and lever **207**. Actuation of this cylinder **210** withdraws a keeper **211**, pivoted to the side of the receiver body **192**, from holding engagement with a latch **212** fixed to the receiver gate shaft **201** so that the weight of the bobbin **15**, and the overcenter spring **202**, causes the latch to rotate (dotted lines in FIG. **20**) and the gate **198** to open rapidly permitting the bobbin **15** to drop into the tube **199** for passage into the creel **200**. Upon discontinuance of the signal from the winding head the pressure in the opening cylinder **210** is released and a spring **213** connected between the keeper **211** and the receiver body **192** moves the keeper **211** back to latching position. A predetermined time after the opening cylinder **210** has operated, a solenoid valve **214***a* is opened and operates a closing cylinder **214**, fixedly mounted on the back of the receiver body **192**, has a plunger **215** which moves downwardly and depress a finger **216** extending outwardly from the receiver gate shaft **201** to swing the shaft **201** and the gate **198** to the waiting or receiving position and the overcenter spring **202** maintains the gate in this position until another bobbin **15** drops into the receiver.

The control system for the installation is shown in FIGS. **23** and **24**. Operation of the system is controlled from winding stations **28** which signal for release of a bobbin from its associated receiver **161**, which in turn signal a bucket **160** to deliver a bobbin **15** to the receiver. The empty bucket cam **170** closes the switch **169** to operate the holder **143** to deliver a bobbin to the empty bucket whose gate is previously closed by the cams **171** and **172**, and to fire another bobbin from the accelerator plunger **137** to the holder.

Each winding station **28** includes a control unit which automatically calls for an additional bobbin **15** as needed. This unit is fully described in the previously mentioned Leesona Corporation patent. To simplify an understanding of the function of this unit, an alternate form of winding station signalling system is shown in FIG. **23**. When the yarn Y is being withdrawn from a bobbin **15** at the winding station **28**, the yarn maintains a yarn sensing pin **220** in an elevated position. As the yarn Y is exhausted from the bobbin, the tail end of the yarn Y passes by the sensing pin **220** and the pin drops to close a switch **221** thereby energizing a signal system. As soon as the switch **221** is closed, the solenoid valve **209** of the receiver gate opening cylinder **210** is actuated to release the receiver gate **198** and a bobbin **15** in the receiver is delivered through the tube **199** to the creel **200** associate with this winding station **28**. A time delay relay **222**, in series circuit with this solenoid valve **209**, is of the initial delay type and at the end of this delay operates to close its relay contact **223**, thereby energizing the solenoid valve **214***a* of the closing cylinder **214** and actuating the closing cylinder to move the gate **198** to waiting or receiving position. This time delay is sufficient for the bobbin **15** to pass from the receiver **161** into the tube **199** leading to the creel **200**. A normal end finding function of the winding station **28** causes the starting end of yarn Y from another bobbin **15** to elevate the sensing pin **220**, whereupon the switch **221** opens.

With reference to the portion of the control system shown in FIG. 24, as the distributing conveyor 26 moves an empty bucket to close the delivery switch 169 (FIG. 11) on the distributing conveyor frame, if the switch 131 in the orienting drum 86 is closed, indicating a bobbin 15 is in position for delivery to the drum gauge mechanism 132, a relay 228 is energized closing its contact 229 so that the solenoid valve 149 is energized and the holder cylinder 150 operates to deliver a bobbin 15 to the empty bucket 160; and the solenoid valve 140 to the bobbin accelerator cylinder 138 is energized so that a bobbin is accelerated through the inverting tube 141 and drops onto the lower holder gate 144 (which opens and closes while the bobbin is traveling through the tube 141). If a bobbin 15 is not present at the top of the barrel, the switch 131 will be opened so that the relay 228 in circuit with this switch 131 is not energized and its contact 229 therefore remains open, thus preventing the solenoid valves 140 and 149 of the accelerator 138 and the holder 143, respectively, from being energized and the holder and accelerator remain inoperative. (The bobbin present switch 131 at the top of the drum 86 would remain open in the event that the barrel was empty of bobbin, for example.) Also, if a bobbin 15 is not present to close the bobbin present switch 131, a second contact 230 the relay 228 remains closed to energize the solenoid valve 178 of the bucket reopening cylinder 176 so that this cylinder raises its plunger 175 to reopen the gate 166 of the still empty bucket. As mentioned previously, when the reopening plunger 175 (FIG. 12) is extended to reopen the empty bucket, the plunger opens the switch 181 so that the solenoid valves 140 and 149 of the accelerator cylinder 138 and the holder cylinder 150, respectively, are not energized. A third normally closed relay contact 231 remains closed if a bobbin 15 is not on the bobbin present switch 131, and this contact is in circuit with the electric clutch 110 to keep the clutch energized and the drum sidewall 91 rotating to move a bobbin 15 onto the bobbin present switch and deenergize the clutch to stop the sidewall. As soon as the delivery switch 169 is depressed by the cam 170 of an open bucket 160, an instant operating terminal delay time delay relay 232 is energized to open its contact 233 in circuit with the actuating coil of this time delay relay 232 so that the terminal delay timing is not effected by fast or slow operation of the delivery switch 169. A second, normally open contact 234 of the time delay relay 232 is in circuit with the electric drum clutch 110 (FIG. 8) and upon closing of this contact 234 the drum sidewall 91 starts rotating to move the bobbin 15 depressing the bobbin present switch 131 off of this switch and onto the gauge device 132 for delivery to the accelerator platform 137. The terminal delay of the time delay relay 232 is sufficiently long so that it expires after the bobbin 15 moves off of the bobbin present switch 131 and this switch opens. Therefore sidewall 91 of the drum 86 continues to rotate until the bobbin present switch 131 again closes whereupon the contact 231 opens and the barrel stops rotating. Also shown in FIG. 24 is the barrel weight switch 106 (FIG. 2) which is in circuit with the motor 32 for the bin conveyor belt 38 and the delivery conveyor belt 67.

While this invention has been described with reference to particular embodiments 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 embodiments or environments except as set forth in the appended claims.

We claim:

1. Apparatus for segregating bobbins, comprising bobbin carrying means having a channel for carrying only one bobbin at a time, means mounting said bobbin carrying means for movement along an upwardly extending path from a position with said channel opening upwardly for receiving a bobbin and through a position in which a bobbin not received in said channel and traveling upwardly therewith may fall away from said channel and then through an intermediate position in which said channel is first inverted sufficiently for discharging said one bobbin therefrom and to a discharge position in which the bobbin is discharged from the channel, guide means extending generally from said intermediate position to said discharge position for retaining the bobbin within said channel, whereby a bobbin not received in said channel and traveling upwardly therewith falls away from said guide means to avoid interference therewith, and a retaining surface extending across an end of said channel, and when along said guide means and proximate said intermediate position said channel declining longitudinally toward said surface, whereby said one bobbin may move toward said surface.

2. Apparatus as set forth in claim 1 in which said bobbin has a rounded cross section so that the bobbin may roll, and in which said channel may receive said one bobbin only when the bobbin is generally longitudinally aligned with said channel, whereby when said channel is along said guide means, said bobbin may roll on said guide means and move longitudinally toward said surface.

3. Apparatus for orienting filled bobbins having a large end and a small end, said apparatus comprising a hollow drum having opposed end walls and therebetween a generally cylindrical sidewall with a longitudinal axis generally horizontally disposed, means mounting said sidewall for rotation about said axis, bobbin carrying means on said sidewall within said drum and skewed relative to said axis for receiving and elevating the bobbins and for separating the bobbins each from the other and delivering the bobbins one at a time, means for orienting the separated bobbins with corresponding ends similarly positioned, and drive means for rotating said sidewall about said axis.

4. Apparatus as set forth in claim 3 in which said carrying means includes channels having generally parallel side surfaces, each of said channels for receiving only one bobbin and only when the bobbin is generally longitudinally aligned with the channel, said channels extending longitudinally across said sidewall and opening inwardly generally toward the center of said drum.

5. Apparatus as set forth in claim 3 in which said orienting means includes gauge means comprising a pair of gauges, one adjacent each of said end walls, said gauges each having means comprising abutments spaced apart sufficiently for just passing the small end of a bobbin and releasably retaining the large end of the bobbin until the small end has passed through the other gauge, whereby the bobbins pass through said abutments in oriented condition small end first.

6. Apparatus as set forth in claim 5 in which said bobbin handling means provides common means for orienting both partially and fully filled bobbins.

7. Apparatus for orienting filled bobbins having a large end and a small end, said apparatus comprising a hollow drum having opposed end walls and therebetween a generally cylindrical sidewall with a longitudinal axis generally horizontally disposed, means mounting said sidewall for rotation about said axis, bobbin handling means including, bobbin carrying means secured to said sidewall within said drum for receiving the bobbins and operable for separating and elevating the bobbins, and means for orienting the separated bobbins with corresponding ends similarly positioned, and means for inverting a bobbin discharged from said orienting means.

8. Apparatus for handling bobbins having opposite ends and a rounded cross section so that they may roll, comprising a member having bobbin carrying means including a channel for receiving a bobbin only when the bobbin is generally longitudinally aligned with said channel, means mounting said member for movement through an upwardly extending path from a position with said channel opening upwardly for receiving a bobbin and through an intermediate position in which said channel is first inverted sufficiently for discharging the bobbin from the channel and to a discharge position in which the bobbin is discharged from the channel, means for moving said member along said path, guide means extending generally from said intermediate position to said discharge position for retaining the bobbin within said channel, and a retaining surface extending across an end of said channel, orienting means at said discharge position for receiving the bobbin from said

channel and for orienting the bobbin when an end of said bobbin is against said retaining surface, and when along said guide means and proximate said intermediate position said channel declining longitudinally toward said retaining surface, whereby said bobbin may roll on said guide means and move toward said surface for reception by said orienting means.

9. Apparatus as set forth in claim **8** in which said channel may receive only one bobbin, and said mounting means mounts said member for movement along a portion of said path prior to said intermediate position in which a bobbin not received in said channel and traveling upwardly with said member may fall away from said guide means to avoid interference therewith.

10. Apparatus for orienting filled bobbins having a large end and a small end, said apparatus comprising a hollow drum having opposed end walls and therebetween a generally cylindrical sidewall with a longitudinal axis generally horizontally disposed, means mounting said sidewall for rotation about said axis, bobbin handling means including, bobbin carrying means secured to said sidewall within said drum for receiving the bobbins and operable for separating and elevating the bobbins, said carrying means including generally parallel channels, each for receiving only one bobbin and only when the bobbin is generally longitudinally aligned with the channel, said channels extending generally longitudinally across said sidewall and opening inwardly generally toward the center of said drum, and means for orienting the separated bobbins with corresponding ends similarly positioned and including said sidewall and portions of said end walls adjacent said sidewall, guide means in an upper portion of said drum for retaining said bobbins in said channels as said bobbins are elevated to the upper portion of the drum, said guide means having an upper end, and gauge means at said upper end of said guide means for receiving bobbins from said channels and orienting the bobbins with their corresponding ends similarly disposed, and drive means operable for rotating said sidewall about said axis.

11. Apparatus as set forth in claim **10** in which said gauge means comprises a gauge having abutment means spaced apart sufficiently for passing only the small end of a bobbin.

12. Apparatus as set forth in claim **10** in which said gauge means comprises a pair of gauges, one adjacent each of said end walls, said gauges each having means comprising abutments spaced apart sufficiently for passing only the small end of a bobbin, and releasably retaining the large end of the bobbin until the small end has passed through the other gauge, whereby the bobbins pass through said abutments in oriented condition small end first.

13. Apparatus as set forth in claim **11** in which said bobbin handling means provides means for orienting partially filled bobbins.

14. Apparatus as set forth in claim **11** in which one of said end walls has a bobbin receiving inlet for the passage of said bobbins into said drum, and the other of said end walls has a bobbin discharge outlet for discharging the oriented bobbins from the drum.

15. Apparatus as set forth in claim **14** in which said bobbin handling means includes means for inverting and elevating a bobbin discharged through said discharge opening.

16. Apparatus as set forth in claim **15** in which the last said means comprises a platform for engaging an end of the bobbin, platform drive means for accelerating said platform to project the bobbin along a path, and bobbin holding means along said path to receive said bobbin as it is projected along said path.

17. Apparatus as set forth in claim **16** in which said holding means has opposite ends and includes closure means at one of said ends operable for releasably holding the bobbin.

18. Apparatus as set forth in claim **16** in which said bobbin holding means comprises a hollow body along said path for receiving the bobbin, said body having a bobbin receiving end and an opposite bobbin discharge end remote from said receiving end, means including a closure at said receiving end and another closure at said discharge end, said closures being operable between closed positions for preventing passage of said bobbin and open positions for permitting passage of said bobbin, means mounting said closures for simultaneous movement between opposite ones of said positions so that one of said closures in said closed position when the other closure is in said open position, and closure drive means operable for moving said closures between said position, whereby when the receiving end closure is in said open position a bobbin may pass into said hollow body and as said receiving end closure closes and the discharge end closure opens a bobbin in said hollow body may pass therefrom.

19. Apparatus as set forth in claim **18** including control means operable for operating the platform drive means and the closure drive means substantially simultaneously, and operating the sidewall drive means independently of the platform and closure drive means to assure a bobbin being in a predetermined position for acceptance by said gauge means prior to operation of said platform and closure drive means.

20. Apparatus for orienting filled bobbins having a large end and a small end, said apparatus comprising a hollow drum having opposed end walls and therebetween a generally cylindrical sidewall with a longitudinal axis generally horizontally disposed, means mounting said sidewall for rotation about said axis, bobbin handling means including, bobbin carrying means comprising channels on said sidewall within said drum for receiving the bobbins and separating and elevating the bobbins, means for orienting the separated bobbins with corresponding ends similarly positioned, and drive means for rotating said sidewall about said axis, bobbin receiving means inward of said channels for holding a plurality of bobbins for receipt by said channels, means operable for supplying bobbins to said bobbin receiving means, and control means for operating the bobbin supply means responsive to the weight of the bobbins in said drum to maintain a substantially constant quantity of bobbins in said drum.

21. Apparatus as set forth in claim **20** in which said control means operates said bobbin supply means to supply bobbins to said drum responsive to a reduction in the weight of said bobbins in said drum below a predetermined weight.

22 Apparatus as set forth in claim **21** in which the sidewall mounting means comprises roller means mounting said sidewall for rotation about said axis, and said control means comprises a carriage, means mounting at least a portion of said roller means on said carriage, means mounting said carriage for movement responsive to a change in weight of the bobbins in said drum, and sensing means responsive to movement of said carriage for operating said bobbin supply means.