March 30, 1965 C. B. POWELL, SR., ET AL 3,175,350

RING RAIL LOWERING APPARATUS

Filed June 18, 1963 3 Sheets-Sheet 1

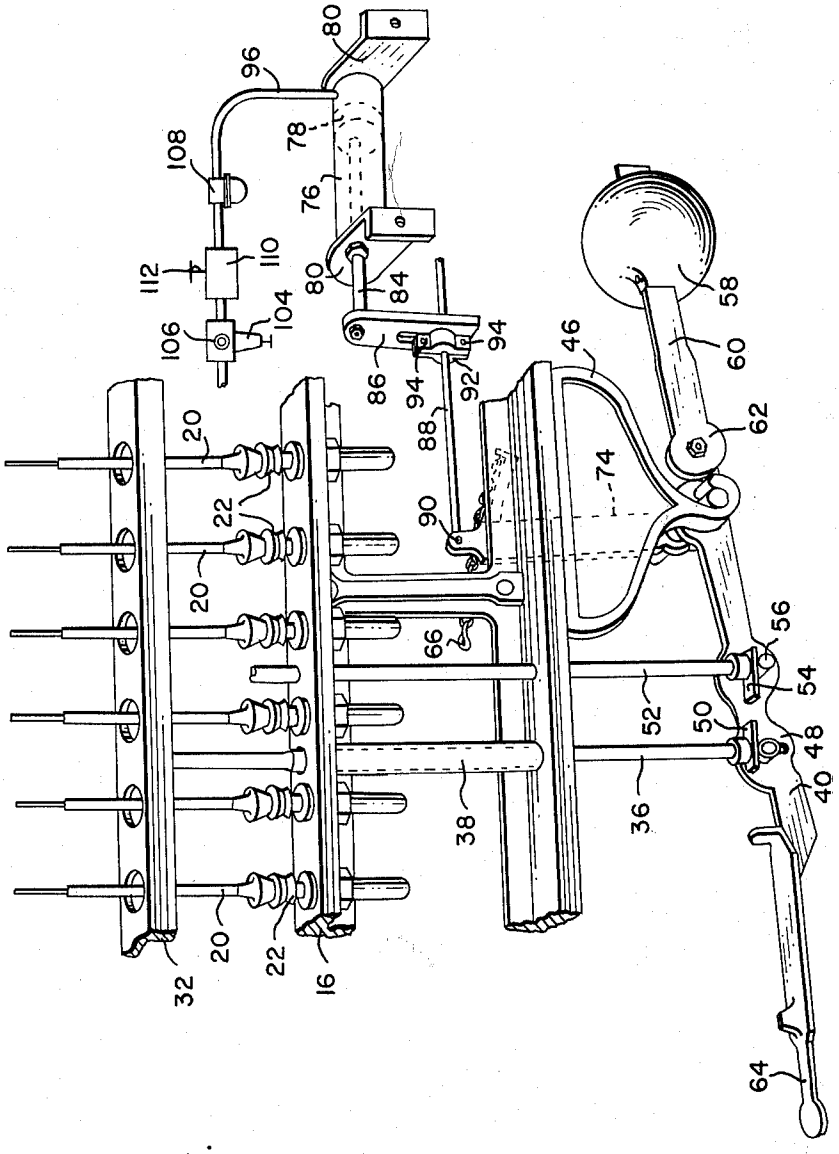


FIG. 1.

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RING RAIL LOWERING APPARATUS

Filed June 18, 1963 3 Sheets-Sheet 2

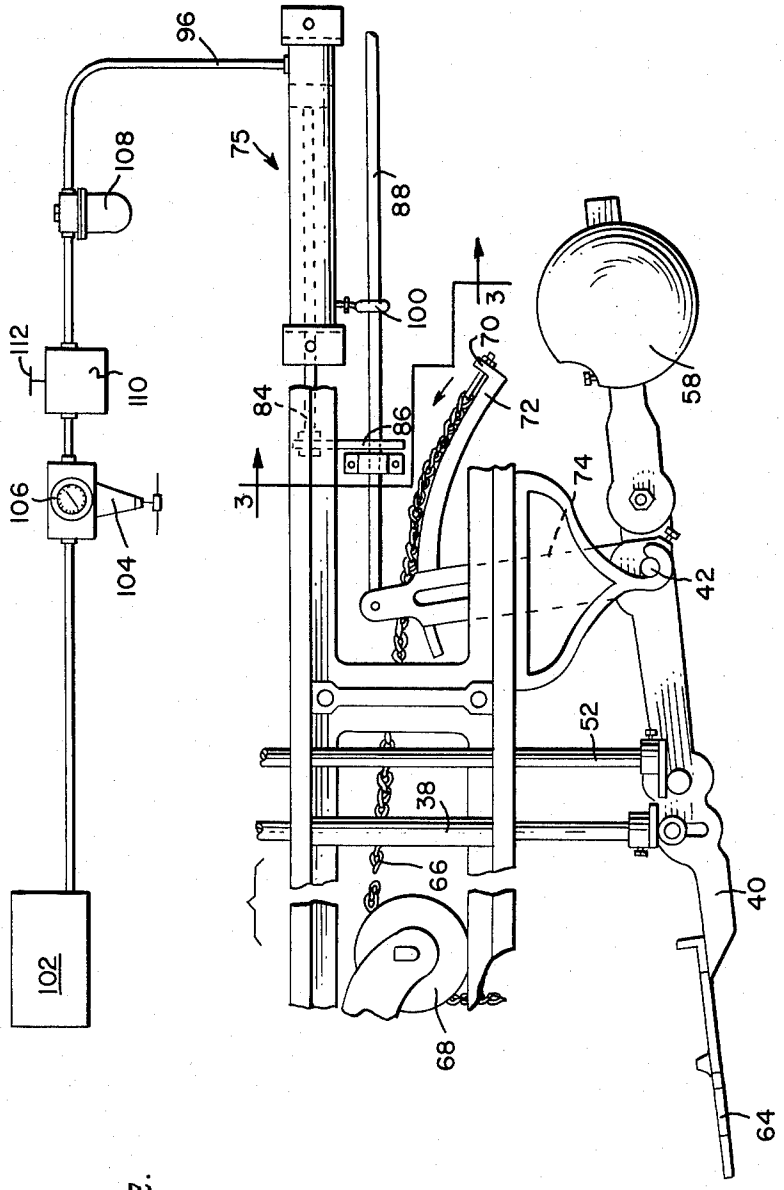


Fig 2.

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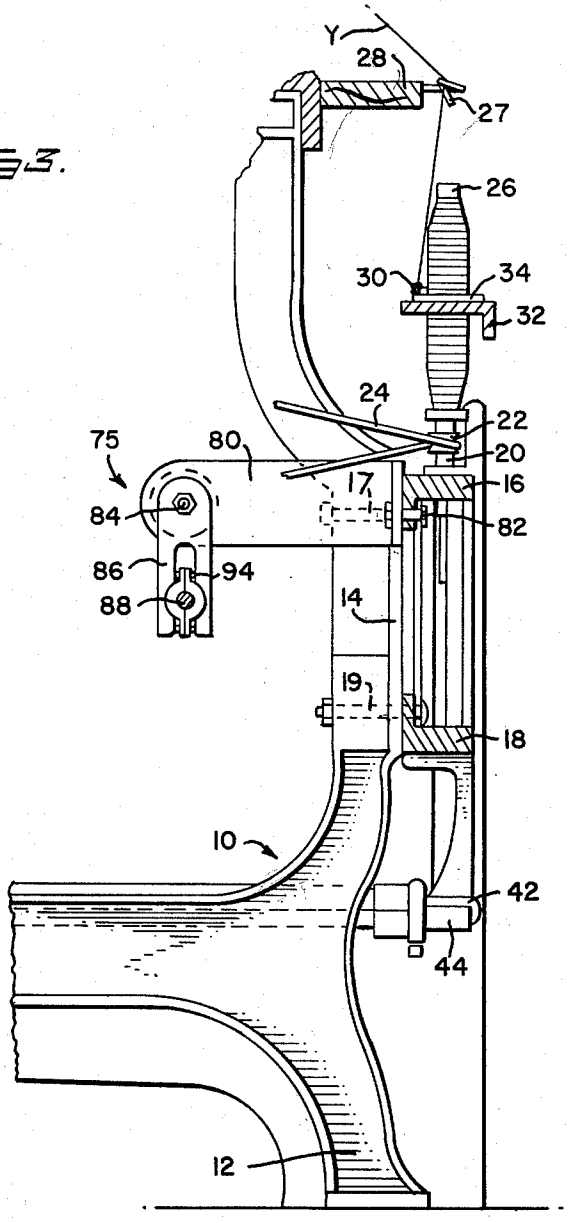
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Fig 3.



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RING RAIL LOWERING APPARATUS

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8 Claims. (Cl. 57—54)

This invention relates to improvements in a yarn twisting and winding apparatus in which strands of yarn are guided by a ring rail for traversing movement back and forth on rotating bobbins incident to the winding thereof, and more particularly to the incorporation in such apparatus of improved power booster mechanism for effectually supplementing the manual force required to be exerted by an operator for the purpose of lowering the ring rail, as is required for doffing the completed bobbins and replacing them with new ones to be wound.

It is a preferred object of the invention to provide such a mechanism which, while providing the major amount of force in a controllable manner for thus lowering or "pulling down" the ring rail, nevertheless permits the operation to be accomplished by the operator through the usual manually controllable means such as a foot pedal, with a degree of sensitivity and control heretofore unobtainable.

It is a further object to provide in combination with the yarn twisting and winding apparatus, such a power booster which is adapted to perform the function of retaining the ring rail in its lowered position for whatever time is required, under the control of the operator, and which may thus serve as a substitute for the ring rail locking mechanisms normally employed.

It is a further object to provide such a power booster mechanism which, upon deactivation, is automatically returned to a retracted inoperative position in which it avoids interference with the normal yarn traversing or builder movement of the ring rail incident to the winding of a bobbin.

By the provision of such a booster mechanism or device, the operator is required to exert but a minimum amount of force for "pulling down" the ring rail, and since he must do this many times in a workday the invention results in reducing the operator fatigue by a considerable amount.

Not only does the invention make possible the lightening of the work load of the operator sufficiently to make a considerable difference in his efficiency, but in addition the use of the invention tends to minimize the risk of injury to the operator such as might result from a foot slipping off of the control pedal or undue strain or hernia.

Further features and advantages of the invention will be apparent from the ensuing detailed description in conjunction with the accompanying drawings of a preferred embodiment of the invention in which:

FIGURE 1 is a diagrammatic perspective view of the invention as applied to a conventional twisting and winding apparatus, of which only those parts or elements which cooperate with the invention are fragmentarily illustrated.

FIGURE 2 is a fragmentary side elevation of the mechanism illustrated in FIGURE 1, but showing further additional details, and

FIGURE 3 is a sectional view generally along the line 3—3 of FIGURE 2, showing in elevation one of the supporting legs of the main frame and its associated frame structure.

Referring now in detail to the accompanying drawings, the spinning and winding frame shown therein is a conventional construction and therefore is shown in part only to the extent necessary to clarify the manner in which the instant invention is combined with it. The main frame of the apparatus, generally indicated by the reference numeral 10 in FIGURE 3, will be understood to embody the usual supporting legs such as 12 and rigid side portions 14, of which only one is shown in FIGURE 3, it being apparent that the opposite side will constitute substantially a mirror image.

Supported on the side 14 of the frame and constituting stationary parts thereof, are the upper and lower rigid horizontal rails 16 and 18, these being securely bolted or otherwise secured in positions as shown at 17 and 19 respectively in FIGURE 3. Rotatably journaled through and supported by the upper rail 16 is a bank of usual winding spindles 20, each of which has a usual drive whorl or pulley 22 through which rotation is imparted to each spindle by conventional drive means such as the flexible drive 24 shown in FIGURE 3, the latter in turn being driven in a manner well-known in the art. The several spindles 20 each are adapted to removably receive and rotatably support conventional bobbins 26 during the winding of a strand of yarn Y onto each bobbin to form a completed yarn package. Each strand of yarn Y, as indicated in FIGURE 3, is guided downwardly from a suitable source (not shown) through a yarn guide 27 affixed to a bracket 28 carried by the frame 10. From the guide 27 each such strand of yarn Y is led down through a further guide or traveler 30 supported in usual manner on a vertically reciprocable ring rail 32. A plurality of spinning rings 34 on the ring rail 32 carry a plurality of the travelers 30, with the rings and travelers suitably spaced so that multiple winding operations may be carried on with respect to each of the plurality of bobbins 26 which normally project and rotate through the several spinning rings 34.

It will be understood that during the operation of such mechanism, the ring rail 32 is automatically reciprocated up and down in a builder movement to traverse the yarn back and forth as it is wound onto the bobbins 26, until the bobbins have been wound to the desired shape and size, at which time the ring rail 32 is "pulled down" or lowered to permit doffing of the full bobbins and their replacement by empty bobbins in accordance with usual practice.

The builder or traversing movement of the ring rail 32 is achieved in usual manner. Thus it will be seen that the ring rail is supported for vertical movement by suitable means such as the rod 36 which, as shown in FIGURE 1, is guided for vertical reciprocation through a bearing sleeve 38 fixedly supported between and the ends of which open through the upper and lower rails 16 and 18 respectively of the main frame. The rail 32 is carried at the upper end of the rod 36 whereby vertical reciprocation of the rod is transmitted to the rail. The rod 36 in turn is driven through a lever arm 40 affixed to and rockably supported by a cross shaft 42 rotatably journaled in a bearing 44 suspended by bracket 46 from the lower frame rail 18. The opposite end of the shaft 42 (not shown) will be understood to be similarly mounted in accordance with usual practice.

Adjacent its free end, the lifter arm has affixed thereto a horizontally projecting crank pin 48 positioned for cooperation with a follower or foot 50 carried at the lower

end of the rod 36. The follower rests on and abuts against the pin so that the rod 36 and rail 32 are raised in response to upward swinging of the arm 40 and return downwardly by the action of gravity as the arm 40 is swung downwardly.

As is usual, a further rod 52 is slidably guided through the rails 16 and 18 whereby its vertical movement may be transmitted to suitable yarn guide mechanisms or other elements constituting no part of the present invention. This rod 52 similarly has a foot or follower 54 at its lower end which is driven by a crank pin 56 carried on the lifter arm 40. A counterweight 58 is carried in usual manner by a rigid lever arm 60 which is fixedly secured at 62 to an extension of lift arm 40 on the opposite side of the shaft or fulcrum point 42 from the main portion of arm 40. This counterweight 58 exemplifies any suitable yieldable means for counterbalancing and moving the ring rail 32 upwardly toward its raised position. For manually "pulling down" or lowering the ring rail 32 against the action of the counterweight 58, there is provided a usual foot pedal 64.

For imparting a builder or yarn traversing movement to the ring rail 32, the shaft 42 is suitably oscillated, as by intermittent pulls exerted thereon from mechanism well-known in the art and therefore not shown. The pulls from such mechanism are transmitted to the shaft 42 through a chain or other flexible tension element 66 extending from said conventional mechanism over a pulley wheel 68 and anchored at 70 to a quadrant plate 72 which in turn is fixedly carried by a lever arm 74 keyed on or otherwise secured to the shaft 42. The arrangement in other words is such that the lever arms 40 and 74 constitute portions of a common bell crank lever which are interconnected through the shaft 42 which also serves as the medial fulcrum for such lever.

The apparatus as thus far described is well-known per se and constitutes no part of our invention except insofar as it is combined therewith in the manner hereinafter more fully described.

In the operation of the apparatus, as is well-known, the ring rail 32 is alternately raised by action of the counterweight 58 and lowered by pulls transmitted through the chain 66, to provide a constant traversing of the yarn Y axially of each bobbin 26 during the winding of the bobbins.

The yieldable rail raising force produced by the counterweight 58 must be quite considerable in order that it may raise the ring rail 32 with sufficient rapidity to achieve the desired builder or yarn traversing movement of the rail 32. Therefore, in actual practice the amount of foot pressure required on the foot pedal 64 to lower the rail 32 is quite considerable, normally being in the order of one hundred fifty to two hundred pounds.

Since the operator of such apparatus has among his duties that of repeatedly lowering or "pulling down" a number of ring rails and locking them down in the course of a day's work, this operation can become quite fatiguing and may involve danger of injury in the event the operator's foot slips from the pedal 64. Moreover the requirement for such a great amount of foot pressure of in other words manual force, makes it difficult for the operator to properly coordinate the lowering of the rail with the completion of the winding in the desired manner.

The present invention therefore comprises means for greatly augmenting the force exerted by the operator while leaving the entire "pulling down" operation completely under the control of the operator.

To this end the invention includes a fluid pressure actuated booster device, shown in each of the figures of the drawings and generally designated by the reference numeral 75. In the preferred embodiment, this device comprises a cylinder 76 having a piston 78 reciprocable therein. The cylinder 76 is fixedly supported from the main frame 10 of the apparatus, as by the brackets 80 respectively, secured to the opposite ends of the cylinder

and bolted as at 82 in FIGURE 1 or otherwise secured to the upper stationary rail 16 or other fixed portion of the frame 10. A piston rod 84 coaxially affixed to the piston 78 is slidably disposed through one end of the cylinder 76 and its associated bracket 80. At its external free end, this rod 84 fixedly carries a bifurcated yoke 86 between the depending furcations or legs of which is slidably received the ring rail height control rod 88. This rod 88 is pivotally connected at 90 to lever arm 74 in such manner that a thrusting of the rod 88 to the left as seen in FIGURE 1, will produce a counterclockwise rocking movement of the arm 74 and shaft 42, with consequent lowering of the lifter arm 40 and the ring rail 32 controlled thereby. In accordance with usual practice the ring rail height control rod 88 may extend between and interconnect adjoining lever arms 74, though it has not been deemed necessary to illustrate this well-known feature.

For transmitting the thrust of the piston rod 84 to the ring rail height control rod 88, the latter has a stop in the form of a split collar 92 affixed thereon. The two halves of the stop may be clamped together about the rod 88 at any suitable point thereon by means of the screws 94 which serve to interconnect them. Actuating fluid is admitted, in the present instance to one end of the cylinder 76 only, through the conduit 96, so that as seen in FIGURE 1 the pressure of the fluid within the cylinder 76 urges the piston 78 to the left in a direction to project its piston rod 84 and to bring the yoke 86 into abutting engagement with the stop collar 92. In FIGURE 1, the parts are shown after the yoke 86 has been projected sufficiently to initiate movement of the rod 88 and rocking of the shaft 42 and lifter arm 40 in a direction to lower the ring rail 32. Obviously continued projection of the piston rod 84 and yoke, as the piston 78 completes its projection stroke, will result in swinging the lifter arm 40 downwardly to permit complete lowering of the ring rail 32 so that it will not interfere with the doffing and replacement of the bobbins 26 on the respective spindles 20.

In order to avoid the creation of an air lock within the cylinder 76, and to filter air which enters it, air is admitted to and exhausted from the left hand side of the cylinder, as seen in FIGURE 1, through a conventional small air filter 100 communicating with the cylinder interior.

The pressurized fluid which is delivered to the cylinder 76 through conduit 96 may consist of air under pressure from a suitable source illustrated diagrammatically at 102 in FIGURE 2. Still referring to FIGURE 2, it is important in accordance with the invention that the pressurized fluid, whether it be air or liquid, be delivered into the cylinder at a constant predetermined pressure slightly less than that required to lower the ring rail 32 against the opposing but yielding force exerted by the counterweight 58. For this purpose there is interposed in the conduit 96 a pressure regulator, preferably of the manually adjustable type, having associated therewith a gauge 106 for indicating the amount of air pressure delivered through the pressure regulator. Also, it has been found desirable to interpose in said conduit 96 a lubricator such as 108 for delivering a lubricant in spray or vapor form through the conduit 96 and into the cylinder 76 to facilitate the movement of the piston 78 therein.

For controlling the fluid pressure device exemplified by the piston 76, there is further interposed in the conduit 96 a three-way valve 110 of any conventional construction having a control handle 112 arranged so that in one position of rotation or rotary adjustment, the valve 110 establishes communication between the two sections of conduit 96 on opposite sides thereof to permit actuation of the fluid pressure device 75; in the second position of rotary adjustment it disrupts the communication between the air pressure source 102 and the cylinder and at the same time confines the fluid pressure within the

cylinder; and in a third position of rotary adjustment, it vents the cylinder to the atmosphere to thereby permit retraction movement of the piston **78** while, preferably still blocking off the flow of pressurized air from the pressure regulator **104** to avoid loss or waste during the inoperative phase of the device **75**.

In the apparatus of the invention which is believed to be apparent from the foregoing description, the piston **78** and its associated yoke **86** will normally be in retracted position, or in other words, with the piston **78** adjacent the right-hand end of the cylinder as seen in FIGURES 1 and 2, during the spinning and yarn winding operation. Throughout this particular operation, the lift arm **40** will be oscillated about its shaft or fulcrum **42** by intermittent pulling forces transmitted in usual manner through the chain **66** and quadrant **72** to the lever arm **74** to thus intermittently rock the entire lever structure in a counter-clockwise direction and to permit its return rocking movement in a clockwise direction by action of the counterweight **58**. This oscillating movement when transmitted through the arm **40** and rod **36** to the ring rail **32** results in the usual yarn traversing movement of the ring rail.

During such traversing movement of the ring rail, the valve **110** will be in its third position as above described, whereby the cylinder **76** will be vented to the atmosphere on both sides of the piston **78**. The piston will have been retracted sufficiently to one end of the path of reciprocation of the stop **92** by abutment with the latter in its reciprocating movement, thus to avoid any substantial interference with or opposition to the yarn traversing or builder movement of the several parts.

At such times as the bobbins are fully wound and it is necessary to "pull down" the ring rail in order to doff and replace them, the valve control handle **112** is manually rotated to its first position as above described to establish communication between the air pressure source **102**, pressure regulator **104** and the cylinder **76**, thereby the pressurized air may enter the right-hand end of the cylinder as seen in FIGURE 2 to urge the piston **78** to the left, and thereby to actuate the booster device **75**.

The adjustment of the pressure regulator **104** will be such that the resulting force exerted on the piston **78** is not quite sufficient to overcome the force of the counterweight **58**, but requires to be slightly supplemented by a light foot pressure upon the foot pedal **64**. It has been found that where the air pressure regulator is so adjusted that the auxiliary or supplemental pressure required upon the foot pedal **64** is in the neighborhood of approximately ten to twenty pounds, there may be obtained a very accurate and sensitive control of the lowering or "pulling down" operation, permitting same to be conducted with a high degree of sensitivity or feel by the operator and in a manner to most efficiently coordinate the "pulling down" of the rail with the conclusion of the yarn traversing and winding operation.

Further, with the pressure regulator **104** adjusted as above described, it has been found that after the ring rail **32** has been fully lowered it may be retained in its lowered position during the doffing and replacement of the bobbins simply by moving the valve control handle **112** to its second position in which it functions to trap the compressed air or other pressurized fluid or liquid within the cylinder while the piston **78** is fully projected. In such projected position, the piston acts through its linkage **84, 86, 92, 88, 90, 74, 42, 40, 48, 36**, with the ring rail **32**, to maintain the latter in substantially its fully lowered position. At this time the slight excess of lifting force transmitted to the rail from the counterweight **58** only exceeds the opposing force exerted by the air pressure within cylinder **76** by such a comparatively slight amount that any slight retraction movement required of the piston **78** in order to balance these forces is relatively immaterial. However, it will be readily apparent that if it is desired to more fully insure against this very slight retraction of the piston **78**, an incompressible liquid may be employed as the cylinder actuating fluid in place of the compressed air as hereinabove described.

It is believed to be readily apparent therefore that our invention greatly relieves the fatigue and strain on the operator of the yarn spinning and winding mechanism, while at the same time giving him a greater degree of control over the lowering operation than has heretofore been obtainable through manually applied power only, and at the same time reduces the danger of accidental injury to the operator.

In this application we have shown and described only the preferred embodiment of our invention, simply in order to disclose the preferred mode of practicing our invention. However, we recognize that our invention is capable of other and different embodiments, and that its several details may be modified in various obvious ways without departing from our invention as defined in the following claims.

Having thus described our invention, we claim:

1. In a yarn spinning and winding apparatus of the class in which a vertically movable ring rail is lowered against the opposing force of a yieldable mechanism, the combination with said apparatus of a fluid pressure actuated device operatively connected to said ring rail to apply lowering force thereto when actuated by the admission of pressurized fluid to the device, means communicating with said device for supplying pressurized fluid thereto at a predetermined pressure slightly less than that required to cause lowering of the ring rail, valve means selectively operable to admit said pressured fluid to said device, and manually operable means operatively connected to the ring rail for applying a manual lowering force thereto to supplement the lowering force exerted by said fluid pressure actuated device.

2. The combination of elements as defined in claim 1 including means operative to trap the pressurized fluid in said device when the rail is lowered to retain the ring rail in its lowered position.

3. The combination of elements as defined in claim 2 including means for selectively venting said device to the atmosphere to deactivate same for yielding in response to the opposing force exerted by said yieldable mechanism.

4. In a yarn spinning and winding apparatus, the combination comprising a ring rail, means supporting said rail for vertical movement between raised and lowered positions, and yieldable means for exerting a constant upward force on the rail sufficient to raise same, in combination with a fluid pressure actuated device operatively connected to said ring rail to selectively apply lowering force thereto, a pressurized fluid source communicating with said device for supplying actuating fluid thereto at a constant predetermined pressure less than that required to lower the rail against said yieldable means, valve means controlling the admission of said fluid from the said fluid source to the said device, and manually operable means connected with said ring rail for applying a supplemental lowering force thereto sufficient when augmented by actuation of said fluid pressure actuated device to lower the rail in opposition to the force exerted by said yieldable means.

5. A yarn spinning and winding apparatus as defined in claim 4 in which said yieldable means comprises a medially fulcrumed lever having an end linked to said rail to support the weight thereof, and a counterweight carried by said lever for normally maintaining the rail in its raised position.

6. In a yarn spinning and winding device as defined in claim 5, the combination including means for intermittently lowering the rail against the action of said counterweight and permitting it to be returned upwardly by said counterweight, and means for selectively rendering the fluid pressure actuated device freely yieldable incident to said intermittent lowering and raising of the rail, to avoid interference therewith.

7. A yarn spinning and winding apparatus as defined in claim 6 in which said valve means is operative selectively to vent said fluid pressure actuated device to the atmosphere to render it thus freely yieldable in response to said intermittent lowering and raising of the ring rail.

8. A yarn winding apparatus as defined in claim 6, including means selectively operable for trapping the actuating fluid within said fluid pressure actuated device whereby to immobilize the ring rail in its lowered position.

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