June 20, 1950 S. A. MANSFIELD ET AL 2,511,928

DOFFING MECHANISM

Filed June 29, 1948 4 Sheets-Sheet 1

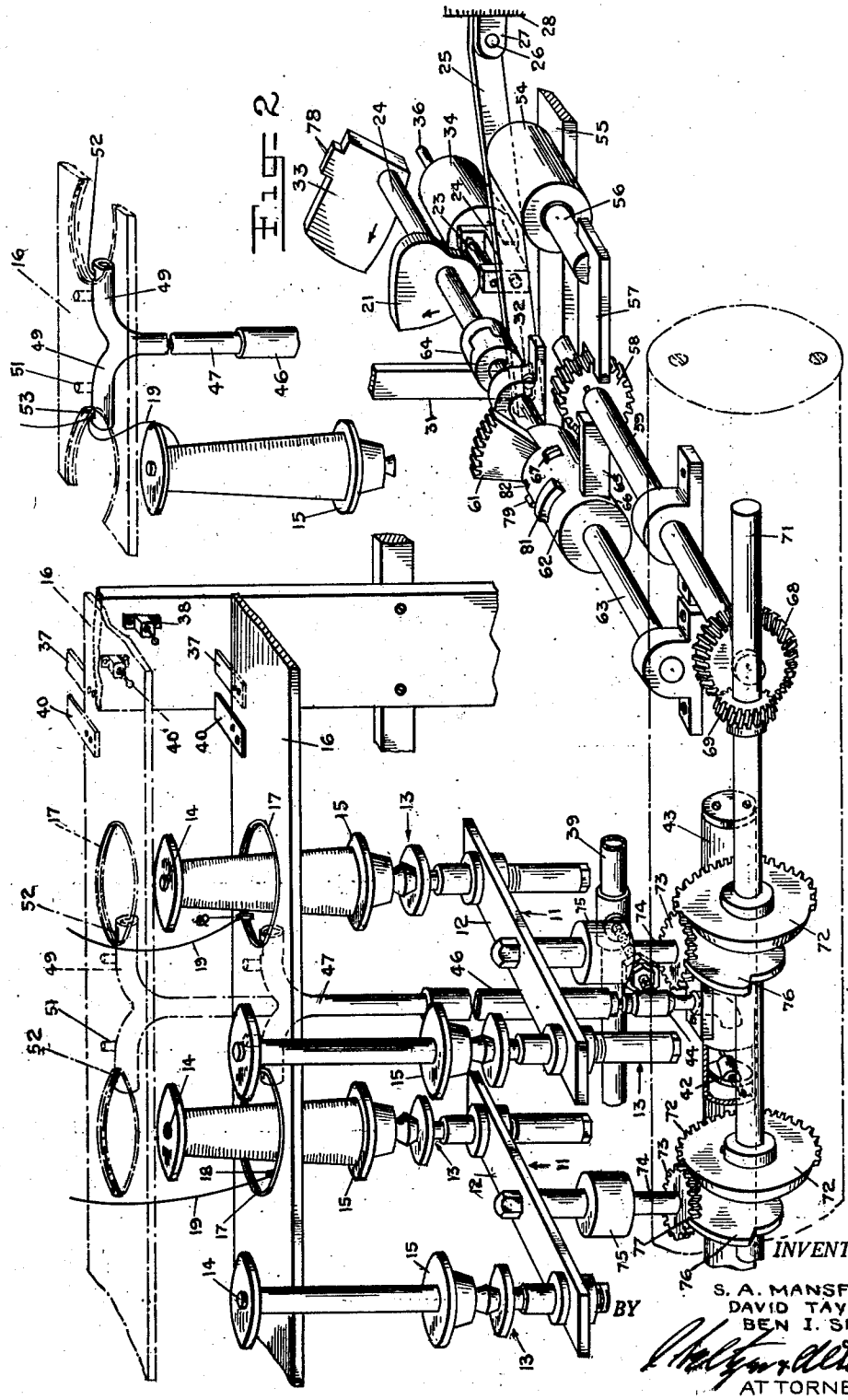


FIG. 2

FIG. 1

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June 20, 1950 S. A. MANSFIELD ET AL 2,511,928

DOFFING MECHANISM

Filed June 29, 1948 4 Sheets-Sheet 2

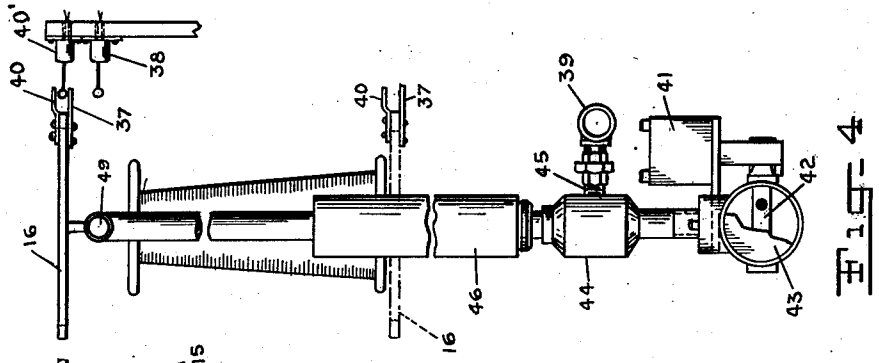



FIG-4

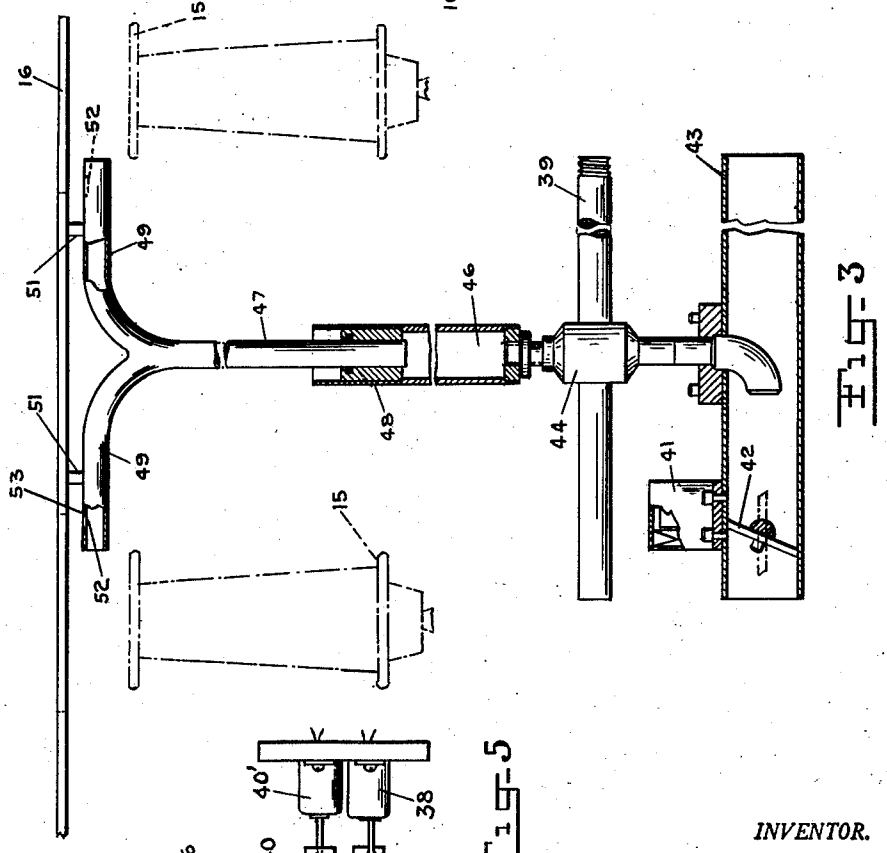



FIG-3

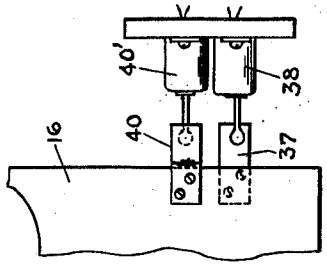



FIG-5

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DOFFING MECHANISM

Filed June 29, 1948 4 Sheets-Sheet 3

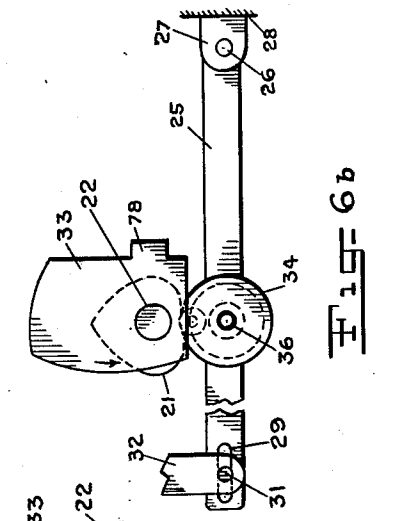


FIG. 6b

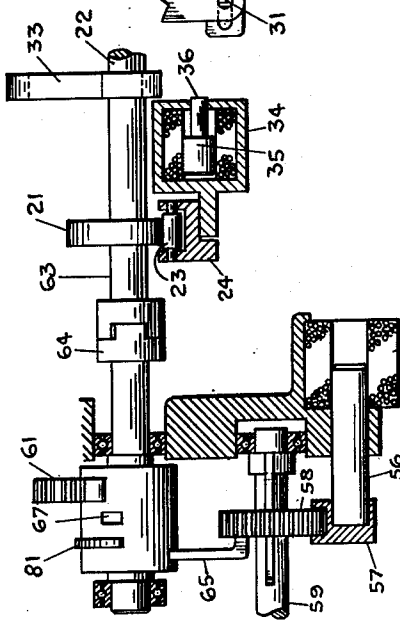


FIG. 6a

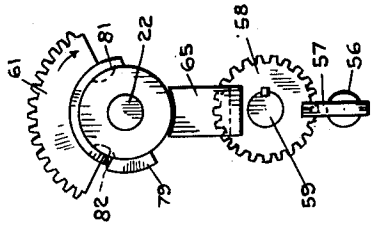


FIG. 6

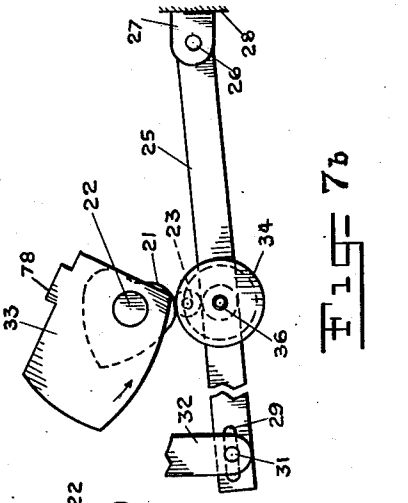


FIG. 7b

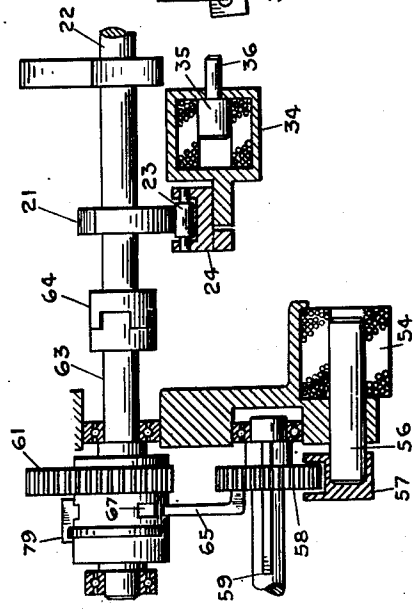


FIG. 7a

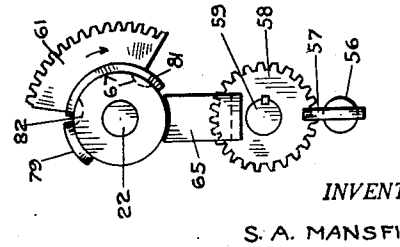


FIG. 7

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June 20, 1950 S. A. MANSFIELD ET AL 2,511,928

DOFFING MECHANISM

Filed June 29, 1948 4 Sheets-Sheet 4

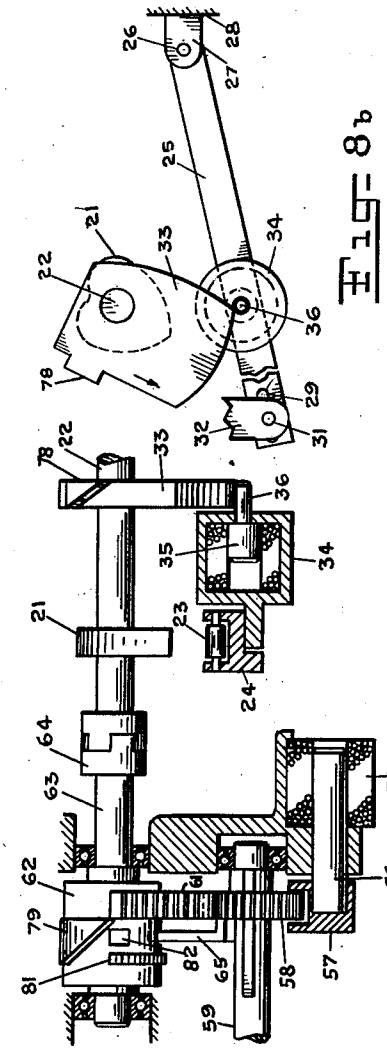


FIG. 8b



FIG. 8a

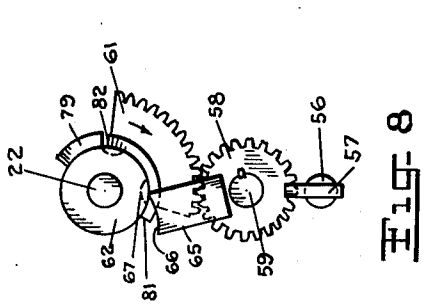


FIG. 8

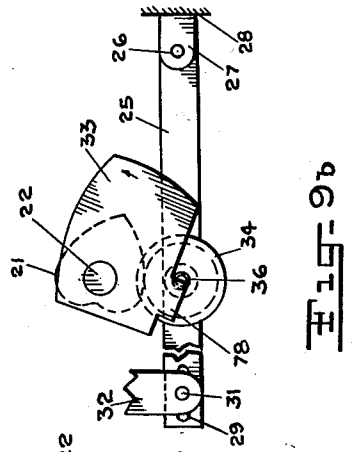


FIG. 9b

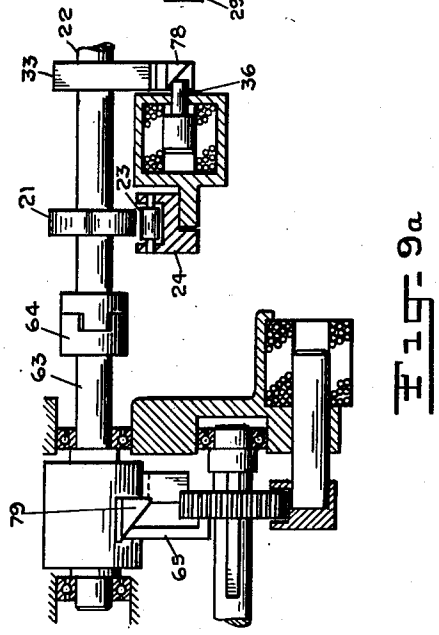


FIG. 9a

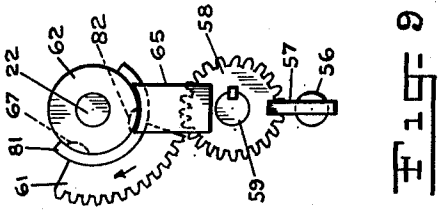


FIG. 9

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Patented June 20, 1950 2,511,928

# UNITED STATES PATENT OFFICE

2,511,928

## DOFFING MECHANISM

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Application June 29, 1948, Serial No. 35,844

20 Claims. (Cl. 57—52)

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This invention relates to textile machinery for use in packaging continuous filament yarn, especially the packaging of yarn continuously with the production thereof, and relates more particularly to doffer mechanism adapted to be employed with conventional spinning machines.

It is an important object of this invention to provide conventional spinning machines with a novel doffer mechanism which will automatically replace a full bobbin of yarn with an empty bobbin.

Another object of this invention is the provision in the novel doffer mechanism of an air current for discharging of an end of the yarn cut from a full bobbin from the spinning machine and for rethreading an empty bobbin when placed in operative position for receiving yarn from the spinning machine.

Other objects of this invention, together with certain details of construction and combinations of parts, will appear from the following description and accompanying drawings.

According to this invention, each of the normal spindle units employed with conventional spinning machines is replaced by a support on which two spindle assemblies are carried. The support is adapted to be rotated so as to position each of said spindles, as desired, beneath the ring rail and into contact with the driving band or belt to have yarn formed by the spinning machine wound thereon. When the bobbins in operative position are fully wound with yarn, a solenoid is energized and moves a cam follower out of contact with the conventional heart-shaped ring rail cam and into engageemnt with a special cam mounted on the same shaft as the said heart-shaped cam. This special cam causes the ring rail to rise above the upper flange of the bobbins whereupon an air valve is turned on thus creating a suction in an air pipe attached to the underside of the ring rail and provided with a cutting means. The suction created in the air pipe draws the yarn thereto causing the yarn to be severed by the cutting means and the loose end of the yarn from the spinning machine to be drawn into the air pipe and discharged into a connecting tube.

As the ring rail rises above its normal position and clear of the top flange of the bobbins, a second solenoid is energized causing a spur gear to be moved into engagement with a spur gear sector mounted on a drum fixed to and rotatable with the cam shaft. The rotation of the spur gear by the spur gear sector causes the rotation of a series of beveled gears to turn the spindle supports through 180° so that the positions of the spindles are interchanged, i. e. the position of the spindle carrying the full bobbin is assumed by the spindle carrying the empty bobbin. After the spindle support has been rotated through 180°, the solenoids are deenergized and the elements operated thereby are caused to return to their original positions. The entire cycle of operations is started by a counter from which an electrical impulse is transmitted to relays in a control circuit. The timing of the actuation of the solenoids and the turning on of the air supply is determined by the use of micro switches placed at points along the path of the ring rail.

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The invention will now be described in greater detail with reference to the accompanying drawings wherein a preferred embodiment of this invention is shown; however, only such elements are shown as are necessary for an understanding of the present invention.

In the drawings,

Fig. 1 is a perspective view of the initial elements of the doffer mechanism of this invention,

Fig. 2 is a detail view, in perspective, of an air pipe in relation to the ring rail employed in connection with a spinning machine,

Fig. 3 is a front elevational view, on an enlarged scale and partly in section, of the air pipe structure,

Fig. 4 is a side elevational view, on an enlarged scale, of the air pipe structure,

Fig. 5 is a detail view of a pair of limit switches,

Figs. 6, 6*a* and 6*b* are detail views showing the control elements of the doffer mechanism in one operating position,

Figs. 7, 7*a* and 7*b* are detail views showing said control elements in their position at one point during the rotation of the drum,

Figs. 8, 8*a* and 8*b* are detail views showing said control elements in their position at another point during the rotation of the drum within the same revolution, and

Figs. 9, 9*a* and 9*b* are detail views showing said control elements in their position at still another point during the rotation of the drum within the same revolution.

Like reference numerals indicate like parts throughout the several views of the drawing.

Referring now to the drawings for a detailed description of this invention, and particularly to Fig. 1, there are shown two of a series of doffer units, generally indicated by reference numeral 11, which are positioned adjacent to a conventional spinning machine, not shown. The number of doffer units in the series will be the same as the number of yarns formed by the spinning machine employed. The doffer units 11 comprising a rotatable spindle rail 12 at each extremity of which is carried a spindle mounting 13 having spindles 14 for the reception of bobbins 15. The spindles of the spindle mountings are rotated by means of driving bands, not shown, in the usual manner. The bobbin which is being wound, of each pair of bobbins on the same spindle rail, is positioned beneath a vertically reciprocable ring rail 16 provided with traveler ring 17 and travelers 18 for distributing the yarn 19

from the spinning machine, or through suitable source over the surface of the bobbin.

When the bobbins being wound are full, as determined by any suitable automatic counter or timer, not shown, means are provided for lifting the ring rail 16 above its normal position to a point where it clears the upper flanges of the bobbins, and to rotate the spindle rails 12 through an arc of 180° so as to carry the spindle mountings supporting the full bobbins to the doffing position, at the same time carrying the spindle mountings and empty bobbins around and into winding position. Where the distance between the spindle rails is not sufficient for them to clear each other, arrangement may be made to rotate each adjacent pair out of phase of each other.

The normal reciprocating motion of the ring rail 16 is effected by the usual heart-shape cam 21 fixed to shaft 22 adapted to be continuously driven at a constant speed by suitable driving means, not shown. Cam 21 cooperates with cam follower 23 rotatably mounted in a bearing bracket 24 fixed to an arm pivoted at 25 in a boss 27 on the main frame 28. The arm 25 is provided with a slot 29 in which is pivotally carried pivot pin 31 fixed to connecting bar 32 which through suitable connecting linkage actuates the ring rail 16 as is well known in the art. Also mounted on shaft 22 is a cam 33, the function of which will hereinafter be set forth.

When the bobbins being wound have received the predetermined quantity of yarn thereon, the timing mechanism causes the energization of a solenoid 34 which is fixed to bearing bracket 24. Energization of solenoid 34 causes the plunger 35 thereof to move cam follower 36 attached thereto into the path of cam 33, see Figs. 6 to 9b. Cam 33 is especially shaped to move cam follower 23 out of the path of heart-shaped cam 21 and, through a linkage including connecting bar 32, to move the ring rail 16 above the upper flange of the bobbins and to hold the same at that point a predetermined length of time. As the ring rail begins its rise to this latter position, the finger 37 fixed to said ring rail operates a limit switch 38 which turns on a supply of air under pressure connected to a conduit 39, and then a second finger 40 fixed to ring rail 16 operates a limit switch 40' which causes the energization of solenoid 41 to move damper 42 in pipe 43 to the position shown in dotted lines in Fig. 3. This creates a suction in the eductor 44 which is connected to conduit 39 by means of a pipe 45. The suction created in eductor 44 is also created in tube 46 connected thereto and in branched pipe 47 telescopically arranged with respect to tube 46, being maintained in position therein by a closure bearing block 48 which is relatively movable with respect to said branched pipe. The branches 49 to said branched pipe 47 are attached to the underside of ring rail 16 by suitable brackets 51. The branches 49 are each provided with an opening 52 and each of the openings are provided with a knife edge 53. The suction created in eductor 44, tube 46 and branched pipe 47 draws the yarn 19 to branches 49, causing the yarn to strike knife edges 53 in openings 52, severing the yarn and drawing the loose ends thereof into the pipe 47 to be discharged into pipe 43. The yarn is at all times threaded to the traveler.

While the ring rail 16 is above its normal position and clear of the upper flanges of bobbins 15, i. e. at the position shown in dot-dash lines in Fig. 1, a solenoid 54 mounted on a support 55 is energized through suitable electrical connections. Energization of solenoid 54 causes plunger 56 to be drawn towards it. Attached to said plunger 56 is a yoke 57 which straddles and is adapted to move a spur gear 58 keyed for relative movement on a shaft 59. Movement of the plunger 56 towards solenoid 54 causes spur gear 58 to be moved into the path of spur gear sector 61 mounted on a drum 62 carried by a shaft 63 coupled to shaft 22 by a coupling 64 whereby the shaft 63 and drum are continually rotated at the same speed as the cam 21. To prevent the shaft 59 from rotating prematurely, a gear lock 65 having a portion 66 thereof corresponding to the curvature of the drum, is attached to and movable with spur gear 58.



As the spur gear is moved to the position shown in Fig. 7a, the continued rotation of drum 62 causes the spur gear segment 61 to mesh with spur gear 58, the portion 66 of gear lock 65 entering opening 67 in the drum (as shown in Figs. 8 and 8a) and thus permitting gear 58 and shaft 59 to rotate. As will be seen from Fig. 8b, it is at this time that cam 21 comes into contact with cam follower 36 and raises ring rail 16 above bobbins 15 to allow clearance of the latter for rotation.

The rotation of spur gear 58 and shaft 59 rotates a bevel gear 68 which meshes with a bevel gear 69 on a shaft 71 on the latter of which are mounted a number of modified beveled gears 72, the number being equal to the number of spindle rails 12 employed. The beveled gears 72 have only enough teeth thereon to rotate a beveled gear 73 meshing therewith through an angle of 180° during one rotation of shaft 71. Beveled gears 73 are each fixed to the lower end of a shaft 74 the upper end of which is fixed to spindle rails 12. The shafts 74 are journaled in bearing members 75 which may be supported in any suitable manner. Thus, while ring rail 16 is in raised position, as indicated by dot-dash lines in Fig. 1, the rotation of spur gear 58 by spur gear sector 33 will through the mechanism just described rotate the spindle rail 12 through 180°, moving full bobbins to doffing position and empty bobbins to the position vacated by the full bobbins ready to receive yarn. At this point, the high point of cam locking members 76, mounted on shaft 71, will be back into position within slots 77 in beveled gears 73, from which they were rotated by the turning of shaft 71, to again lock the gears 73 and the spindle rails 12 against premature turning.

As shaft 22 continues to rotate, a cam wedge 78 forces cam follower 36 and plunger 35 into solenoid 34, and wedge 79 on drum 62 engages gear lock 65 and forces the spur gear 58 attached thereto to move axially along shaft 59 to a point to the left of barrier 81. During the rotation of the drum, the opposite tip of the concave surface 66 of the gear lock enters a second opening 82 for permitting the completion of one revolution of the spur gear 58. When the empty bobbins are in place, cam 33 has completed a revolution and the heart-shaped cam comes into contact with its cam follower 23 to again start normal operation. On its way down from its uppermost position, the finger 40 again operates limit switch 40' deenergizing solenoid 41, thus moving damper 42 to the position shown in full lines in Fig. 3. This causes the eductor 44 to reverse the flow of air in air pipe 47 and thus a stream of air is emitted from branches 49. This stream of air blows the yarn to the empty bobbin and the yarn begins to wind thereon. Finger 37 then

again contacts microswitch 38 to shut off the air supply.

It will be appreciated that with minor modifications within the scope of the invention, such as for example employing a turret type of spindle rail for the spindle rail 12 and by changing the number and position of teeth on gear 72, the apparatus of the instant invention may be employed to wind more than one bobbin to its capacity before manual doffing.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of our invention.

Having described our invention, what we desire to secure by Letters Patent is:

1. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means operatively conducted to said cam shaft for raising said ring rail above the normal traverse thereof and above said spindles, and means for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position.

2. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means, including a second cam mounted on said cam shaft for rotation therewith, for raising said ring rail above the normal traverse thereof and above said spindles, and means for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position.

3. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means including a second cam mounted on said cam shaft for rotation therewith, for raising said ring rail above the normal traverse thereof and above said spindles, and means, including a drum and a gear sector mounted thereon, for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position.

4. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means, including a second cam mounted on said cam shaft for rotation therewith, for raising said ring rail above the normal traverse thereof and above said spindles, and means, including a drum mounted on and rotated by said cam shaft and a gear sector carried by said drum for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position.



5. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means, including a second cam mounted on said cam shaft for rotation therewith, for raising said ring rail above the normal traverse thereof and above said spindles, and means for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position, said latter means including a gear system operatively connected to said spindle rail, a drum mounted on and rotated by said cam shaft, and a cam sector carried by said drum and adapted to operate said gear system.

6. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means, including a second cam mounted on said cam shaft for rotation therewith, for raising said ring rail above the normal traverse thereof and above said spindles, and means for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position, said latter means including a gear system operatively connected to said spindle rail, a drum mounted on and rotated by said cam shaft, and a cam sector carried by said drum and adapted to operate said gear system to rotate the spindle rail through 180° during a complete operative revolution of said drum.

7. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means, including a second cam mounted on said cam shaft for rotation therewith, for raising said ring rail above the normal traverse thereof and above said spindles, means for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position, said latter means including a gear system operatively connected to said spindle rail, a drum mounted on and rotated by said cam shaft, and a cam sector carried by said drum and adapted to operate said gear system to rotate the spindle rail through 180° during a complete operative revolution of said drum, and means rotatable by said gear system for locking the spindle rail in position.

8. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means, including a second cam mounted on said cam shaft for rotation therewith, for raising said ring rail above the normal traverse thereof and above said spindles, means for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position, said latter means including a gear system operatively connected to said spindle

rail, a drum mounted on and rotated by said cam shaft, and a cam sector carried by said drum and adapted to operate said gear system to rotate the spindle rail through 180° during a complete operative revolution of said drum, means rotatable by said gear system for locking the spindle rail in position and means for locking said gear system against premature rotation.

9. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means, including a second cam mounted on said cam shaft for rotation therewith, for raising said ring rail above the normal traverse thereof and above said spindles, means for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position, said latter means including a gear system, having a laterally movable gear, operatively connected to said spindle rail, a drum mounted on and rotated by said cam shaft and a spur gear sector carried by said drum and adapted to cooperate with said laterally movable gear to operate said gear system.

10. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means, including a second cam mounted on said cam shaft for rotation therewith, for raising said ring rail above the normal traverse thereof and above said spindles, means for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position, said latter means including a gear system, having a laterally movable gear, operatively connected to said spindle rail, a drum mounted on and rotated by said cam shaft, a spur gear sector carried by said drum and adapted to cooperate with said laterally movable gear to operate said gear system, and means carried by said laterally movable gear for locking the said gear system against premature rotation.

11. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means, including a second cam mounted on said cam shaft for rotation therewith, for raising said ring rail above the normal traverse thereof and above said spindles, means for rotating said spindle rails while said ring rail is in its raised position to bring to each of said spindles in turn into winding position, said latter means including a gear system, having a laterally movable gear, operatively connected to said spindle rail, a drum mounted on and rotated by said cam shaft, a spur gear sector carried by said drum and means for moving said laterally movable gear into the path of said spur gear sector so as to cause said spur gear sector to operate said gear system.

12. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means, including a second cam mounted on said cam shaft for rotation therewith, for raising said ring rail above the normal traverse thereof and above said spindles, means for rotating said spindle rails while said ring rail is in its raised position to bring to each of said spindles in turn into winding position, said latter means including a gear system, having a laterally movable gear, operatively connected to said spindle rail, a drum mounted on and rotated by said cam shaft, a spur gear sector carried by said drum, means for moving said laterally movable gear into the path of said spur gear sector so as to cause said spur gear sector to operate said gear system, and means carried by said laterally movable gear for locking said gear system against premature rotation.

13. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means, including a second cam mounted on said cam shaft for rotation therewith, for raising said ring rail above the normal traverse thereof and above said spindles, means for rotating said spindle rails while said ring rail is in its raised position to bring to each of said spindles in turn into winding position, said latter means including a gear system, having a laterally movable gear, operatively connected to said spindle rail, a drum mounted on and rotated by said cam shaft, a spur gear sector carried by said drum, means for moving said laterally movable gear into the path of said spur gear sector so as to cause said spur gear sector to operate said gear system, and separate means for moving said laterally movable gear out of the path of said spur gear sector.

14. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means, including a second cam mounted on said cam shaft for rotation therewith, for raising said ring rail above the normal traverse thereof and above said spindles, means for rotating said spindle rails while said ring rail is in its raised position to bring to each of said spindles in turn into winding position, said latter means including a gear system, having a laterally movable gear, operatively connected to said spindle rail, a drum mounted on and rotated by said cam shaft, a spur gear sector carried by said drum, means for moving said laterally movable gear into the path of said spur gear sector so as to cause said spur gear sector to operate said gear system, and a wedge on said drum for moving said laterally movable gear out of the path of said spur gear sector.

15. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail,

means, including a second cam mounted on said cam shaft for rotation therewith, for raising said ring rail above the normal traverse thereof and above said spindles, means for rotating said spindle rails while said ring rail is in its raised position to bring to each of said spindles in turn into winding position, said latter means including a gear system, having a laterally movable gear, operatively connected to said spindle rail, a drum mounted on and rotated by said cam shaft, a spur gear sector carried by said drum, means for moving said laterally movable gear into the path of said spur gear sector so as to cause said spur gear sector to operator said gear system, a wedge on said drum for moving said laterally movable gear out of the path of said spur gear sector, and means carried by said laterally movable cam for locking said gear system against premature rotation.

16. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means for raising said ring rail above the normal traverse thereof and above said spindles, means for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position and means operatively connected to said spindle rail for providing suction to the yarn at one position of the raised ring rail and for providing an air stream against the yarn at another position of said raised ring rail.

17. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means for raising said ring rail above the normal traverse thereof and above said spindles, means for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position and means operatively connected to said spindle rail and comprising an eductor and damper for providing suction to the yarn at one position of the raised ring rail and for providing an air stream against the yarn at another position of said raised ring rail.

18. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means for raising said ring rail above the normal traverse thereof and above said spindles, means for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position, said latter means including a gear system, having a laterally movable gear, operatively connected to said spindle rail, a drum mounted on and rotated by said cam shaft, a spur gear sector carried by said drum, means for moving said laterally movable gear into the path of said spur gear sector so as to cause said spur gear sector to operate said gear system, separate means for moving said laterally movable gear out of the path of said spur gear sector, and means operatively connected to said spindle rail for providing suction to the yarn at one position of the raised ring rail and for providing an air stream against the yarn at another position of said raised ring rail.

19. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the traverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means for raising said ring rail above the normal traverse thereof and above said spindles, means for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position, said latter means including a gear system, having a laterally movable gear, operatively connected to said spindle rail, a drum mounted on and rotated by said cam shaft, a spur gear sector carried by said drum, means for moving said laterally movable gear into the path of said spur gear sector so as to cause said spur gear sector to operate said gear system, a wedge on said drum for moving said laterally movable gear out of the path of said spur gear sector, and means operatively connected to said spindle rail and comprising an eductor and damper for providing suction to the yarn at one position of the raised ring rail and for providing an air stream against the yarn at another position of said raised ring rail.

20. Doffing mechanism for yarn winding apparatus comprising, in combination with a vertically reciprocating ring rail and means, including a cam and a cam shaft on which said cam is mounted, for effecting the transverse of said ring rail, a rotatable spindle rail, means for supporting a plurality of spindles on said spindle rail, means for raising said ring rail above the normal traverse thereof and above said spindles, means for rotating said spindle rail while said ring rail is in its raised position to bring to each of said spindles in turn into winding position, said latter means including a gear system, having a laterally movable gear, operatively connected to said spindle rail, a drum mounted on and rotated by said cam shaft, a spur gear sector carried by said drum, means for moving said laterally movable gear into the path of said spur gear sector so as to cause said spur gear sector to operate said gear system, a wedge on said drum for moving said laterally movable gear out of the path of said spur gear sector, means carried by said laterally movable gear for locking said gear system against premature rotation, and means operatively connected to said spindle rail and comprising an eductor and damper for providing suction to the yarn at one position of the raised ring rail and for providing an air stream against the yarn at another position of said raised ring rail.

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The following references are of record in the file of this patent:

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## Certificate of Correction

Patent No. 2,511,928 June 20, 1950

SAMUEL A. MANSFIELD ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 5, line 25, for the word "conducted" read *connected*;

and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of September, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
*Assistant Commissioner of Patents.*