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Kieronski et al.

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[54] **BOBBIN EJECTING MECHANISM FOR DOFFING MACHINE**

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[52] **U.S. Cl.** **57/53**, 242/41

[51] **Int. Cl.** **D01h 9/00**

[58] **Field of Search** ..... 57/1, 34 R, 52, 53, 54; 242/41, 46

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[57] **ABSTRACT**

A doffing unit for a textile machine such as a spinning frame removes bobbins from spindles with an arm and gripping chuck which releases the bobbins into an ejecting unit inside the doffing machine from which the bobbins are ejected horizontally and in vertical axial alignment into a receiving box. The ejecting unit has a chute and a pusher mechanism in the side of the chute operated by an air cylinder controlled by an air valve operated by a movable base member of the chute so that the pusher is operated in response to the impact of a falling bobbin in the chute striking against and depressing the base plate.

12 Claims, 6 Drawing Figures

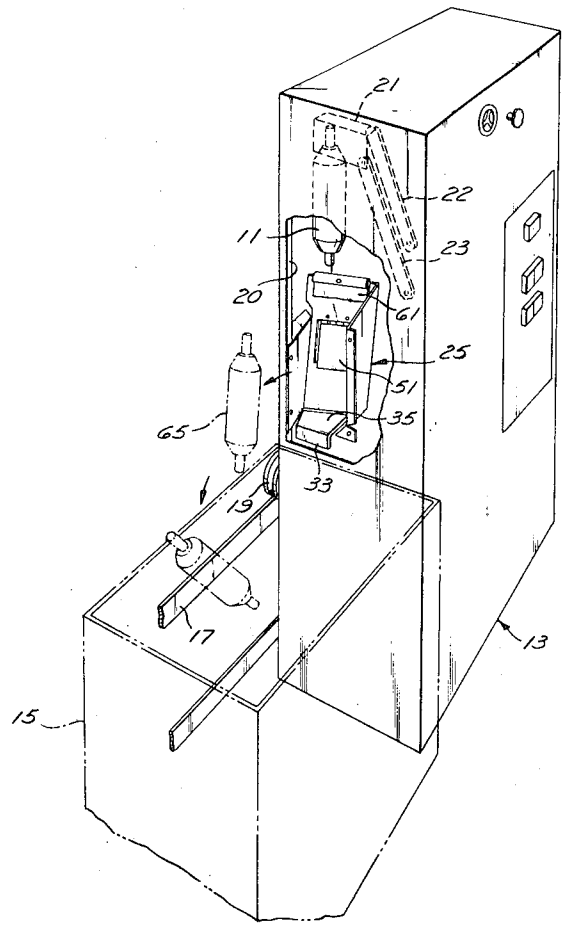
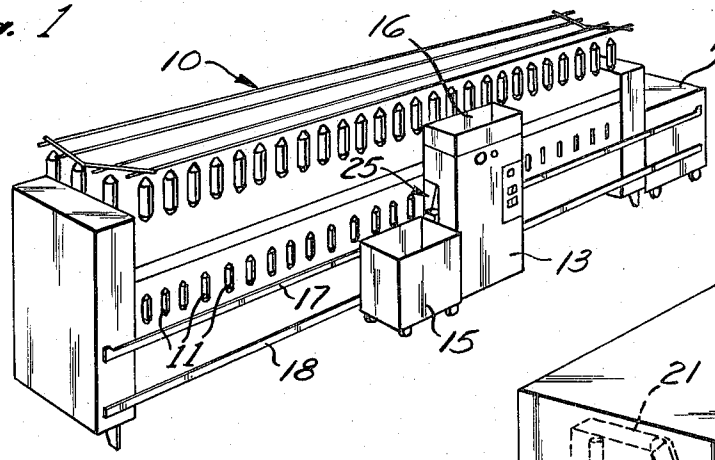


Fig. 1



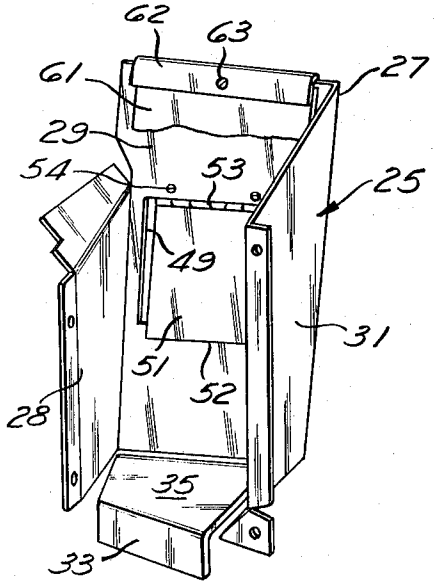


Fig. 3

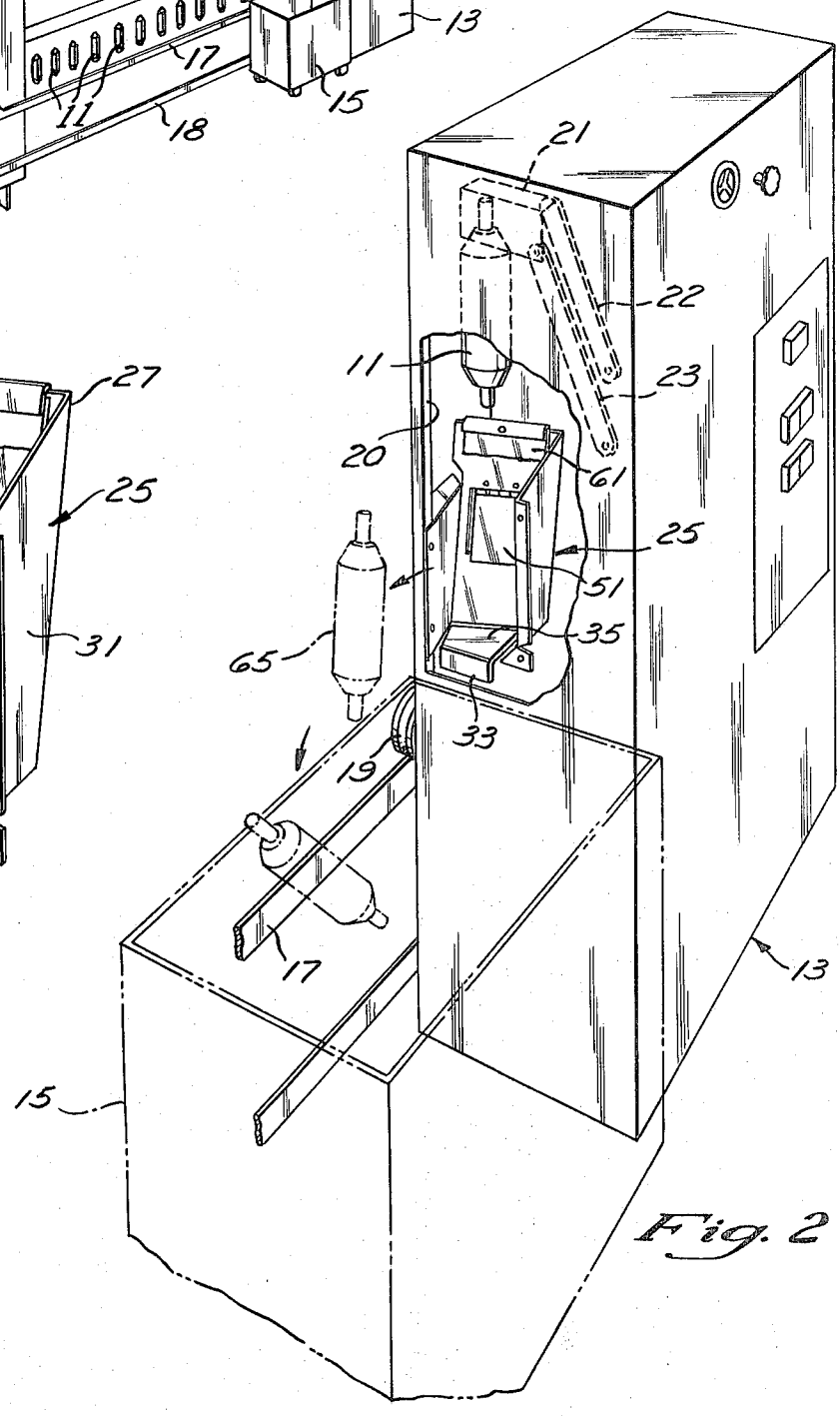


Fig. 2

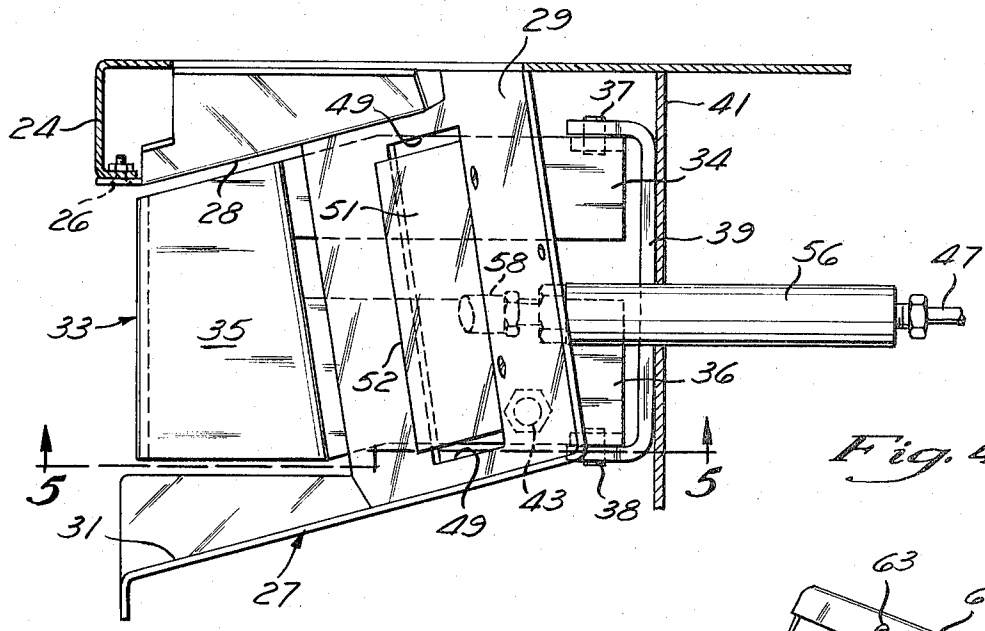


Fig. 4

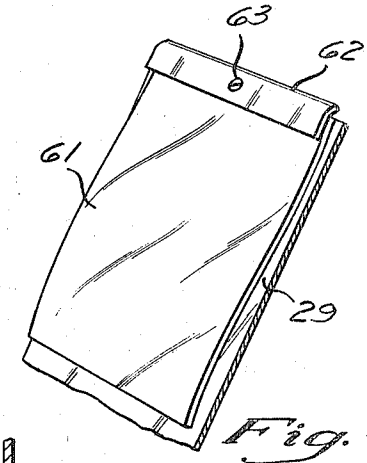


Fig. 6

Fig. 5

BOBBIN EJECTING MECHANISM FOR DOFFING MACHINE

BACKGROUND OF THE INVENTION

This invention relates generally to textile machinery and more particularly to machines for automatically doffing full bobbins from spinning frames or the like and replacing them with empty bobbins so that the spinning frame may be restarted for a new cycle of operation.

In one such arrangement for automatic doffing, a doffing machine is movable among a plurality of spinning frames and includes a transporter unit which is movable between the spinning frames and for doffing purposes is moved into alignment with one end of a spinning frame. Mounted on the transporter unit are a pair of doffer units, one for each side of the frame, and during the doffing cycle these doffer units move on rails carried by the transporter and the spinning frame along the side of the spinning frame to remove full bobbins and replace them with empty bobbins until they have completed doffing an entire side whereupon they return to their station on the transporter.

With this type of doffing machine, the doffer unit preferably moves at a constant speed and by suitable means, such as limit switches, the operations of removing a fully wound bobbin and replacing it with an empty bobbin are performed in correct timing and proper sequence. A bobbin is removed from the spindle by a suitable arm and gripper chuck arrangement, such as that shown as in U.S. Pat. No. 3,171,681 of S. Roller, granted Mar. 2, 1965, and U.S. Pat. No. 3,300,958 to S. Roller et al, granted Jan. 31, 1967. With this arrangement an arm comes outwardly and down from the doffer unit and a chuck on the end of the arm grips the upper end of bobbin, after which the arm is withdrawn upwardly and inwardly into the interior of the doffing unit and the full bobbin released, whereby it is transported to an empty cart or doff box in front of the doffer unit so that after the doffing cycle is completed and the doffer unit returns to the transporter, the cart contains all of the full bobbins removed from the frame.

Heretofore, after the bobbin has been released such units have provided a chute into which the bobbin falls, is rotated through 90° and impelled horizontally outward into the cart on a small conveyor belt. With this arrangement, the full bobbins are ejected in a horizontal position and tend to accumulate in one corner of the cart and in addition the mechanism tends to be rather complicated and the use of the conveyor belt causes a likelihood of abrasion of the outer yarn layers of the wound bobbin.

SUMMARY OF THE INVENTION

According to the present invention, there is provided an improved bobbin ejecting mechanism for receiving each of the fully wound bobbins after these are released by the gripping chuck and ejecting them into the cart of doff box in such a way that the full bobbins fall in random array to obtain more uniform distribution of the full bobbins in the cart and to avoid any tendency for the bobbins to accumulate in a particular location in the cart.

Another feature of the present invention is that the bobbins are ejected while retaining a substantially vertical orientation and without rubbing contact on any surfaces so that damage to the external layers of the wound yarn is minimized.

Still another feature of the present invention lies in the simplicity of its mechanism enabling low cost manufacture at a high degree of reliability in operation.

The foregoing features and advantages of this invention are accomplished by providing a bobbin receiving arrangement comprising a chute assembly into which the bobbin falls in vertical orientation after it is released by the gripping chuck. The chute assembly has three sides of suitable sloping orientation and is open on the side toward the cart into which the bobbin is to be ejected. On the side of the chute opposite the cart is located a pusher assembly in the form of a hinged door or gate behind which is located a spring returned single-acting pneumatic cylinder, which when energized by air pressure causes the pusher or gate to swing outwardly and upwardly toward the bobbin thereby impacting or pushing it out into the cart.

To actuate the ejector, the floor or base member of the chute is mounted in a pivotal arrangement so that upon contact by the falling bobbin, it is depressed to thereby actuate a three way air valve to energize an air cylinder and hence the pusher. Thus as the bobbin is released, it falls by gravity onto the bottom or base plate which then actuates the air valve to energize the cylinder and cause the ejector to swing outwardly and push the full bobbin substantially horizontally through the open side of the chute assembly so that it may fall into the open cart into a random manner. With this arrangement, the operation of the ejector is determined entirely by the falling bobbin and is therefore independent in timing and mode of operation from any of the remainder of the mechanisms on the doffer unit and any temporary delay or hangup in the release of the bobbin does not affect either the operation of the ejecting unit or cause any malfunction in the remainder of the doffer unit.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a spinning frame showing a doffer unit incorporating this invention partially through a doffing cycle;

FIG. 2 is an enlarged perspective view of the doffer unit of FIG. 1 showing details of the operation of the bobbin ejector;

FIG. 3 is an enlarged perspective of the chute assembly of the bobbin ejector;

FIG. 4 is a plan view of the bobbin ejector mechanism taken as a section through the doffer unit;

FIG. 5 is a cross sectional view of the bobbin ejector mechanism taken on line 5—5 of FIG. 4; and

FIG. 6 is a fragmentary perspective view of the chute and ejector flap.

DETAILED DESCRIPTION

Referring to the figures in greater detail, FIG. 1 shows a spinning frame 10 with an automatic doffing unit partially through the doffing cycle. It will be understood that while a spinning frame has been shown for purposes of illustration, automatic doffing units of the type to which the present invention pertains may be used with other types of textile machines including twisting and roving frames and other machinery in which a textile strand is wound on a bobbin which is

open at the top for removal from the spindle by an axially upward movement.

In a spinning frame **10** there will be a plurality of bobbins **11** each of which will be mounted on a spindle (not shown) by a friction fit. In the normal operation of the spinning frame, the frame will be run until all of the bobbins reach a substantially full condition, after which the frame is stopped, the doffing unit goes through its cycle removing the full bobbins, replacing them with empty bobbins in one pass along the side of the frame, after which the doffing unit returns to its starting position. In the present example, there is located a transporting unit **12** at one end of the frame which may be mounted for movement along rails in the floor between adjacent spinning frames and which serves to transport the doffing units from frame to frame. The doffing unit as shown at **13** moves on wheels or rollers **19** (see FIG. **2**) along upper and lower rails **17** and **18** affixed to the side of the spinning frame **10** and is carried on similar rail sections on the side of the transporter **12.** In doffing, the doffing unit **13** pushes an empty open cart or doff box **15** into which the full bobbins are ejected as described in greater detail hereinafter. Normally, the doff box **15** will roll along the floor on wheels and is generally, but not necessarily, secured to the doffing unit **13** by clamp means or the like so that after the full doff box is returned to the transporter it may be easily removed and moved elsewhere for further processing of the yarn on the bobbins. Generally, the doffing unit **13** carries a bobbin box **16** on the top containing the empty bobbins to be replaced on the spindles, but since this portion of the doffing operation forms no part of the present invention, it will not be described in any further detail.

Further details as to the bobbin ejecting mechanism of this invention are shown in FIG **2.** The full bobbins are gripped by a bobbin gripping head or chuck **21** mounted on arms **22** and **23** which form a parallelogram linkage to maintain the bobbin in a vertical upright position. Further details of the construction and operation of the bobbin gripping head may be found in the aforesaid U.S. Pat. Nos. 3,171,681 and 3,300,958. For purposes of explaining the present invention it will be understood that the bobbin gripping head moves outwardly and downwardly to grip a full bobbin on the spindle and then is raised upwardly and inwardly to the position shown in FIG. **2** after which the gripping head **21** releases the bobbin **11** allowing it to fall vertically downward into the ejecting unit **25.**

The ejecting unit **25** is mounted in the doffing unit **13** directly below the bobbin gripping head **21** when it is in the raised position within the doffing unit and the ejecting unit is located within an opening **20** formed in the side of the doffing unit. With this arrangement, when full bobbins are released by the gripping head **21** they fall vertically downward into the ejecting unit **25** from which they are ejected, in the manner explained in greater detail hereinafter, horizontally outwardly through the opening **20** so that they may fall into the doff box or cart **15.**

The ejecting unit **25** includes a chute member **27** having three generally vertically extending sides with the fourth side being defined by the opening **20.** The chute **27** is secured to suitable frame or side members **24** of the doffing unit by suitable means such as screws **26,** not all of which are shown in the figures, and includes a front side **28** generally adjacent the spinning frame **10** and a middle side **29** opposite the opening **20.** The third or backside **31** extends generally parallel to the front side **28,** and as shown in greater detail in FIGS. **3** and **4,** it will be seen that the front and back sides **28** and **31** slant generally somewhat rearwardly and away from the spinning frame and in a general direction toward the center of the doff box **15.** As shown in greater detail in FIG. **5,** while the front and back sides **28** and **31** extend in planes substantially in a vertical direction and parallel to each other, the middle side **29** slopes upwardly and away from the opening **20** to better guide and accomodate the shape of a full bobbin as explained in greater detail hereinafter.

At its lower end, the chute **27** is closed off by a base member **33.** The base member **33** includes a platform portion **35** shaped to substantially fill the opening at the lower end of the chute as defined by the sides **28, 29** and **31** and this platform portion **35** in turn is supported by a pair of front and rear legs **34** and **36** which extend laterally beneath the middle side **29** of chute **27** where they are provided with pivotal or hinge mountings **37** and **38** to a bracket member **39** secured in turn to a suitable frame member **41** of the doffing unit. As shown in phantom lines in FIG. **5,** this pivotal mounting of the base member **33** allows the platform portion **35** to move substantially vertically within the lower end portion of the chute **27.**

Directly below the leg **36** and adjacent but spaced slightly outwardly from the pivot **38** is located a three way air valve **44** having a spring biased plunger **43** extending upwardly in contact with the leg **36.** The air valve **44** is rigidly mounted on a suitable support member **45** also secured to a frame member of the doffing unit **13,** and since the plunger **43** is spring biased to an upward position, the force of plunger **43** serves to resiliently bias the base member **33** to an upward position with the platform **35** located as shown in solid lines in FIG. **5.** The air valve **44** includes a suitable outlet or exhaust port to the atmosphere (not shown), together with a supply line **46** from a suitable source of compressed air carried in the doffing unit **13,** together with an outlet line **47.** When the air valve **44** is in the normal position shown in FIG. **5,** the outlet line **47** is connected to the exhaust port and the spring biasing of the plunger **43** holds the base member **33** in the upward position. However, when a full bobbin is released by the bobbin gripping head **21,** it falls vertically downward until the lower end of the bobbin strikes the platform **35.** The striking force of the full bobbin then causes the platform **35** and base member **33** to deflect downwardly to the position shown in phantom lines in FIG. **5.** This causes the air valve plunger **43** to be depressed thereby internally connecting the supply line **46** to the outlet line **47** to actuate the pusher mechanism of the ejecting unit.

The pusher unit includes a pusher plate **51** mounted in a rectangular opening **49** centrally located on the middle side **29** of chute **27.** As shown, the pusher plate **51** is connected by a suitable hinge **53** and fasteners **54** at the upper edge of opening **49** and to the rear face of the middle side **29,** which the lower edge **52** of pusher plate **51** extends over the outer or front face of the middle side **29** so that pivotal movement of the pusher plate **51** about the hinge **53** is limited to a movement into the space defined by the chute **27.**

To actuate the pusher plate **51,** an air cylinder **56** is mounted by a suitable bracket (not shown) to the doff-

ing unit 13 and the air cylinder, which is of the single acting, spring retracted type, has a piston rod 57 whose external end terminates adjacent the pusher plate 51 in a bumper 58 made of suitable resilient material such as nylon. The air cylinder 56 in turn is connected to the outlet line 47 from air valve 44 so that when the air valve 44 is actuated by depression of the base member 33 upon impact from a loaded bobbin, the cylinder will be actuated to cause the piston rod 57 and bumper 58 to move toward the left as shown in FIGS. 4 and 5 and thereby cause the pusher plate 51 to rotate and eject the full bobbin from its position on top of the platform 35. After the full bobbin has been ejected, the spring action in the plunger 43 causes the platform 35 to return to the position shown in solid lines in 35, thereby returning the operation of the air valve 44 to its normal position. The outlet line 47 is then connected to the exhaust outlet and the internal spring within the air cylinder 56 causes the piston rod 57 and bumper 58 to retract within the air cylinder so that the pusher plate 51 may return to the normal position.

From the above it will be seen that the operation of this ejecting unit is controlled entirely by the impact of a full bobbin upon the base platform 35 to actuate the air valve 44 and thereby cause the pusher plate 51 to eject the full bobbin into the doff box 15. Since this control is entirely pneumatic and is not dependent upon any electrical signals or timing, it can operate efficiently and independently of the remaining mechanism of the doffing unit 13.

In order to provide more controlled ejection of the full bobbin, and to prevent any damage to the yarn on the external layers of the bobbin from contact with the pusher plate 51, the ejecting unit 25 is provided with a flap member 61 substantially co-extensive with the middle side 29 of chute 27. The flap member 61 is formed of a relatively soft and flexible resilient material, such as polyurethane rubber, and is secured to the middle side 29 only at its upper end by means of a suitable clamp 62 and fastening screw 63. It will be understood that the flap 61 is so configured as to provide proper clearance with the sides 28 and 31 so that it can swing and pivot freely within the chute 27 about a hinge point located beneath the clamp 62. Since the flap 61 overlies the pusher plate 51, it is only the flap 61 that will actually contact the full bobbin so that during the ejecting operation, the flap 61 will tend to assume the position shown in phantom lines at 61*a* in FIG. 5 and thereby impact the full bobbin in a manner to spread the impact loads generally over the surface of the bobbin.

While an ejecting unit of fixed dimension can be used with bobbins having a range of sizes, it is understood that the chute 27 is generally dimensioned so that a full bobbin has adequate clearance on all sides when it is in a downward position in contact with the platform 35. The location and stroke of movement of the pusher plate 51 are selected so that with full bobbins of the intended size, the impacting blow upon the bobbin produced by the pusher plate 51 as conducted through the flap 61 will generally be directed to a point close to the center of gravity of the fully wound bobbin so that as the bobbin is ejected, it tends to remain in a generally vertical or upright position as shown at 65 in FIG. 2. After this, because the variations in the operation of the mechanism and of the amount and distribution of the wound yarn over the bobbin, the bobbin may tend to tilt in one direction or the other from the vertical, so that as successive bobbins fall into the doff box 15, they tend to fall in a rather random arrangement which tends to distribute the full bobbins randomly throughout the space of the doff box rather than tending to deposit them in a fixed orientation in one corner as has been the tendency with the prior art devices.

It will also be understood that if there are variations in the weight and size of the bobbins, the ejecting impact from the pusher plate 51 may be modified by lengthening or shortening the stroke of the piston rod 57 and hence the lost motion travel of the bumper 58, as well as controlling the impact by the pressure level of the air pressure admitted through the supply line 46. Thus, variations in the weight of the fully wound bobbins can be compensated for to give the desired distribution and orientation of the bobbins within the doff box 15.

Although the preferred embodiment of the invention has been described in detail hereinabove, it is recognized that various modifications and rearrangements may be made thereto without departing from the scope of the invention as defined in the following claims.

What is claimed is:

1. A doffing unit for removing bobbins from spindles of a textile machine and transferring them to a bobbin receiving box comprising a bobbin gripping unit, an ejecting unit operable to propel bobbins into the receiving box and means to move said gripping unit between a spindle and said ejecting unit and release a bobbin therein, the improvement in said ejecting unit comprising a chute adapted to receive a bobbin and having an opening adjacent said receiving box, pusher means operable to impact a bobbin in said chute and eject it into said receiving box and means to operate said pusher means to eject a bobbin in said chute into said receiving box responsive to the presence of a bobbin in said chute.

2. A doffing unit as set forth in claim 1 wherein said pusher means is arranged to strike the side of a bobbin with a lateral impact near the center of the bobbin.

3. A doffing unit as set forth in claim 2 wherein said chute is arranged to receive a bobbin with its axis of rotation vertically oriented.

4. A doffing unit as set forth in claim 1 wherein said last mentioned means comprises an air cylinder and an air valve for controlling the actuation of said cylinder responsive to the impact of a bobbin against a portion of said chute.

5. A doffing unit as set forth in claim 4 wherein said pusher means is a hinged plate located in a portion of said chute.

6. A doffing unit as set forth in claim 4 wherein said chute portion is a base member in the lower end of said chute.

7. A doffing unit for removing bobbins from spindles of a textile machine and transferring them to a bobbin receiving box comprising a bobbin gripping unit, an ejecting unit operable to propel bobbins into the receiving box and means to move said gripping unit between a spindle and said ejecting unit and release a bobbin therein, the improvement in said ejecting unit comprising a chute positioned in said doffing unit below said bobbin gripping unit and arranged to receive a bobbin with its axis in a substantially vertical orientation, said chute including an open side adjacent said receiving box and a side opposite said open side,

pusher means located on said opposite side constructed and arranged to apply a lateral force to a bobbin in said chute to eject it out through said open side into said receiving box, said chute including a base member closing off the lower end thereof, means mounting said base member for vertical movement, means biasing said base member to an upper position, pusher actuating means arranged to actuate said pusher to apply an ejecting impact to a bobbin in said chute, and control means responsive to downward movement of said base member to operate said actuating means and thereby eject a bobbin from said chute in response to an impact from said bobbin moving said base member in a downward direction.

8. A doffing unit as set forth in claim **7** wherein said pusher actuating means comprises a single acting spring-returned air cylinder.

9. A doffing unit as set forth in claim **8** wherein said control means comprises an air valve operable to control air flow to and from said air cylinder.

10. A doffing unit as set forth in claim **9** wherein said air valve includes spring means operable to bias said base member to an upper position whereby depression of said base member opens said air valve to energize said air cylinder.

11. A doffing unit as set forth in claim **7** wherein said pusher means includes a pusher plate pivotally mounted in said opposite side of said chute for swinging movement into said chute upon actuation of said pusher actuating means.

12. A doffing unit as set forth in claim **11** including a resilient flap member overlying said pusher member and moveable by said pusher member to contact a bobbin in said chute.

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