May 7, 1963 A. H. BAHNSON, JR., ETAL 3,088,266

APPARATUS FOR DOFFING SPINNING FRAMES

Filed July 11, 1960 6 Sheets-Sheet 1

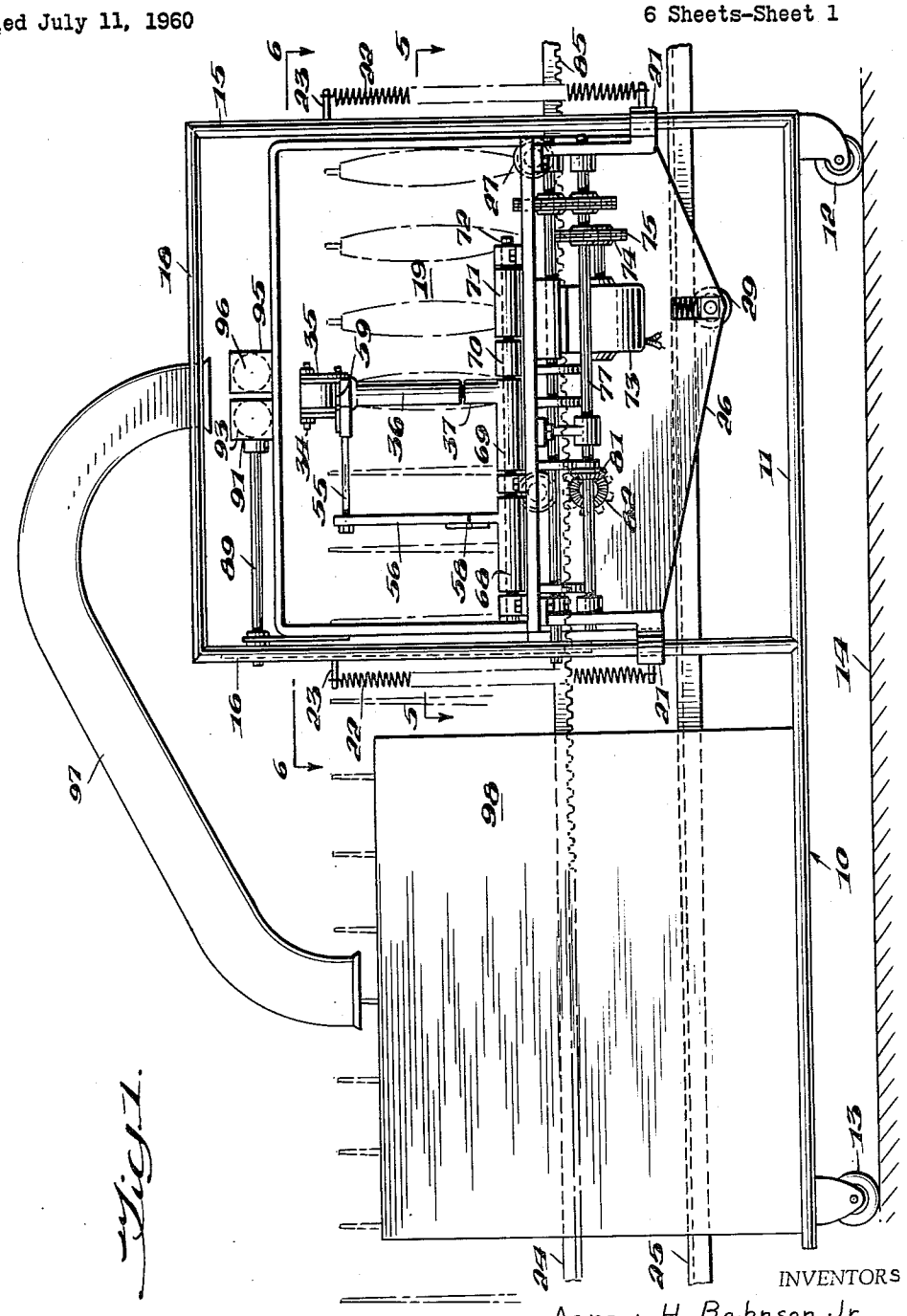


Fig. 1.

INVENTORS
Agnew H. Bahnson Jr
James F. King Jr

BY Pierce, Scheffler & Parker
ATTORNEYS

May 7, 1963 A. H. BAHNSON, JR., ETAL 3,088,266

APPARATUS FOR DOFFING SPINNING FRAMES

Filed July 11, 1960 6 Sheets-Sheet 2

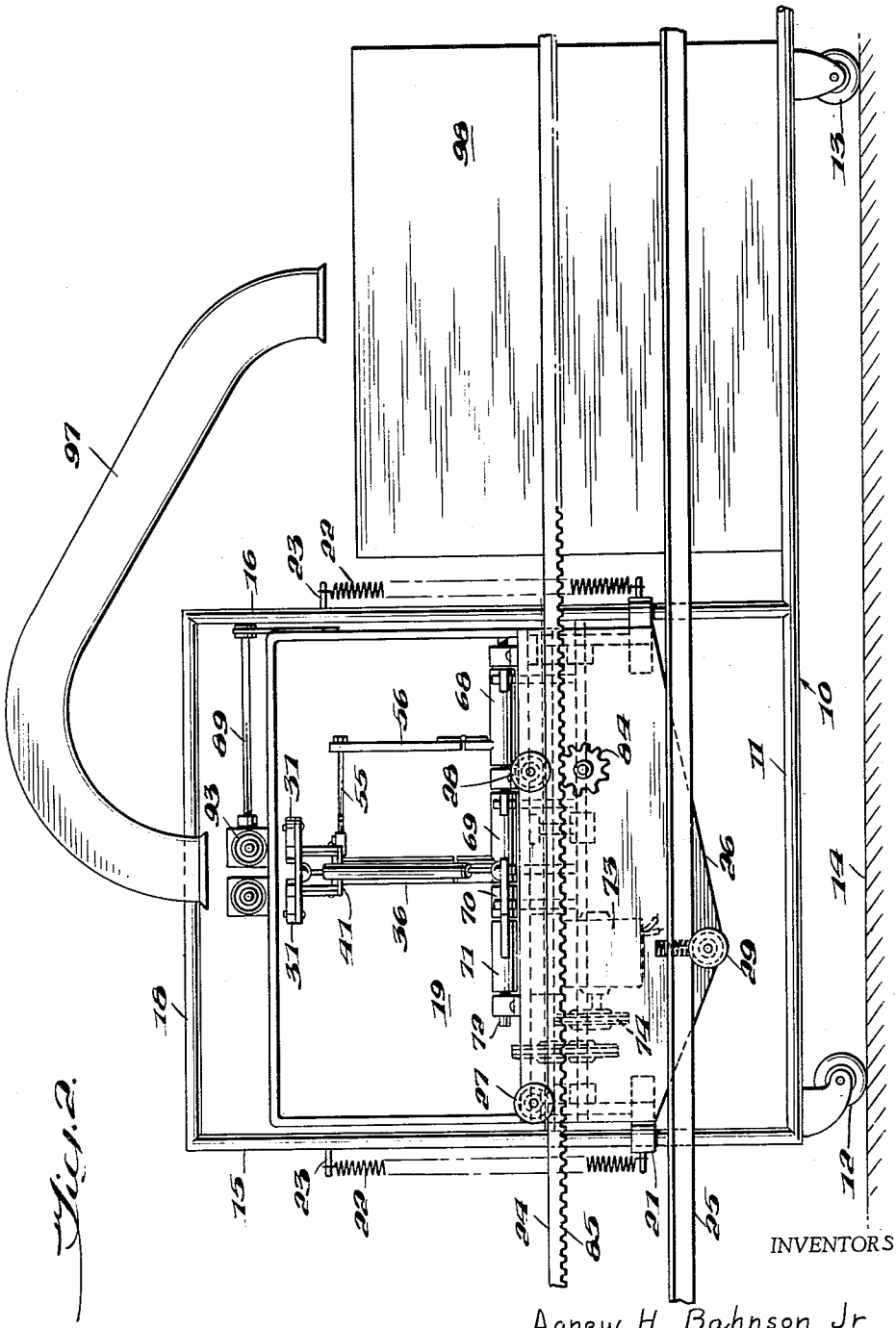


Fig. 2.

INVENTORS

Agnew H. Bahnson Jr
James F. King Jr

BY Pierce, Scheffler & Parker

ATTORNEYS

May 7, 1963 A. H. BAHNSON, JR., ETAL 3,088,266

APPARATUS FOR DOFFING SPINNING FRAMES

Filed July 11, 1960 6 Sheets-Sheet 3

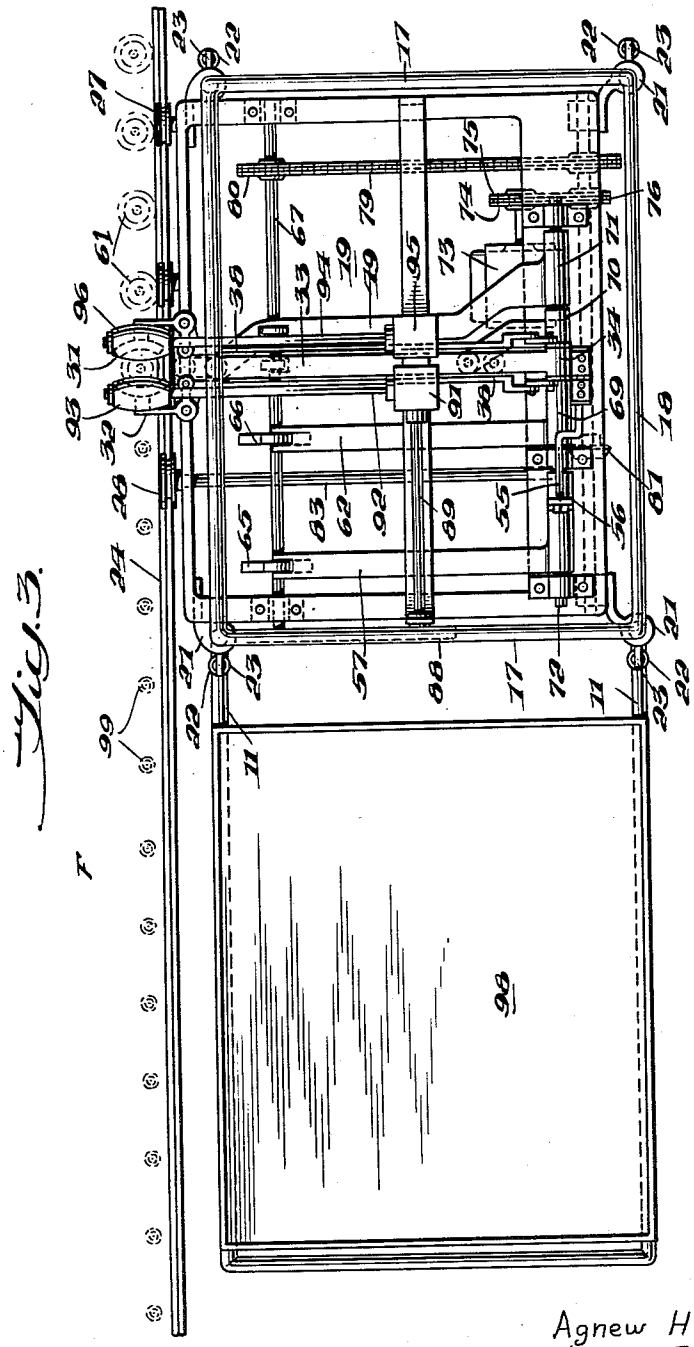


Fig. 3.

INVENTORS
Agnew H. Bahnson Jr.
James F. King Jr.

BY Pierce, Scheffler & Parker
ATTORNEYS

May 7, 1963 A. H. BAHNSON, JR., ETAL 3,088,266

APPARATUS FOR DOFFING SPINNING FRAMES

Filed July 11, 1960 6 Sheets-Sheet 4

Fig. 4.

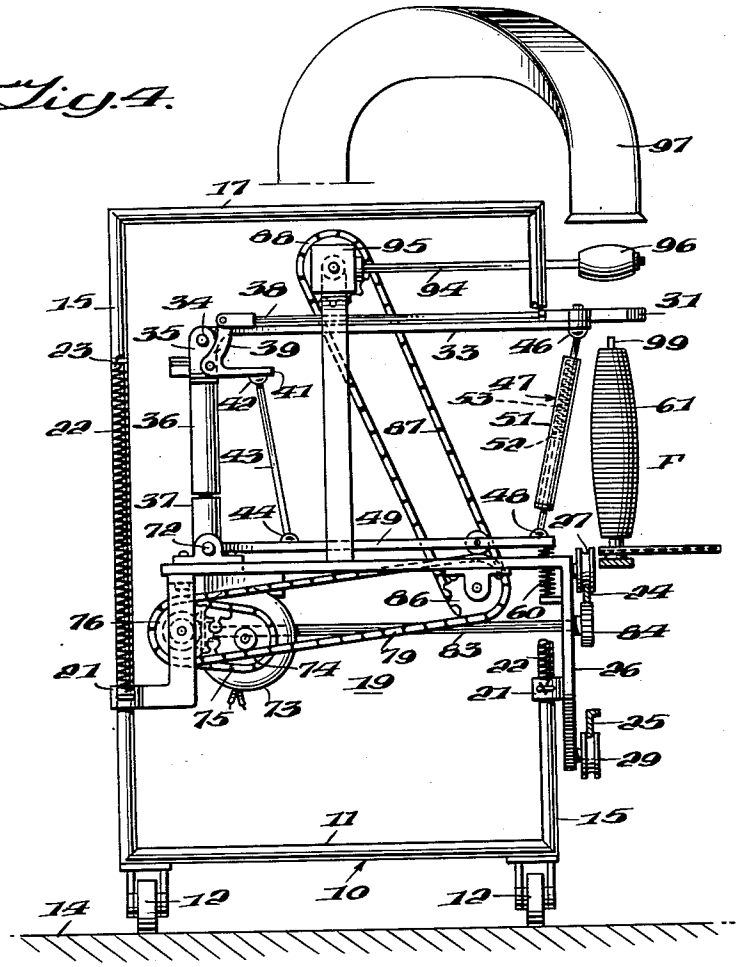
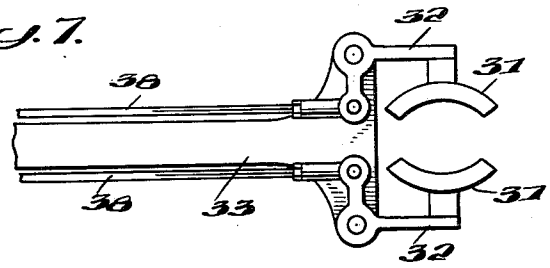



Fig. 7.




INVENTORS
Agnew H. Bahnson Jr.
James F. King Jr.

BY Pierce, Scheffler & Parker
ATTORNEYS

May 7, 1963 A. H. BAHNSON, JR., ETAL 3,088,266

APPARATUS FOR DOFFING SPINNING FRAMES

Filed July 11, 1960 6 Sheets-Sheet 5

Fig. 6.

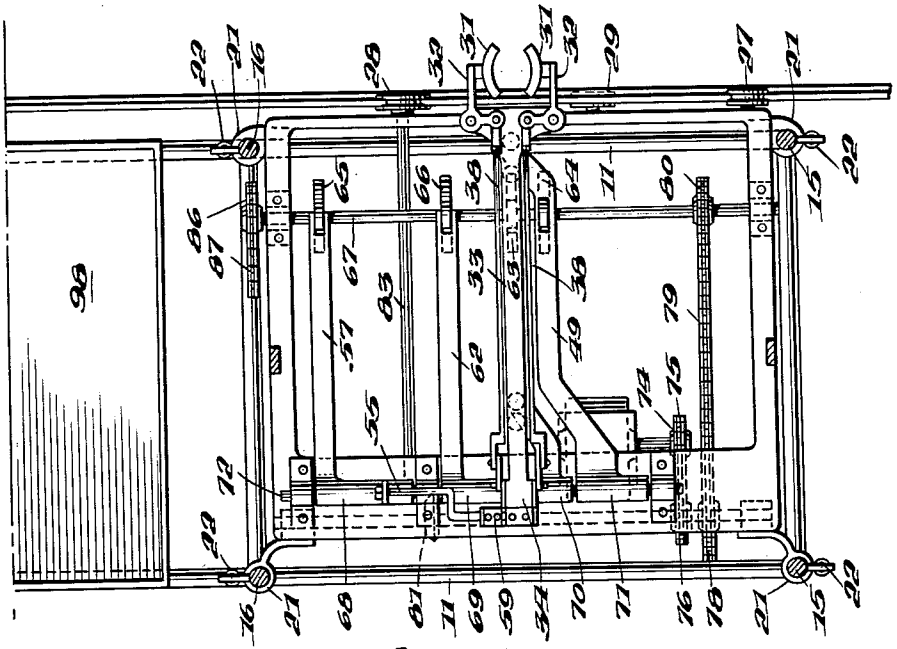
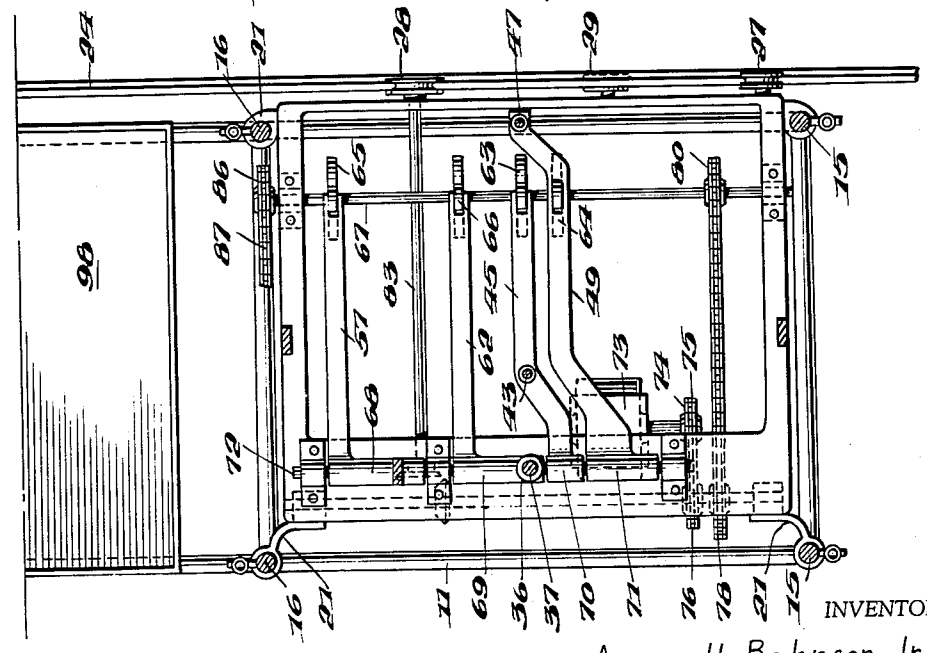


Fig. 5.



INVENTORS
Agnew H. Bahnson Jr.
James F. King Jr

BY Pierce, Scheffler & Parker
ATTORNEYS

May 7, 1963 A. H. BAHNSON, JR., ETAL 3,088,266

APPARATUS FOR DOFFING SPINNING FRAMES

Filed July 11, 1960 6 Sheets-Sheet 6

Fig. 8.

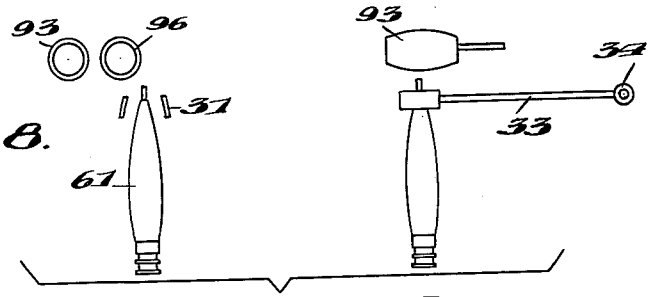



Fig. 9.

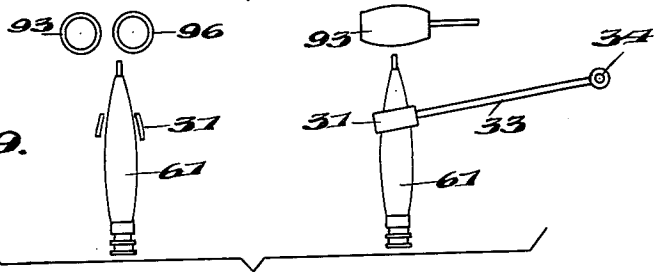



Fig. 10.

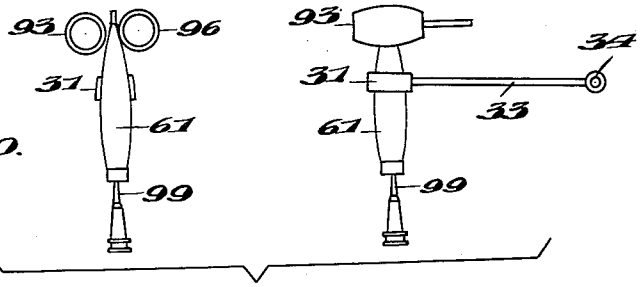
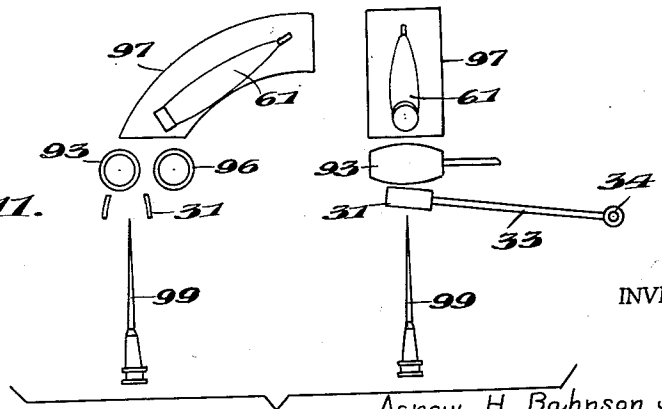



Fig. 11.




INVENTORS

Agnew H. Bahnson Jr
James F. King Jr

BY Pierce, Schiffler & Parker

ATTORNEYS

United States Patent Office

3,088,266

Patented May 7, 1963



3,088,266

# APPARATUS FOR DOFFING SPINNING FRAMES

Agnew H. Bahnson, Jr., and James F. King, Jr., Winston-Salem, N.C.; said King assignor to The Bahnson Company, Winston-Salem, N.C., a corporation of North Carolina

Filed July 11, 1960, Ser. No. 41,883
8 Claims. (Cl. 57—53)

This invention relates to apparatus for doffing spinning frames and the like and more particularly to apparatus of the type described, designed to travel along the spinning frame from one end to the other and doff the full bobbins from the spindles individually and in a consecutive manner.

The general object of the invention is to provide an improved doffing apparatus which will operate more quickly than those of previously known constructions. The inventive concept is characterized by a truck or carriage which is moved at a constant rate along the row of spindles on which bobbins have been fully wound, and means for exerting an initial lifting movement on the bobbins in a consecutive manner so as to break them loose from their respective spindles and feed them vertically upward into the nip between a pair of pinch rolls which accelerates the upward motion, the bobbins being literally ejected from the rolls, after passing therebetween, into a chute which serves to guide them into a suitable box-like receptacle mounted on the carriage. A principal advantage of the invention is that the pinch rolls operating in conjunction with the comparatively short-stroke bobbin removal means results in a considerable reduction in the doffing time per spindle, thus reducing, to a considerable extent, the total time required to doff one side of the spinning frame and hence effecting an economy in operation since the shut-down time of the frame is correspondingly reduced.

A further advantage of the invention is that the improved doffing apparatus may be installed on conventional spinning frames with a minimum of alteration.

The foregoing as well as other objects and advantages inherent in the invention will become more apparent from the following detailed description of one practical embodiment thereof and from the accompanying drawings which illustrate the construction. In these drawings:

FIG. 1 is a view in side elevation of the doffing apparatus looking in the direction of the spinning frame;

FIG. 2 is also a view in side elevation of the doffing apparatus looking in the direction away from the spinning frame;

FIG. 3 is a view of the doffing apparatus in top plan;

FIG. 4 is a view in end elevation of the doffing apparatus;

FIG. 5 is a horizontal section taken on line 5—5 of FIG. 1;

FIG. 6 is also a horizontal section taken on line 6—6 of FIG. 1;

FIG. 7 is a detailed view showing the construction of the gripper arms by which the full bobbins are lifted from their spindles into the pinch rolls; and

FIGS. 8–11 are schematic views showing the sequential steps involved in removing a bobbin from its associated spindle and transferring the same into a chute by means of the pinch rolls.

With reference now to the drawings and in particular to FIGS. 1–3, the doffing apparatus is characterized in general by a truck or carriage that is arranged to move longitudinally along the spinning frame F from one end to the other. The truck structure may take various forms and in the present embodiment is characterized by a rectangular chassis 10 made from tubular steel members 11 which may be welded or otherwise secured together.



Castered wheels 12 at the front end of the chassis and non-castered wheels 13 at the rear of the chassis enable the truck to roll along the floor 14 of the spinning room in the aisle between adjacent spinning frames.

Upstanding at each of the front corners of the chassis 10 is a post 15 which can be made from tubular steel and similar upstanding posts 16 are provided at each side of the chassis substantially midway of its length. The tubular steel posts 15 and 16 are interconnected at the top by means of transverse and longitudinal tubular steel members 17, 18. These four posts 15 and 16 are provided to support the head on which the doffing components are mounted. The doffing head 19 is seen to be of rectangular configuration and its dimensions are such that it can be fitted in a horizontal attitude within the rectangular space established by the four upright posts 15, 16. Because the floor of a spinning room may often be uneven, it is desirable to mount the doffing head, which is guided along the frame at a constant height, so as to permit it to yield in a vertical direction relative to the truck. To this end, it will be seen that the doffing head is not mounted rigidly on the truck but rather includes at each corner thereof a guide sleeve 21 which makes a close sliding fit with the correspondingly positioned upstanding post 15, 16. To carry the weight of the doffing head, a tension spring 22 is provided at each of the posts 15, 16. The upper end of each spring 22 is anchored to its corresponding post by means of a laterally projecting lug 23 and the lower end of each spring is connected to the correspondingly positioned guide sleeve 21. Consequently, the doffing head 19 has a spring type of suspension which permits of a vertical yielding movement with respect to the truck.

In order to establish the necessary guiding relationship between the doffing head and the side of the spinning frame so that the head will travel accurately along the line of bobbins to be doffed, upper and lower, parallel spaced guide rails 24, 25 are secured to the spinning frame and these rails which can take the form of angle iron extend from one end of the frame to the other. The doffing head includes a vertically disposed plate member 26 aligned parallel with the guide rails 24, 25 on which are rotatably mounted two longitudinally spaced guide wheels 27, 28 each having a peripheral groove that establishes a running engagement with the vertically upward extending flange of the upper guide rail 24. A third guide wheel 29 also rotatably mounted on plate member 26 beneath and intermediate the upper guide wheels 27, 28 is likewise provided with a peripheral groove which establishes a running engagement with the vertically downward flange of the lower guide rail 25. The lower guide wheel 29 is preferably spring mounted to permit of a slight vertical movement in order to facilitate the placing of the plate member 26 on the guide rails 24, 25.

As previously explained, a principal object of this invention is to doff the bobbins in a consecutive manner, as the doffing head moves longitudinally along the spinning frame, by means which exert an initial lifting movement of the bobbins so as to break them loose from the spindles and feed them upwardly into the nip between a pair of pinch rolls which serve to impart a quick accelerating force upward to the bobbins. The accelerated bobbins then pass upwardly from the rolls at a relatively high velocity into the mouth of a chute and are then carried through the chute under their own momentum to a point of discharge into a suitable box-like receptacle which can be carried by the truck.

In the present embodiment, the initial lifting movement is imparted to the bobbins by means of a gripper arm assembly which includes a pair of pivotally mounted jaws mounted on a lifting arm to which is imparted the neces-

sary compound motion for acting upon the bobbins in succession.

As seen in FIGS. 4, 6 and 7, the two gripper jaws are indicated at 31, and each jaw is carried by one arm of a bellcrank 32 which is pivotally mounted at the outer end of a gripper arm 33 for motion in a generally horizontal plane. The opposite end of gripper arm 33 terminates in a horizontally extending pivot bearing 34 mounted in a fork 35 at the upper end of a vertical sleeve 36 which is mounted upon a vertically extending shaft 37, the sleeve 36 being adapted to be oscillated about the axis of this shaft in a manner to be later explained.

Push-pull rods 38 are employed to open and close the gripper jaws 31. One end of each of the rods 38 is articulated to the other arm of the associated bellcrank 32, and the opposite end of each rod 38 which extends parallel with arm 33 is articulated in one arm of a bellcrank 39 which is pivotally mounted on fork 35 for motion in a vertical plane. The other arms of the bellcranks 39 are interconnected by means of a horizontal bridge 41 for simultaneous movement. Connected to the bridge 41 by a universal joint 42 is the upper end of a connecting rod 43, and a similar universal joint 44 connects the lower end of rod 43 to an intermediate point on a cam follower arm 45 which is adapted to be actuated in a vertical plane.

Connected to the underside of the gripper arm 31 near the outer end thereof by a universal joint 46 is the upper end of a connecting rod assembly 47, and a similar universal joint 48 connects the lower end of this assembly to the outer end of another cam follower arm 49. The connecting rod assembly 47 is preferably comprised of a cylinder 51, a piston 52 operating in the cylinder, and a helical loading spring 53 located between the piston head and the upper end of the cylinder. The latter connects directly with the upper universal joint 46, and the piston 52 connects directly with the lower universal joint 48. The purpose of this construction is to enable a hammer-like blow to be imparted to the gripper arm 33 so as to facilitate breaking loose the bobbins from their respective spindles. With the construction described, the piston 52 will have an initial amount of free travel upwardly as the cam follower arm 49 rises until the loading spring 53 "bottoms" whereupon the piston and cylinder then become effectively coupled and thrust upwardly as a unit against the underside of the gripper arm.

For oscillating the gripper assembly, including the gripper jaws 31 and arm 33, about the axis of shaft 37, it will be seen from FIGS. 1 and 2 that the upper end of sleeve 36 is provided with a laterally extending arm 55 which is connected to the upper end of an arm 56 that extends upward from a third cam follower arm 57. As the latter raises and lowers, arm 56 will oscillate in a vertical plane thus causing sleeve 36 to be oscillated about its vertical axis. A hinge 58 is provided in arm 56 to compensate for oscillating motion of sleeve 36, and a similar hinge 59 is provided in arm 55 to compensate for the arcuate motion of arm 56.

For oscillating the sleeve 36 in a vertical plane so as to maintain the center of the gripper jaws 31 in alignment with the line of bobbins 61 as sleeve 36 and gripper arm 33 oscillate about the axis of shaft 37, the latter forms a part of an upward extension of a fourth cam follower arm 62.

The outer ends of the four cam follower arms 45, 49, 57 and 62 are actuated by cams 63—66, respectively which are mounted upon a horizontally extending cam shaft 67 located below the level of the cam follower arms and parallel with the guide rails 24, 25. Suitable spring means 60 may be provided for each of the cam follower arms to maintain them in engagement with their respective actuating cams.

The inner ends of the four cam follower arms terminate in axially aligned pivot bearings 68—71 which are mounted upon a horizontal shaft 72 parallel with cam shaft 67 so as to permit pivotal movement of the cam follower arms about the shaft axis.

The present embodiment uses a single electric motor 73 to drive the truck longitudinally of the spinning frame and also to actuate the doffing mechanism. Motor 73 is mounted upon the doffing head 19 beneath the level of the cam follower arms, and the drive shaft of this motor is provided with a drive sprocket 74 which is coupled by means of a drive chain 75 to a sprocket 76 mounted on a horizontally extending drive shaft 77 which is parallel to the cam shaft 67. Electric power to the motor 73 can be provided in a suitable manner such as by conventional sliding shoes and electrified rails, not shown, which may be mounted on the frame. Drive shaft 77 carries a second sprocket 78 which is coupled by means of a drive chain 79 to a sprocket 80 mounted on one end of cam shaft 67 previously described.

A bevel gear set including one bevel gear 81 on shaft 77 and another bevel gear 82 on shaft 83 is used to transfer rotation of shaft 77 through 90° to shaft 83 which extends normal to shaft 77 in the direction of the spinning frame and terminates exteriorly of plate 26 in a rack pinion 84 which meshes with the teeth of a rack gear 85 which may be formed at the underside of the upper guide rail 24. Thus when motor 73 is energized, it serves to drive cam shaft 67 and also rack pinion 84 along the rack 85 and thus causes the truck to move longitudinally of the frame.

Secured to the other end of cam shaft 67 is a drive sprocket 86 which is coupled by a drive chain 87 to an upper sprocket 88 secured upon a shaft 89 which extends parallel to cam shaft 67. Shaft 89 terminates within a housing 91 which includes a bevel gear set and a support bearing for one end of another horizontal shaft 92 which extends normal to shaft 89 in the direction of the spinning frame. The other end of shaft 92 terminates in a pinch roll 93 which is suitably secured to the shaft and located above the gripper jaws 31. Thus the pinch roll 93 is driven by means of the shaft 92 which receives its driving power from shaft 89 through the bevel gear set within housing 91.

The peripheral velocity of pinch roll 93 is preferably such as to match the upward velocity of the bobbin as it enters the rolls 93, 96.

Disposed parallel with shaft 92 is a similar rotatable shaft 94 having one end thereof mounted within a bearing housing 95. Shaft 94 also terminates in a pinch roll 96 located parallel to and spaced laterally of roll 93 but is not power driven. It can be power driven, if desired, but only one of the two rolls 93, 96 is required to be power driven in order to accelerate the bobbins in an upward direction, as they are lifted upward by the gripper jaws 31 into the nip between the pinch rolls.

Full bobbins 61 after being doffed by the gripper jaws 31 and passed upwardly through the rolls 93, 96 are carried by their own momentum through a chute 97 into a box-like receptacle 98 carried by the truck rearwardly of the doffing head.

The doffing apparatus operates in a cyclic manner and the various phases of operation in each cycle are illustrated in sequence in FIGS. 8–11.

By way of brief review, it has been explained that the function of the four cam follower arms 45, 49, 57 and 62 is to compound their motion and transfer it to the gripper arm 33 to maintain the gripper jaws 31 in proper relation to the bobbin 61 throughout the entire doffing cycle. Cam follower arm 57 serves to move the gripper arm 33 and jaws 31 in a longitudinal oscillating pattern to compensate for the continuous movement of the doffing head along the line of bobbins on the spindles 99; cam follower arm 62 moves the gripper arm and jaws in a transverse direction relative to the spinning frame to compensate for the arc of swinging caused by cam follower arm 57; cam follower arm 45 actuates the gripper jaws 31 at the proper instant so as to grasp the bobbin;

and cam follower arm **49** moves the gripper arm **33** and jaws in a vertical direction to position the jaws **31** over the bobbin and to remove the bobbin and lift it into the nip between the rolls **93, 96** directly above thus accelerating the bobbin upward and transferring it to the chute **97** through which it is passed into the receptacle **98**.

FIG. 8 shows the positions of the various operating components at the beginning of a complete cycle of operation as a bobbin **61** is approached. In this view, the rolls **93, 96** have not as yet reached a position directly over the bobbin and the jaws **31** are open and adjacent the upper end of the bobbin. In the next view, FIG. 9, the rolls have moved more closely to a position directly over the bobbin and the jaws have descended along the bobbin and moved to a closed position around the same. In the next view, FIG. 10, the rolls are directly over the bobbin and the jaws have now lifted the bobbin from its spindle **99** into the nip between the rolls. In the next view, FIG. 11, the bobbin has been ejected upwardly from the rolls into the chute **97** and the jaws have opened. The doffing unit is then readied to doff the next bobbin in the line by swinging the raised jaws into position over that bobbin whereupon the parts will again be in the position shown in FIG. 8, and a new cycle commences.

In conclusion, while one practical embodiment of the invention has been described and illustrated, various modifications in the construction and arrangement of the component parts are possible within the spirit and scope of the invention as defined in the appended claims since the inventive concept resides principally in the two coordinated features of lifting the bobbins from their spindles in succession as the doffing apparatus travels along the line of bobbins into the nip between rolls which then accelerate the upward motion and effect transfer of the bobbins through a chute or equivalent guide structure into a receptacle.

We claim:

1. Apparatus for doffing spinning frames and the like comprising a doffing unit arranged to move longitudinally along a line of full bobbins on the frame, said doffing unit including means for lifting the bobbins in succession from their respective spindles, roll means above and cooperative with said lifting means, and bobbins for effecting a transfer of each bobbin from said lifting means and thereby continuing the upward movement of said bobbins, and means rotating said roll means.

2. Apparatus for doffing spinning frames and the like comprising a doffing unit arranged to move longitudinally along a line of full bobbins on the frame, said doffing unit including a receptacle for the doffed bobbins, means for lifting the bobbins in succession from their respective spindles, roll means above and cooperative with said lifting means and bobbin for effecting a transfer of each bobbin from said lifting means and thereby continuing the upward movement of said bobbins, means rotating said roll means, and a chute extending from said roll means to said receptacle, the entrance to said chute being located above said roll means.

3. Apparatus for doffing spinning frames and the like comprising a doffing unit arranged to move longitudinally along a line of full bobbins on the frame, said doffing unit including means for lifting the bobbins in succession from their respective spindles, a pair of spaced rolls located above said lifting means, said lifting means serving to feed the bobbins into the space between said rolls, and said rolls serving to continue the upward movement of the bobbins, and means for rotating at least one of said rolls.

4. Apparatus for doffing spinning frames and the like comprising a chassis arranged to move longitudinally along the frame, a receptacle on said chassis for the doffed bobbins, a doffing head mounted on said chassis, guide means on said frame cooperative with and engaging complementary guide means on said doffing head for guiding said doffing head along a fixed path longitudinally along a line of bobbins on said frame, means carried by said doffing head for lifting the bobbins in succession from their respective spindles, roll means carried by said doffing head above and cooperative with said lifting means and bobbin for continuing the upward movement of said bobbins, means rotating said roll means, and a chute extending from said roll means to said receptacle, the entrance to said chute being located above said roll means.

5. Apparatus for doffing spinning frames and the like as defined in claim 4 wherein the mounting for said doffing head on said chassis includes resilient means permitting a yielding movement therebetween in a vertical direction as said chassis moves along the frame to compensate for any unevenness in the level of the floor on which the frame is supported.

6. Apparatus for doffing spinning frames and the like as defined in claim 4 and which further includes an electric motor on said doffing head, a gear rack extending longitudinally on said frame parallel with said guide means, and a rack pinion meshed with said gear rack, said rack pinion being driven by said motor whereby to effect longitudinal movement of said doffing head and related chassis along said frame.

7. Apparatus for doffing spinning frames and the like as defined in claim 4 wherein said means for lifting said bobbins in succession from their respective spindles comprises a pair of jaws for gripping the bobbin and which are mounted for actuation towards and away from each other at one end of a lifting arm, mutually perpendicular pivot means supporting the other end of said lifting arm for pivotal movement of said arm in vertical and horizontal planes respectively, a first cam follower arm and means controlled thereby for actuating said jaws, a second cam follower arm and means controlled thereby for actuating said lifting arm pivotally in a vertical plane, a third cam follower arm and means controlled thereby for actuating said lifting arm pivotally in a horizontal plane, a cam shaft including cams thereon individual to said cam follower arms for actuating the same in a predetermined sequence, and means for driving said cam shaft in rotation.

8. Apparatus for doffing spinning frames and the like as defined in claim 7 wherein said means for driving said cam shaft is constituted by an electric motor carried by said doffing head, said motor also serving as the means for rotating said roll means, and further serving to move said doffing head and chassis longitudinally along said frame, there being on said frame a gear rack extending longitudinally thereof, and a rack pinion meshed with said rack and which is driven by said motor.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 692,491 | Stell | Feb. 4, 1902 |
| 1,067,058 | Peterson | July 8, 1913 |
| 2,379,713 | Hohl | July 3, 1945 |
| 2,531,238 | Tandler et al. | Nov. 21, 1950 |
| 2,886,940 | Urano et al. | May 19, 1959 |
| 2,961,822 | Escursell | Nov. 29, 1960 |