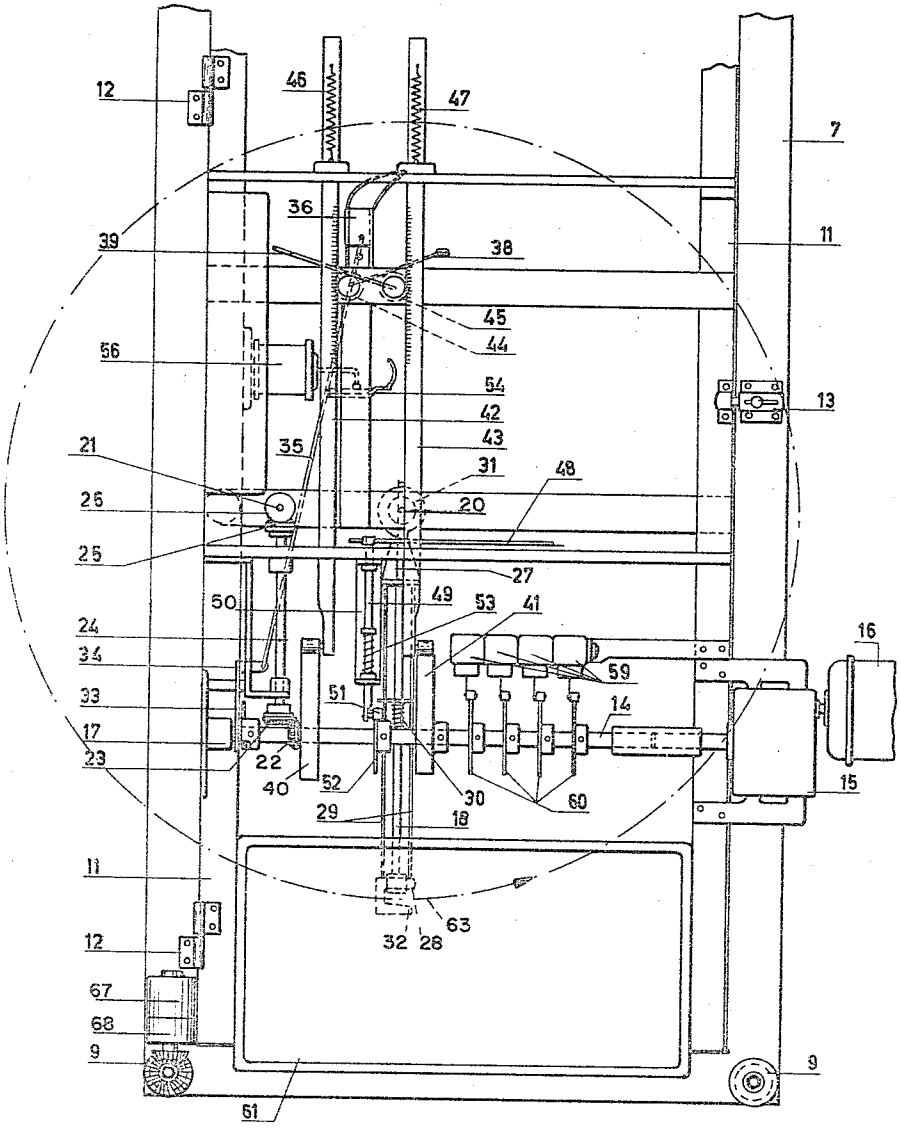
March 21, 1967 H. A. ZOETMAN ETAL 3,309,856

DEVICE FOR THE SPINNING OR TWINING AND WINDING OF YARNS

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FIG. 1



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DEVICE FOR THE SPINNING OR TWINING AND WINDING OF YARNS

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FIG. 2

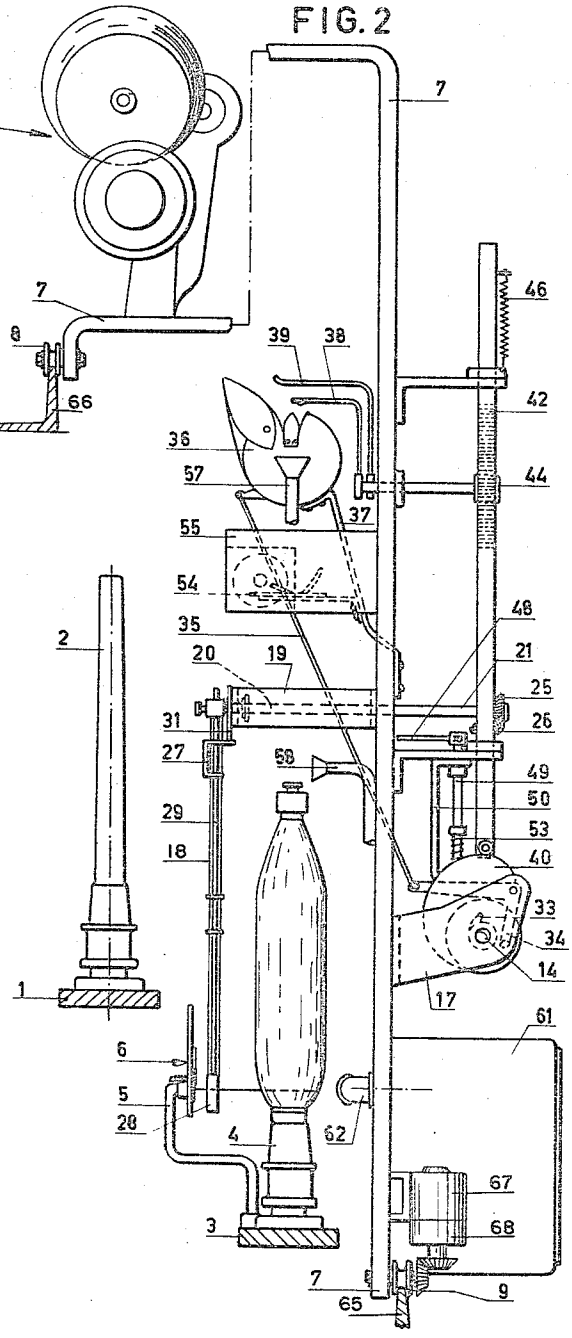
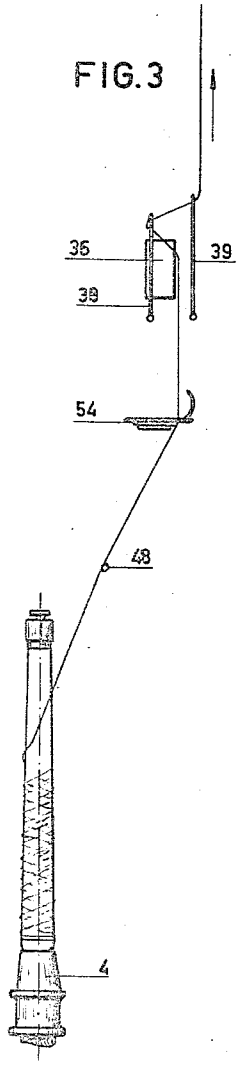


FIG. 3



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FIG. 4

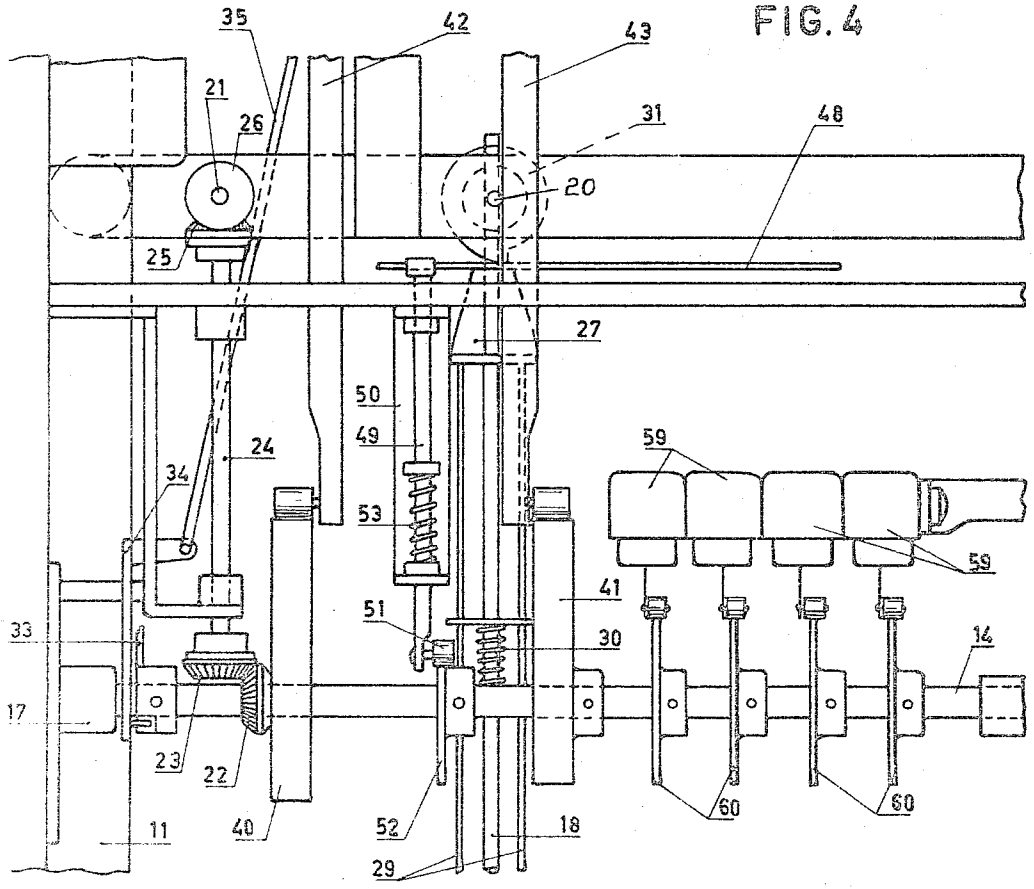
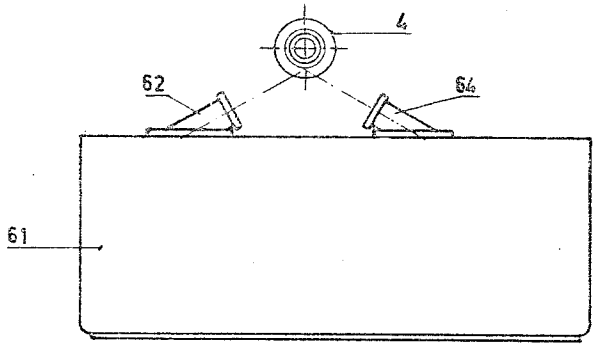


FIG. 5



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United States Patent Office 3,309,856 Patented Mar. 21, 1967

3,309,856

DEVICE FOR THE SPINNING OR TWINING AND WINDING OF YARNS

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Filed July 24, 1963, Ser. No. 297,386
Claims priority, application Netherlands, Sept. 13, 1962, 283,204
8 Claims. (Cl. 57—34)

This invention relates to a device for the spinning or twining of yarns and the rewinding of the said yarn into larger yarn bodies, the said device comprising a spinning or twining machine, a doffing apparatus for changing the full tubes on the spinning or twining spindles after each spinning period for empty tubes arranged near the spindles, and a winding machine for rewinding the yarn after doffing from the full tubes into larger bobbins.

A device of this kind for the production of jute yarn is known, in which the doffed tubes are rewound by a winding machine having a large number of winding places, which is arranged on and in the floor in front of the spinning machine.

At each winding place the yarns of three doffed tubes or bobbins are successively knotted to the yarn already present on the bobbin and are rewound.

Because the winding machine extends over the whole length of the spinning machine, this known device takes up a lot of room. This is a drawback, as in the textile industry the floor surface required is an important cost-price-determining factor. At the same time the winding machine reduces the accessibility of the spinning machine for the repair of yarn ruptures, the putting in of new roving spools and the like, while, owing to its large dimensions, the winding machine is an expensive investment.

An object of the invention is to provide a device, in which the aforesaid drawbacks are either entirely absent or reduced and which is suitable for working up various fibre materials, especially cotton, wool and synthetic fibres, into yarn.

For this purpose, the device according to the invention is characterized in that the winding machine is capable of being shifted along the spinning or twining machine.

The capacity of a modern winding machine is such that one single winding unit can co-operate with about one hundred spinning spindles, depending on the type of spinning machine and the nature and the thickness of the yarn. Owing to this, a device which is according to the invention composed of a spinning machine and a winding machine, does not require more room than would be necessary for a spinning machine by itself, while the spinning machine retains an undiminished accessibility except for the place where the winding machine is located.

A practical combined construction of the spinning machine and the winding machine is obtained, if the spinning machine is provided with rails which are placed in longitudinal direction and along which the winding machine can be shifted on rollers or on wheels. Preferably, one of the rails is provided at the front side of the spinning machine near the spindle frame and a second rail at the upper side of the spinning machine.

According to another feature of the invention, the winding machine is provided with a driving mechanism for stepping it along the spinning machine. Preferably, the motor of this driving mechanism is switched on and off automatically, the automatism being controlled by a light-sensitive element in co-operation with a light source, both of which move along together with the winding machine and are directed to the place where a tube is situated relative to the winding machine during rewinding. A full tube will reflect more light from the light source to the light-sensitive element than an empty or almost empty tube, and the change in the voltage or the resistance of the light-sensitive element which is thus brought about is employed to control the stepping of the winding machine.

The device according to this invention is further characterized in that the winding machine is provided with a device by which the yarn of a full tube prior to its being rewound is connected to the yarn already present on the bobbin. Preferably, this device comprises a knotter, a movable gripper for introducing the yarn end from the full tube into the knotter, one or more movable yarn carriers for introducing the yarn end between the bobbin and the last unwound tube into the knotter, and a cutting apparatus for cutting the yarn end between the tube and the knotter. According to the invention the movements of these elements are derived from a cam shaft driven by a motor, which shaft is each time rotated by one single turn. The starting of the driving motor is combined with the stopping of the motor for the stepping mechanism, while the stopping of the driving motor of the cam shaft is controlled by a cam on the cam shaft itself.

The starting and stopping of the motor which drives the bobbin, can also be controlled by the light-sensitive element and the cam shaft. In this case the starting of this motor takes place at the end of a revolution of the cam shaft by means of a switch, which co-operates with a cam on the cam shaft, while, the stopping of the motor is commanded by the light-sensitive element, when in the said element a change in the voltage or in the resistance is brought about by the tubes being nearly empty.

According to another feature of the invention, two or more rails arranged in the longitudinal direction of the spinning machine, which rails can be connected to an electric voltage and along which there glide sliding contacts mounted on the winding machine, are used for transmitting the electric energy required for the motors and the operational apparatus to the winding machine. By choosing a low voltage it is possible to exclude the possibility of casualties caused by touching the open rails.

The invention also bears relation to a winding machine, which can serve to extend existing spinning and twining machines provided with a doffing apparatus into one of the above-described devices for spinning or twining and winding yarn.

A description of a device according to the invention will be given hereinafter by way of explanation with reference to the accompanying drawing, in which:

FIG. 1 is a front view of the winding machine,

FIG. 2 is a side view of the winding machine and part of the spinning machine,

FIG. 3 is a diagram matical front view of some elements of the winding machine during knotting,

FIGURE 4 shows the center portion of FIGURE 1 on a larger scale, and FIGURE 5 is a top plan view of a detail of the winding machine showing the light source and the light-sensitive element.

The apparatus show in the drawings is based upon a ring spinning machine of conventional design. Of this machine only the spindle frame 1 with spindles 2 and the doffing frame 3 with spindles 4 are shown in FIGURE 2. The doffing frame 3 is adjustable in vertical direction between the position as shown in the drawing and the position situated at the same height with the spindle frame 1. A holder 5 with a pair of shears 6 is mounted on the doffing apparatus near each spindle. These shears are of the type in which, after a thread has been cut, one of the thread ends remains clamped. The shears 6 are coupled with a rod, not shown in the drawing, which runs along the whole

length of the spinning machine and by which they can be operated simultaneously.

The winding machine is mounted on a carrier 7, which can be shifted along rails 65 and 66 arranged along the spinning machine by means of two wheels 8 at its top side and two wheels 9 at its bottom side.

At the top side of the carrier 7 there is disposed a winding unit 10. This winding unit 10 may be of a type chosen at will.

Furthermore there is a frame 11 rotatably mounted on the carrier 7 by hinges 12. The frame 11 can be fixed in the position in which the plane of said frame coincides with the plane of the carrier 7 by a diagrammatically indicated locking device 13.

The frame 11 is provided with the elements necessary for knotting together the yarn ends of the successive tubes. The movements of these elements are derived from the cam shaft 14, which is driven by the motor 16 via a reduction gear 15. The end of the cam shaft which is turned away from the driving mechanism is supported in the support 17, which is fixed to the frame 11.

One of the above-mentioned elements is the gripper arm 18, which is fixed to the shaft 20 which is rotatably mounted in the support 19. The shaft 20 is by means of a chain driven by the shaft 21, which in turn is driven by the cam shaft 14 via the bevel gear 22, 23, the intermediary shaft 24 and the bevel gear 25, 26. Two transverse pieces 27 and 28, which are connected by rods 29, are slidably mounted on the arm 18. The transverse piece 27 is pressed against a fixedly mounted cam 31 by the spring 30. The transverse piece 28 has a hooked extension piece 32, which, together with the widened end of the arm 18, forms a clamp, which, in dependency on the position of the arm 18, is either kept closed by the spring 30, or is kept open by the cam 31 against the action of the spring 30.

A knotter 36 of conventional type is operated by a cam 33 of the cam shaft 14 by means of a lever 34 and a rod 35. The knotter 36 is fixed to the frame 11 by means of a support 37.

Near the knotter there are present two arms 38 and 39 which are rotatably fixed to the frame 11, one arm, 38, having a curled end and the other arm, 39, having a slightly bent end. The swinging movements of these two arms 38 and 39 are derived from the cam discs 40 and 41 respectively on the cam shaft 14 and are transmitted by sliding rods 42 and 43 respectively which are provided with teeth, which co-operate with the pinions 44 and 45 respectively on the shafts to which the arms 38 and 39 respectively are fixed. Two springs 46 and 47 respectively, maintain a continuous contact between the sliding rods 42 and 43 respectively and the cam discs 40 and 41 respectively. An arm 48 can be swung in the horizontal direction by means of a shaft 49 which is mounted in the support 50. The swinging movement of the arm 49 is derived from cam 52 on the cam shaft 14, by a roller 51 mounted on the short arm of the shaft 50. A torsion spring 53 keeps the roller 51 pressed against the cam 52.

Under the knotter 36 a thread cutter 54 is fixed to the frame 11 by a support 55. The thread cutter is operated by an electromagnet 56.

The winding machine is provided with or connected with a sucking-off device not shown in the drawing, a sucking nozzle 57 of said device being mounted near the knotter 36 and a sucking-nozzle 58 being provided in the frame 11 in such a way that, during the unwinding of a tube, it is situated over the tube which had been rewound before that. An electromagnetically operated shut-off valve is provided in the conduit connecting the sucking-off device with the sucking nozzles 57 and 58.

A number of switches 59, which are operated by cams 60, insure that the excitation of the electromagnetical operational elements as well as the starting and stopping of the motors is effected in the right moments, as described below. The remaining electric apparatus is provided

in a box 61 fixed to the frame 11, in which box also are present a light-sensitive element 62, for instance a photoresistance, and a light source 64, as shown in FIG. 5. The light-sensitive element and the light source are both directed to the same place of the tube which is in the unwinding position.

The operation of the device is as follows:

When at the end of a spinning period the tubes on the spinning spindles 2 are fully wound, they are placed on the spindles 4 of the doffing frame 3 either by hand or by an automatic doffing machine. The thread between the traveller of the spinning machine and the full tube is cut by the shears 6, which hold the thread-end which is connected to the full tube.

When using the above-described device, the rewinding of the yarn on the tubes starts with the tube which is positioned farthest to the left, as viewed from the front side of the spinning machine. It is simplest for the yarn end of this tube to be knotted to the yarn end of the bobbin on the winding unit 10 by hand, although it is also possible to have this operation performed by the apparatus itself. Subsequently, the motor of the winding unit 10 is started and the yarn is unwound from the tube, thereby passing through the eye of the arm 38.

During rewinding the light-sensitive element 62 and the light source 64 are directed to the lower part of the yarn packet.

When the yarn packet has dwindled to a thin, disconnected layer on the tube, the dark surface of the tube will reduce the amount of light which is reflected toward the light-sensitive element. The electric changes consequently undergone by this element, control a switch which disconnects the motor of the winding unit.

At the same time, a motor 67 with which the device is equipped is started, said motor being connected to one of the wheels 8, 9 via a reduction gear 68, as shown schematically, or to a pinion, which co-operates with a fixedly mounted gear rack, via a reduction gear, so that the whole of the winding machine travels to the right, until the light-sensitive element and the light source are positioned opposite the next yarn packet; then the motor 67 is stopped again.

Simultaneously to this stopping, the motor 16 of the cam shaft 14 is started. The rotation of the cam shaft 14 is transmitted to the shaft 21, on which is mounted the arm 18, by means of the bevel gear 22, 23, the shaft 24, the bevel gear 25, 26 and a chain transmission. As a result hereof, the arm 18 swings in the direction of the arrow 63, causing the yarn portion present between the yarn packet which is to be rewound and the shears 6 belonging to this to be introduced between the broad end of the arm 18 and the hooked part 32 of the transverse piece 28. After the arm 18 has been swung over a small angle, the transverse piece 27 is set free from the cam 31 and the yarn end is clamped between the end of the arm 18 and the element 32 by the action of the spring 30.

When the arm 18 is swung further on, the yarn end is pulled clear from the shears 6 and is carried along. As arm 18 passes through its highest position, the clamped yarn end is over the knotter 36, and so the yarn which is between the yarn end and the tube on the spindle 4 is caught by the extension of the knotter 36, and then pulled into an appropriate slot of the knotter, after which the further swinging movement causes the cam 31 to push away the transverse piece 27 against the action of the spring 30 and the yarn end is released. Now the arm 18 swings on until the lowest position has again been reached.

In the meantime the electromagnetic valve, which controls the connection of the sucking-off device with the sucking nozzles, has been opened by one of the switches 59, so that the free end of the yarn that has been laid in the knotter 36, is sucked into the sucking nozzle 57, keeping taut the yarn present in the knotter 36, as required for the good functioning of the conventional knotters.

While the yarn from the full tube is being laid into the

knotter 36 by the arm 18, the arm 38, the eye of which holds the yarn portion between the winding unit 10 and the unwound tube, is moved to the left over the knotter 36 by the co-operation of the cam disc 40, the spring 46, the sliding rod 42 and the pinion 44. The arm 48 is also swung to the left by the co-operation of the cam 52 with the roller 51, while the arm 39 is swung to the right over the arm 38 by the co-operation of the cam shaft 41, the spring 47, the sliding rod 43 and the pinion 45.

By the leftward movement of the arms 38 and 48, the yarn which is present between the unwound tube and the winding unit 10, is brought into the shears 54. When the arms 38 and 39 are in an approximately vertical position (this position is represented diagrammatically in FIG. 3), the control magnet 56 of the shears 54 is excited by one of the switches 59 and the yarn is cut. Now, when the arms 38 and 39 are moved further on, the yarn end connected to the bobbin on the winding unit 10, is pulled across the knotter 36 and is sucked up and kept taut by the sucking nozzle 57, while the arm 39 takes care that the yarn in the knotter 36 is in the correct position. After this, the knotter 36 is operated by the cam 33 via the lever 34 and the coupling rod 35, so that the two yarn ends which have been laid in the knotter are knotted together. The superfluous yarn ends which are cut off during this operation are sucked away by the sucking nozzle 57.

When the yarn between the unwound tube and the winding unit 10 is being cut by the shears 54, it is situated before the sucking nozzle 58. As a result, the loose end of the yarn left on the tube is caught by the sucking nozzle 58 and the whole of this yarn is subsequently sucked off.

After a complete revolution of the cam shaft 14, all the elements have returned to their original position. After that, the motor 16 is disconnected by one of the switches 59 and the driving motor of the winding unit 10 is started, and the yarn is unwound from the tube, until the tube is nearly empty, after which the above-described cycle is repeated. The yarn between the tube and the winding unit 10, which after the knotting together does no longer pass through the eye of the arm 38, is, because the eye is of the open, helicoidal type, reinserted into the eye as a result of the ballooning which always occurs when the yarn is being unwound from the tube.

Because no yarn is left on the unwound tubes, these can, after all of them have been unwound, be immediately exchanged with the tubes on the spinning spindles which have in the meantime been wound again; consequently, only two tubes are required for each spinning spindle.

We claim:

1. Apparatus for the spinning or twining of yarn and the rewinding of the yarn into large yarn bodies, comprising a spinning or twining machine having a plurality of spinning or twining spindles arranged in a row, means for holding doffed full tubes in a row substantially adjacent the row of spinning or twining spindles, a winding machine for rewinding the yarn from the doffed tubes into larger bobbins, and means mounting said winding machine for shifting movement along said spinning or twining machine to effect rewinding of successive doffed tubes in said row thereof.

2. Apparatus as set forth in claim 1 wherein said last mentioned means comprise wheels mounted on said winding machine, and two or more rails along which said wheels are adapted to roll, said rails extending along said spinning or twining machine parallel to said row of spindles and said row of doffed full tubes.

3. Apparatus as set forth in claim 1 further comprising motor means for moving said winding machine along said spinning or twining machine, and means for automatically starting and stopping said motor means to move said winding machine from a substantially empty doffed tube to a full doffed tube.

4. Apparatus as set forth in claim 3 wherein said means for starting and stopping said motor is responsive to a condition of the doffed tubes.

5. Apparatus as set forth in claim 3 wherein said means for starting and stopping said motor comprises a light source and a light-sensitive element mounted on said winding machine so as to be directed toward the doffed tube which is in position to be unwound by the winding machine, said light-sensitive element and said light source being directed relative to each other so as to have the light source pass light to the doffed tube for reflection to the light-sensitive element, whereby said light-sensitive element will start said motor means in response to changes in reflected light during the latter stages of unwinding the one tube and will stop said motor means in response to changes in reflected light received from a full doffed tube when the winding machine has moved into position to unwind a new full doffed tube.

6. Apparatus for rewinding yarn from doffed tubes into larger bobbins, comprising means for supporting a plurality of doffed full tubes in a longitudinal row, a winding machine for rewinding the yarn from successive doffed tubes into larger bobbins, means mounting said winding machine for shifting movement along said row of doffed tubes to effect rewinding of successive doffed tubes in said row, and means for automatically shifting said winding machine from one doffed tube to a successive doffed tube upon substantial completion of the rewinding of the one doffed tube.

7. Apparatus as set forth in claim 6 wherein said means for automatically shifting said winding machine is responsive to changes in the reflectivity of the surface of the one doffed tube.

8. Apparatus as set forth in claim 6 wherein said means for automatically shifting said winding machine is responsive to changes in light reflected from the one doffed tube.

References Cited by the Examiner

UNITED STATES PATENTS

1,245,874	11/1917	Colman	57—54 X
2,936,130	5/1960	Reiners	242—35.6
3,059,865	10/1962	Furst	242—35.6
3,088,266	5/1963	Bahnson, Jr.	57—53
3,111,280	11/1963	Reiners II	242—35.5
3,132,463	5/1964	Glastra et al.	57—52

FOREIGN PATENTS

920,957	3/1963	Great Britain.

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