June 26, 1945. A. BRUGGER 2,378,978

WINDING MACHINE WITH AUTOMATIC SPOOL EXCHANGING MEANS

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FIG. 1

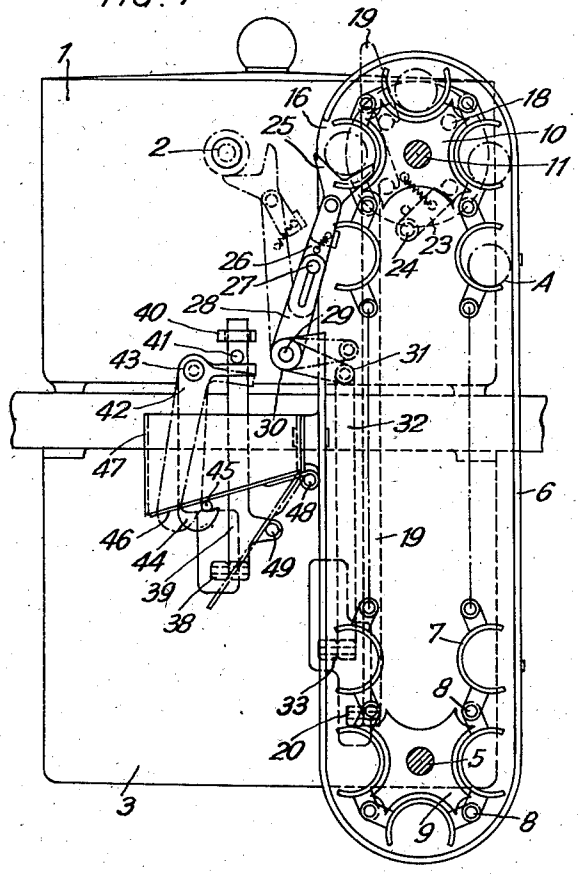
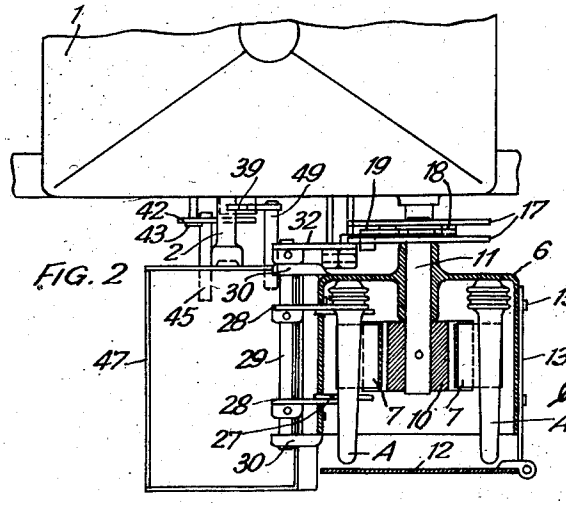


FIG. 2



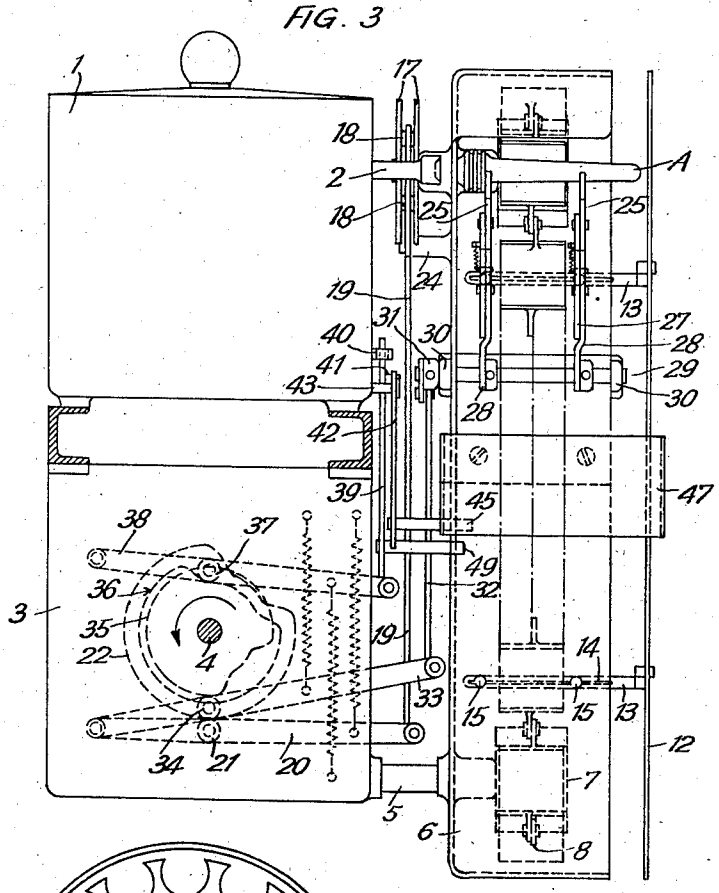
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FIG. 3



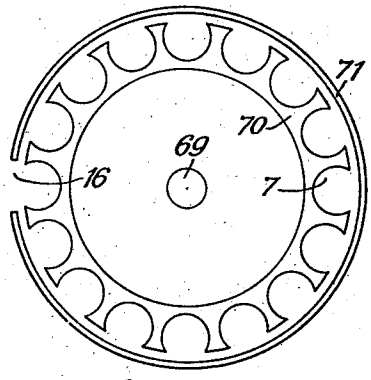


FIG. 8

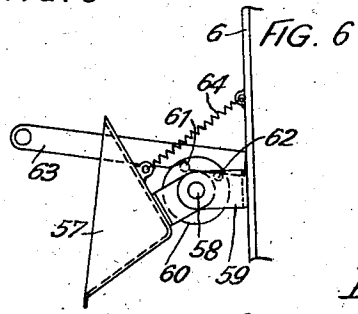


FIG. 6

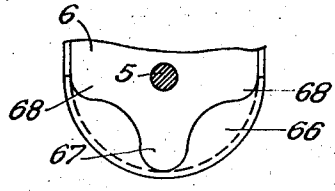


FIG. 7

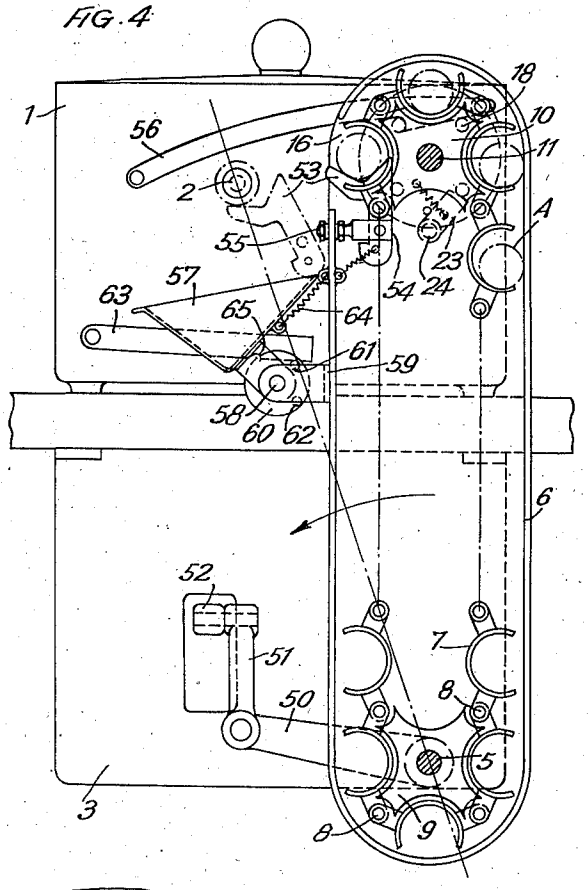
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FIG. 4



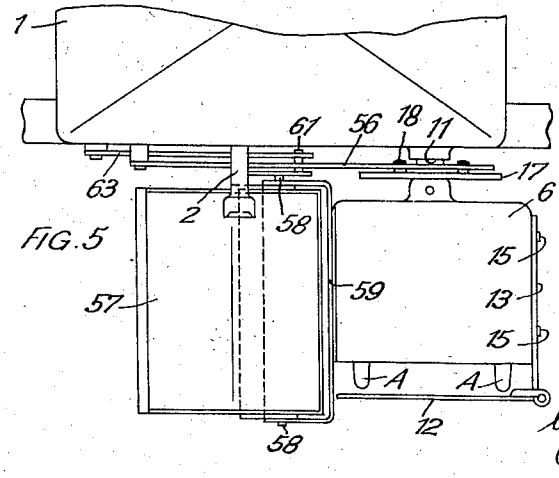


FIG. 5

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UNITED STATES PATENT OFFICE

2,378,978

WINDING MACHINE WITH AUTOMATIC SPOOL EXCHANGING MEANS

Albert Brügger, Horgen, Switzerland

Application November 12, 1943, Serial No. 510,032
In Germany March 17, 1941

12 Claims. (Cl. 242—41)

This invention relates to winding machines with automatic spool exchanging means.

The winding machine according to the invention is formed with an endless spool magazine which is arranged laterally of the winding spindle axis or circumferentially thereof and comprises a series of consecutive horizontal spool receiving pockets that are adapted to be advanced for successively conveying the spools into position of delivery.

This arrangement does away on one hand with a storage container provided with an automatic speel delivery device for supplying an endless feed device with empty spools, and permits on other hand the feeding of empty spools to the winding spindles from the magazine in relatively simple and reliable manner, while the space required for accommodating this arrangement is relatively small. Since for the delivery of a spool it suffices to feed the endless spool magazine the distance of one pocket division, idling movement and incident increased wear and also the setting up of oscillations during the operation are avoided.

Advantageously, the spool pockets are spaced as closely as possible for the purpose of obtaining maximum receiving capacity for empty spools which can easily be placed by hand in the spool pockets that are empty, advantageously, on their front sides.

Three embodiments of the invention are illustrated, by way of example only, in the accompanying drawings in which

Fig. 1 shows an elevation partly in section of a first embodiment provided with a pocket chain;

Fig. 2 is a top plan view thereof partly in section;

Fig. 3 is a view thereof as seen from the left hand side of Fig. 1;

Fig. 4 shows an elevation partly in section of a second embodiment including a pocket chain;

Fig. 5 is a top plan view thereof;

Fig. 6 is a detail view of gripper means for full spools in tilting position;

Fig. 7 shows a specific form of a casing containing the pocket chain, and

Fig. 8 shows a front elevation of a third embodiment comprising a cylindrical pocket carrier member.

Referring to the drawings the instant winding machine is assumed to be a cop winding machine having a gear box 1 which is arranged on a frame and from which the winding spindle 2 projects towards outside. On the same frame is arranged, below the gear box 1, a box like container 3 in which, as shown in Fig. 3, a driving shaft 4 for the actuation of automatic spool exchanging means is mounted. The container 3 is provided with a lower outwardly projecting carrier bolt 5 by which a casing 6 is supported. This casing contains an endless chain which provides a spool magazine and is composed of horizontal pockets 7 which are connected with link joints 8. In the drawings the link joints 8 interposed between the pockets are exaggerated in size for the purpose of illustration. The pockets 7 are of arcuate cross section and are open at both ends. The pocket chain 7, 8 thus formed passes over a lower sprocket in the form of a guide sprocket 9 arranged on the bearing shaft 5 and an upper guide sprocket 10 supported by a shaft 11.

The sprockets 9 and 10 which are similar are each provided with four circumferential concave surfaces, which correspond in size to the arcuate cross section of the pockets 7 for the reception of which they serve. The back wall of the casing 6 is juxtaposed to one end face of the pockets 7 of the endless conveyor chain. On the opposite side of the casing 6 a pivotal lid 12 is fastened which pivots on an upper and a lower hinge pin 13. The hinge pins 13 can be adjusted relative to the casing 6 by means of longitudinal slots 14 and screws 15 (Fig. 3) in such a way that the pivotal lid, when in closed position, is placed at a smaller or greater distance from the open end of the casing 6.

On opening the pivotal lid 12 any empty pockets 7 can each be supplied with an empty spool A which is insertable by hand into the pocket 7 from the respective end face. The back wall of the casing 6 borders and determines at the same time the depth of insertion of the spools A unless the spools are pushed into the casing 6 by said lid up to the required depth, if necessary.

By means of the hinge pins 13, Fig. 3, the axis of hinging of the lid 12 is adjustable commensurate with the length of the spools used in the winding machine. By this means the empty spools A are arranged within the casing 6 in appropriate position for being fed onward.

The pivotal lid 12 is, advantageously, made of transparent working material, for example glass, thus permitting the immediate viewing of the empty spools A stored in the casing 6. In the upper part of the casing 6 a lateral opening 16 serving as an exit from the pockets 7 for the individual empty spools A is provided for passing the spools to the winding spindle 2 for the purpose of being clampingly held to said spindle by means of a counter holder (not shown), in a

manner known per se. This counter holder can be coaxially arranged with the winding spindle 2 by means of a supporting device and axially displaced against spring influence.

On the termination of a winding on the spool clamped to the winding spindle 2 said spool is released, by automatic retraction of the counter holder, so as to fall down. Thereupon, to the winding spindle 2 a fresh empty spool is supplied for which purpose the pocket chain 7, 8 is advanced the amount of the spacing of a pocket in which way each time a fresh empty spool is conveyed directly to the delivery position formed by the opening 16 of the casing 6.

In the first embodiment shown in Figs. 1 to 3 on the upper bolt 11 of the casing 6 two discs 17 (Fig. 2) are secured which are interconnected by a group of four stop pins, that is, cross pins 18 which are equally distributed on the circumference of the disc 17. By this means a feed member is formed which is rigid with the sprocket 10 and the cross pins 18 of which cooperate with a feed rod 19 which is pivotally connected with a control lever 20 (Fig. 3), which, due to being spring-influenced bears against a cam disc 22 by means of a roller 21, the cam disc rotating together with the driving shaft 4.

For the purpose of effecting the spool exchanging operation automatically the driving shaft 4 is advanced in a manner known per se at the end of each rotation after the winding of a spool is completed on the winding spindle 2, whereby the feed rod 19 is reciprocated in its longitudinal direction from the cam disc via the control lever 20. By guide means (not shown) the lateral movement of the feed rod 19 is limited which rod moves, when shifting in one direction of throw, the feed member 17, 18 and thus the guide sprocket 10 the amount of one quarter of a revolution by which means the pocket chain 7, 8 is advanced for one division. In the course of this operation the feed rod 19 assumes temporarily a position, as shown in chain-dotted lines in Fig. 1, in which this rod engages with one of the cross pins 18.

In the course of each advance feed of the pocket chain 7, 8, a spring-pressed locking lever 23, which is fulcrumed on a projection 24 on the casing 6, is automatically positioned underneath a cross pin 18 on the pair of discs 17 so that the pocket chain is prevented from backward movement. By this means the precise feeding of the pocket chain 7, 8 step by step is warranted, which is particularly important insofar as the pocket chain 7, 8 tends to move backwardly when the chain length shown on the right hand side in Fig. 1 outweighs that shown on the left hand side by effect of the empty spools carried thereby. This happens obviously particularly at the times when the left hand chain length is within the embrace of the spool delivery position 16.

From the pocket 7 of the pocket chain 7, 8 arriving at the position of delivery 16 the empty spool rolls away by action of its own weight so as to maintain a predetermined position, the rolling having been imparted thereto by the arcuate guide surface presented to it, in order to be properly received by two forked lever arms 25. The forked lever arms 25 are mounted on supporting arms 26 which are extensible in the longitudinal direction by means of screws 27 relative to a mounting arm 28. By means of the mounting arms 28 the two supporting arms 26 are secured to a common shaft 29 which has its bearings 30 in the casing 6. With an arm 31 fastened to the shaft 29 engages a connecting rod 32 which is articulated to a control lever 33 which, due to being spring-influenced bears, by means of a cam disc 35, against a roller 34, which rotates together with the driving shaft 4.

On each revolution of the driving shaft 4 the bearer arms 26, 28 are pivotally adjusted to the left in regard to Fig. 1 from the cam disc 35 via the parts 34, 33, 32, 31 and 29, in conjunction with which the two forked lever arms 25 convey the empty spool, which had been received, while the preceding feed step had been effected by the pocket chain 7, 8, into a position coaxially with the winding spindle 2 to which the spool is subsequently clamped by means of the counter holder. Thereupon the bearer arms 26, 28 swing back into initial position whilst the forked lever arms 25, as indicated in chain-dotted lines in Fig. 1, disengage from the clampingly fixed spool by wiping across the latter. This effect is due to the forked lever arms 25 pivotally moving against the spring force of tension springs which normally hold the forked lever arms 25 in a predetermined position of rest relative to the supporting arms 26. The supporting arms 26 are adjustable relative to the mounting arms 28 by means of the screws 27 by which means the forked lever arms 25 can be adjusted as to height into appropriate position relatively to the casing 6 in dependence upon requirements in accordance with the existing spool diameter.

Further on the driving shaft 4 a cam disc 36 is fastened against which bears, by means of a roller 37, a spring-urged control lever 38 to the lower end of which a tripping rod 39 is pivotally connected the upper end portion of which engages with a guide 40 on the gear box 1 and is provided with a stop pin 41 for cooperation with a bell crank lever 42 which is pivoted to the casing 6 at 43. The tripping rod 39 cooperating by means of the stop pin 41 with the laterally directed arm of the bell crank lever 42 has its second depending arm formed as a locking pawl 44.

As shown in Figs. 1 and 3 the locking pawl 44 projects into engagement with the lower portion of a bolt 45 on a pivotal bottom of a box 47 which is open on top and is secured to the casing 6 and serves for intercepting the full spool which had been released from the winding spindle 2. The full spool received by the box 47 drops out through the lower end of the box into a removable receptacle when the pivotal bottom 46 swings into the chain-dotted position indicated in Fig. 1. This operation takes place automatically at predetermined times by downward movement of the tripping rod 39 by action of the cam disc 36 through the intervention of the parts 37, 38, so that the bell crank lever 42 is swung out by the stop pin 41 in such manner that the locking pawl 44 releases the bolt 45, whereupon the pivotal bottom 46 swings from its oblique position about its axis 43 downwardly until it hits a bolt 49 on the tripping rod 39. Due to the fact that the pivotal bottom 46, swings from closing position into position of maximum opening abruptly, the full spool drops down rapidly in accordance therewith without change of position relative to the surroundings, that is, tilting about its longitudinal axis, which would be likely to happen if the starting movement of the spool were slow.

Subsequently the pivotal bottom 46 is swung back into closing position again by action of the bolt 49 when the tripping rod 39 is moved upwardly by action of the cam disc 36 in the course of which the locking pawl 44 engages again with

the bolt 45 so as to secure the pivotal bottom 46 in closing position again.

In the exemplification of the machine described the empty spool is conveyed towards the winding spindle 2 from out of the stationary casing 6 including the pocket chain 7, 8 by means of the pivotal feed device composed of the parts 25, 26, 28 and 29.

In contrast therewith in the second exemplification the empty spool is supplied to the winding spindle 2 by the casing 6 itself, due to this casing, which contains the pocket chain 7, 8 also in this case, being swingably arranged. To this end the lower bearing bolt 5 serves as a pivot for the casing 6 which can be pivotally adjusted from out of the position of rest, shown in Fig. 4, in the direction of the arrow. An arm 50 which is firmly connected to the casing 6, via the bearing bolt 5 and is connected with a control lever 52 by a link 51 serves this purpose. This control lever 52 is actuated from a driving shaft, similar to the shaft 4 (Fig. 2) as shown for the first exemplification, while the automatic spool exchanging operation takes place. In the second exemplification two forked lever arms 53 are arranged, within the embrace of the spool delivery position 16 provided on the casing 6, in a manner similar to the arrangement of the two lever arms 25 used in the first exemplification. The lever arms 53 are mounted on a supporting member 54 which is adjustable as to height relative to the casing 6 by means of a slot guide and cooperative screws 55 in appropriate position dependent upon requirements.

The empty spool conveyed to the position of delivery 16 of the casing 6 by means of the pocket chain 7, 8 is received by the two forked lever arms 53 and inserted between the winding spindle 2 and the counter holder (not shown) as the casing is swung out of position of rest in order to be clamped in winding position. Thereupon the casing 6 swings back into position of rest in the course of which movement the forked lever arms 53 wipe over the clamped spool, as indicated in chain-dotted lines in Fig. 4, by swinging about their pivot axes on the supporting member 54 against spring influence. In the course of the swinging movement of the casing 6 into inoperative position a control lever 56 mounted on the gear box 1 effects the feeding of the pocket chain 7, 8 by one division, due to the hook like end of the feed lever 56 catching a cross pin 18 on a feed disc 17 so that the latter then rotates for one quarter of a revolution. When the casing 6 swings out of position of rest again another cross pin 18 on the feed lever 17 moves behind the hook like end of the control lever 56 for being caught by the latter for effecting a further feed movement by the disc 17 and thus by the pocket chain 7, 8 for one step.

The full spools being released from the winding spindle 2 in the coure of the spool exchanging operation are in this instance alternately intercepted by a trough 57 which has an angular cross section and is mounted at its end faces by means of studs 58 on arms of a carrier stirrup 59 fastened to the casing 6. One of the studs 58 carries a small disc 60 which is provided with two pins 61 and 62 which are adapted for cooperation with a stop lever 63 mounted on the gear box 1. A tension spring 64 tends to retain the trough 57 in the position of rest shown in Fig. 4 in which the trough 57 bears against the casing 6 by one of its longitudinal edges.

The spool dropping into the trough 57 in the course of the spool exchanging operation comes to bear on the two legs forming the angular cross section of the trough 57 by which means the position of the spool is defined. When the casing 6 for the purpose of suppyling an empty spool to the winding spindle 2 swings out of position of rest the trough 57 maintains its position relative to the casing 6 by the pin 61 on the disc 60 sliding along the lower longitudinal side of the stop lever 63. The casing 6 in swinging back into position of rest operates to move the stud 61 into driving engagement with a mating rest 65 on the stop lever 63 in such manner that the pin 61 is kept from movement by said rest 65 in consequence whereof the disc 60 turns about its axis, thereby tilting the trough 57 for the purpose of delivering the full spool into a removable receptacle. The tilting movement of the trough 57 is on the verge to come to an end if as shown in Fig. 6 the pin 62 on the disc 61 hits the stop lever 63, whereupon the lever 63 is raised in appropriate manner for permitting the pin 61 on the disc 60 to disengage from the rest 65 on the stop lever 63, and then the trough 57 is swung back into position of rest shown in Fig. 4 by action of the tension spring 64.

As evident from Fig. 7 the lower end of the casing 6 is equipped with a patterned cap piece 66 on the entrance side of the casing. This piece 66 is provided with a rounded out central recess 67 and two lateral recesses 68 arranged symmetrically thereto. The recesses 67 and 68 are so coordinated in regard to position, form and size with corresponding inserting positions within the range of the lower point of reversal of the endless pocket chain that, as will be seen by comparison of Figs. 1 and 4, so to speak a guide is obtained which facilitates the insertion of empty spools into the chain. The cap piece 66 covers surfaces of the casing 6 on the entrance side thereof that carry articulations through which the spool pockets are connected with each other by which means inadvertent inserting of spools between two adjacent pockets of the chain 7, 8 is practically made impossible. For the purpose of facilitating, in a similar manner, the proper inserting of empty spools also within the embrace of the upper point of reversal of the endless pocket chain the casing including the pocket chain is provided with a correspondingly patterned cap piece on the entrance side also at the upper end thereof.

The two guide prisms for the endless pocket chain may be dismountably arranged on their bearing bolts for allowing of being interchanged with other sprockets having different chain or pocket divisions if the pocket chain must be exchanged for another chain with corresponding divisions. The spool magazine formed by the pocket chain, which serves at the same time as a conveyer, can naturally be built in any size as required.

Instead of forming an endless chain by articulating the spool pockets directly to each other the pockets may be arranged, upon choice, also on one or more endless tapes, ropes or carrier chains.

In the third exemplification shown in Fig. 8 the horizontal spool pockets 7 are arranged in an annular row about a horizontal axle 69. The spool pockets 7 are provided on the outside of a cylindrical liner 70 which is supported by the axle 69 and is fed step by step so as to convey the pockets or empty spools successively to the position of delivery 16. An outer circumferential

ring 71 or the like retains the spools in the pockets 7 until they arrive at the position of delivery 16.

The passing of the spools from the position of delivery 16 to the winding spindle may be effected in similar manner as described in connection with the two precedingly explained exemplifications by conveyer means or by suitable relative motion of the carrier accommodating the spool pockets. Obviously care is taken also in such an arrangement that the spool pocket carrier is secured against backward movement by a locking device in a manner similar to that explained in connection with the two precedingly described exemplifications. Also in such arrangements walls may be used as stop means for the end faces of the spools as explained in the two previous exemplifications.

It will be seen that, in general, the spool magazine instead of being arranged on the right hand side of the winding spindle, that is the axis of said spindle, as shown in Figs. 1 and 4, may also be arranged on the left hand side or, if required, directly above or below the axis of the winding spindle, that is, on the upper or under side of said spindle. In other words the spool magazine may be arranged in any desired position, for example, laterally of the winding spindle on any side thereof or all around the same. For the purposes of the invention the interstice between two adjacent spool pockets is kept as small as possible, and should be smaller than the clear width of a pocket.

I claim:

1. In a winding machine with automatic spool exchanging means, a winding spindle, an endless movable spool magazine arranged collaterally of the axis of said winding spindle, a series of consecutive spool receiving pockets arranged in said magazine, stop means arranged on said magazine, locking lever means arranged for automatic cooperation with said stop means, a position of spool delivery defined by said magazine adjacent to said winding spindle for successively delivering said spools to said winding spindle, feed means associated with said magazine for individually advancing said spools into said delivery position, and means for automatically moving said lever means into locking engagement with said stop means for preventing backward movement of said magazine.

2. In a winding machine with automatic spool exchanging means, a winding spindle, an endless movable spool magazine arranged collaterally of the axis of said winding spindle, a series of consecutive spool receiving pockets arranged in said magazine, a position of spool delivery defined by said magazine adjacent to said winding spindle for successively delivering said spools to said winding spindle, feed means associated with said magazine for individually advancing said spools into said delivery position, a group of stops associated with said magazine and serving for effecting said advancing movements of said magazine, locking lever means arranged for automatic cooperation with said stop means, and means for automatically moving said lever means into locking engagement with the respective said stops for preventing backward movement of said magazine.

3. In a winding machine with automatic spool exchanging means, a winding spindle, an endless movable spool magazine arranged collaterally of the axis of said winding spindle, said endless articulated spool magazine having points of reversal of movement, a series of consecutive spool receiving pockets arranged in said magazine, said pockets being of arcuate cross section, guide sprockets arranged at said points of reversal and having recesses corresponding in cross section to the arcuate cross section of said pockets, a position of spool delivery defined by said magazine adjacent to said winding spindle for successively delivering said spools to said winding spindle, and feed means associated with said magazine for individually advancing said spools into said delivery position.

4. In a winding machine with automatic spool exchanging means, a winding spindle, an endless movable spool magazine arranged collaterally of the axis of said winding spindle, a series of consecutive spool receiving pockets arranged in said magazine, two walls confronting said magazine at opposite ends of said pockets serving for retaining the spools received in said pockets in a predetermined longitudinally position, a position of spool delivery defined by said magazine adjacent to said winding spindle for successively delivering said spools to said winding spindle with the individual spools being in said predetermined longitudinal position, and feed means associated with said magazine for individually advancing said spools into said delivery position.

5. In a winding machine with automatic spool exchanging means, a winding spindle, an endless movable spool magazine arranged collaterally of the axis of said winding spindle, a series of consecutive spool receiving pockets arranged in said magazine, two walls confronting said magazine at opposite ends of said pockets, serving for retaining the spools received in said pockets in a predetermined longitudinal position, means for adjusting the distance between said walls commensurate with the length of spool used, a position of spool delivery defined by said magazine adjacent to said winding spindle for successively delivering said spools to said winding spindle with the individual spools being in said predetermined position, and feed means associated with said magazine for individually advancing said spools into said delivery position.

6. In a winding machine with automatic spool exchanging means, a winding spindle, an endless movable spool magazine arranged collaterally of the axis of said winding spindle, a series of consecutive spool receiving pockets arranged in said magazine, a wall confronting said magazine at one end of said pockets, a pivotal lid arranged in front of the other end of said pockets, means for adjusting the pivot axis of said lid relative to said wall commensurate with the length of spool used, a position of spool delivery defined by said magazine adjacent to said winding spindle for successively delivering said spools to said winding spindle with the individual spools being in said longitudinal position, and feed means associated with said magazine for individually advancing said spools into said delivery position.

7. In a winding machine with automatic spool exchanging means, a winding spindle, an endless movable spool magazine arranged collaterally of the axis of said winding spindle, a series of consecutive spool receiving pockets arranged in said magazine, a wall confronting said magazine at one end of said pockets and constituting a part of a casing, a pivotal lid made of transparent material arranged on said casing in front of the other end of said pockets in opposite relation to said casing wall, said wall and said lid

serving for retaining the spools received in said pockets in a predetermined longitudinal position, a position of spool delivery defined by said magazine adjacent to said winding spindle for successively delivering said spools to said winding spindle with the individual spools being in said predetermined longitudinal position, and feed means associated with said magazine for individually advancing said spools into said delivery position.

8. In a winding machine with automatic spool exchanging means, a winding spindle, an endless movable spool magazine arranged collaterally of the axis of said winding spindle, a series of consecutive spool receiving pockets arranged in said magazine, a position of spool delivery defined by said magazine adjacent to said winding spindle, pivotal conveyer means arranged at said delivery position for automatically successively delivering said spools to said winding spindle by pivotal movement of said conveyer means, and feed means associated with said magazine for individually advancing said spools into said delivery position.

9. In a winding machine with automatic spool exchanging means, a winding spindle, an endless movable spool magazine arranged collaterally of the axis of said winding spindle for pivotal movement relative to said spindle, a series of consecutive spool receiving pockets arranged in said magazine, a position of spool delivery defined by said magazine adjacent to said winding spindle for successively delivering said spools to said winding spindle by pivotal movement of said spool magazine, and feed means associated with said magazine for individually advancing said spools into said delivery position.

10. In a winding machine with automatic spool exchanging means, a winding spindle, an endless movable spool magazine arranged collaterally of the axis of said winding spindle, a series of consecutive spool receiving pockets arranged in said magazine, a position of spool delivery defined by said magazine adjacent to said winding spindle for successively delivering said spools to said winding spindle for being wound with the material supplied to the machine, feed means associated with said magazine for individually advancing said empty spools into said delivery position, means for releasing the full spools from said winding spindle, a vessel for intercepting said released full spools, a pivotal bottom on said vessel sustaining said full spools, and means associated with said bottom for automatically temporarily opening said bottom, thereby discharging said released full spools.

11. In a winding machine with automatic spool exchanging means, a winding spindle, an endless movable spool magazine arranged collaterally of the axis of said winding spindle, a series of consecutive spool receiving pockets arranged in said magazine, a position of spool delivery defined by said magazine adjacent to said winding spindle for successively delivering said spools to said winding spindle for being wound with the material supplied to the machine, feed means associated with said magazine for individually advancing said empty spools into said delivery position, means for releasing the full spools from said winding spindle, a vessel for intercepting said released full spools, a pivotal bottom on said vessel sustaining said full spools, means associated with said bottom for automatically temporarily moving said bottom into oblique position, and means for holding said bottom in said oblique position for discharging said full spools over said obliquely adjusted bottom.

12. In a winding machine with automatic spool exchanging means, a winding spindle, an endless movable spool magazine arranged collaterally of the axis of said winding spindle, a series of consecutive spool receiving pockets arranged in said magazine, a position of spool delivery defined by said magazine adjacent to said winding spindle for successively delivering said spools to said winding spindle for being wound with the material supplied to the machine, feed means associated with said magazine for individually advancing said empty spools into said delivery position, means for releasing the full spools from said winding spindle, a tiltable trough for intercepting said released full spools, and means for automatically temporarily tilting said vessel out of position of rest, thereby discharging said released full spools.

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