Jan. 11, 1944. W. ESSER ET AL 2,338,914

CROSS WINDING FRAME

Filed March 29, 1940 5 Sheets-Sheet 1

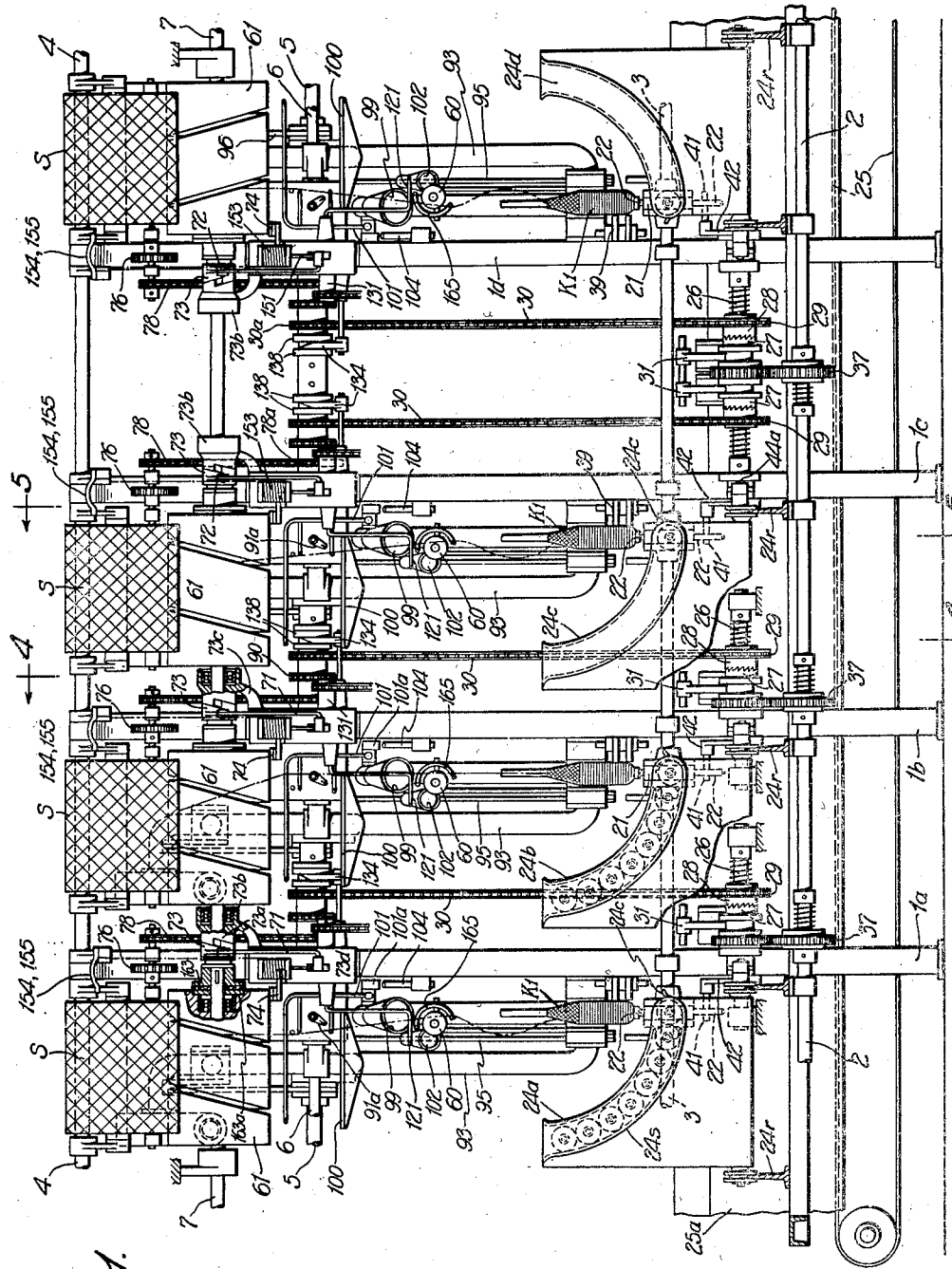

Fig. 1.

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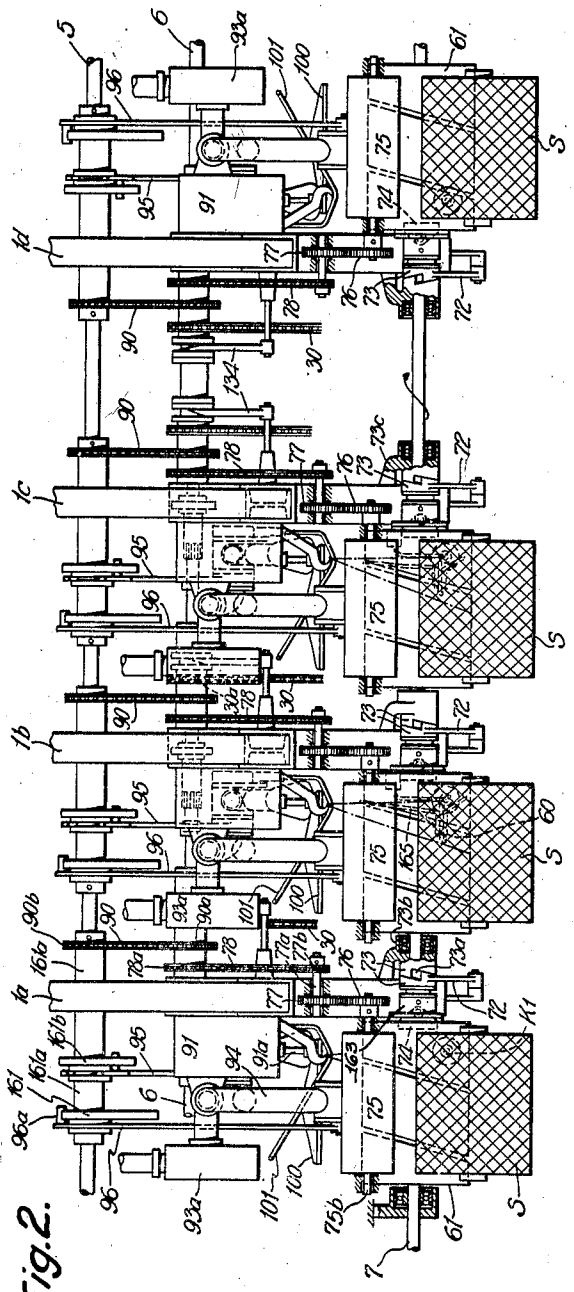

Fig.2.

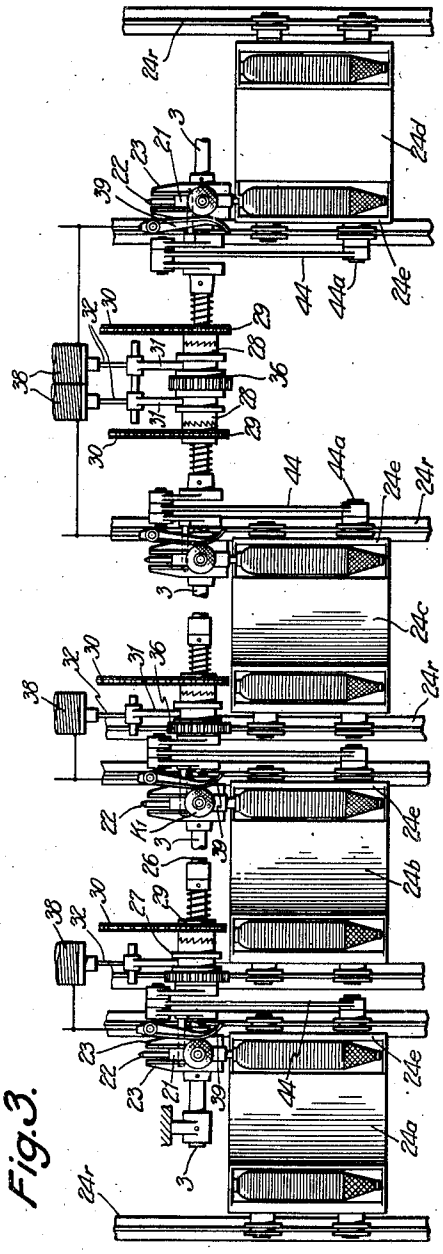

Fig.3.

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CROSS WINDING FRAME

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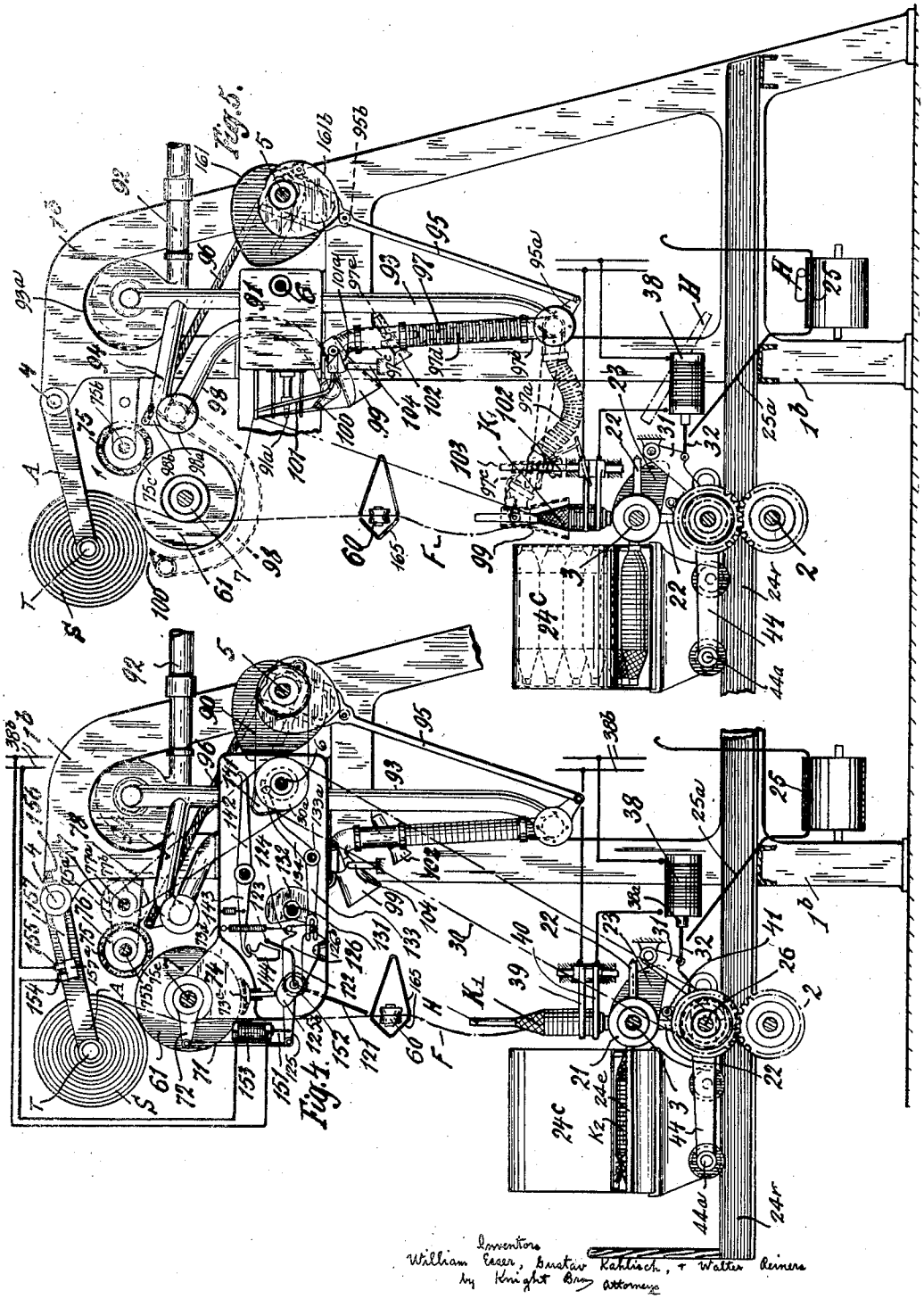

Fig. 4.

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CROSS WINDING FRAME

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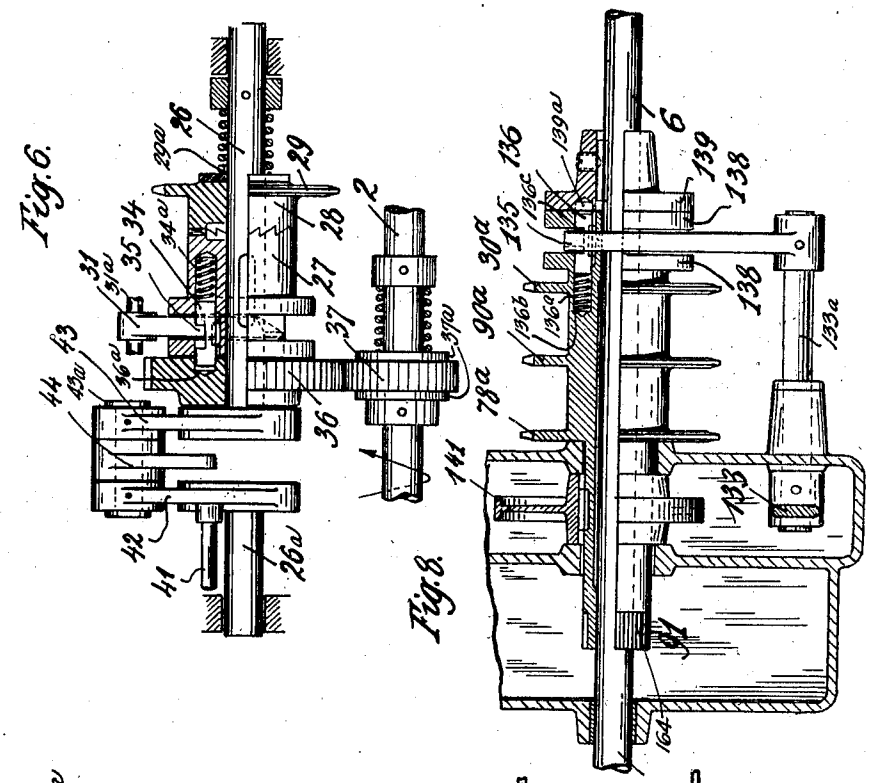

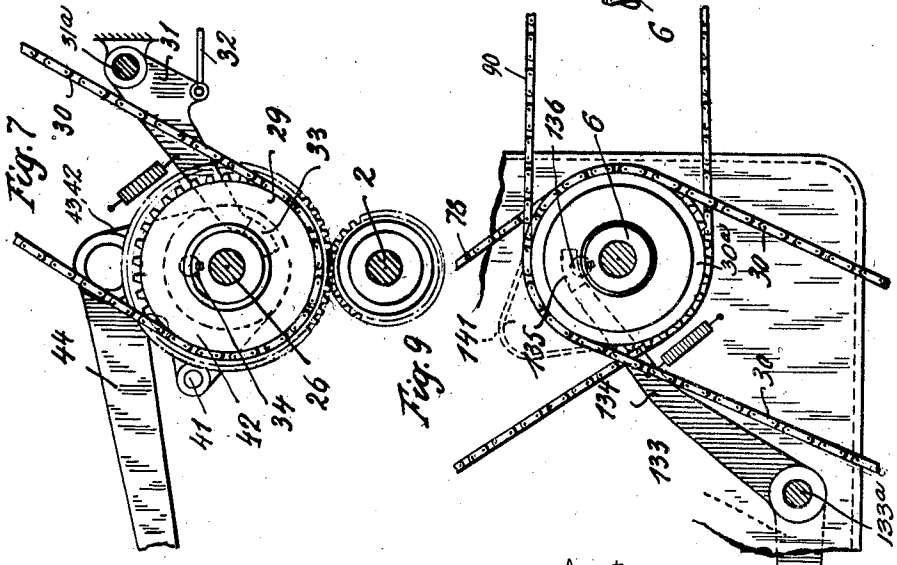

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CROSS WINDING FRAME

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Fig. 10.

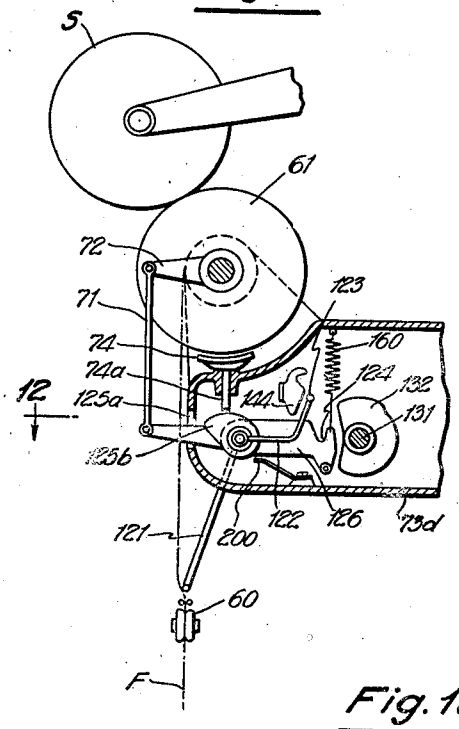


Fig. 11.

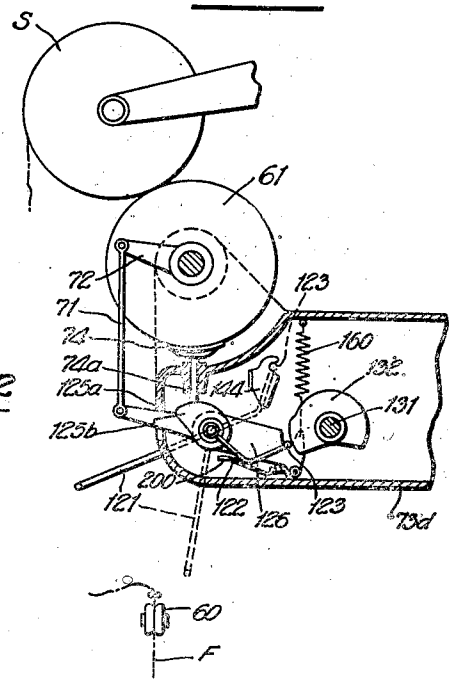
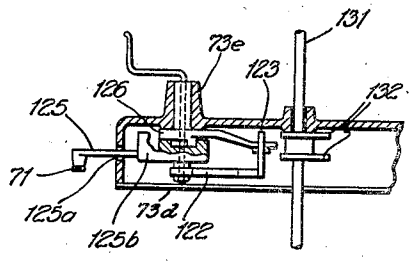


Fig. 12.



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Patented Jan. 11, 1944 2,338,914

UNITED STATES PATENT OFFICE

2,338,914

CROSS WINDING FRAME

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Application March 29, 1940, Serial No. 326,641
In Germany April 18, 1939

5 Claims. (Cl. 242—35.6)

In order to do away, as much as possible, with manual labour on winding frames, it has already been proposed to arrange, in the individual winding points, magazines for feeding bobbins and thread knotting devices, so that, when the thread supply ceases, the accumulating bobbin is lifted off its driving pulley and braked, in order that the end of the yarn not yet wound on could be knotted together with the beginning of the yarn from a reserve supply bobbin which in the meantime had been brought to the running position. A requisite for all these known devices is, therefore, that the broken end of the winding bobbin be still sufficiently long and remain within the range of the knotting device. Since, moreover, the magazine consists of a plate rotating horizontally in front of the supply bobbin and carrying at the same time in a bell some of the necessary building elements, whereas another part of these building elements, together with the knotting arrangement must be disposed at the side of the bell in front of the winding bobbin, in order to render certain, as far as possible, the intended knotting operation, the spacing of spindles of the frame must be greater than usual. Furthermore, winding points are not easily accessible and cannot be surveyed readily.

According to the invention, when a supply bobbin carrier is used, which is of the known type, comprising a star shaped device rotating in a vertical plane to eject automatically an exhausted tube and to swing into running position a reserve bobbin, a central control device is arranged above the rotary star, but below the collecting bobbin, which central control device, influenced by the broken end feeler arranged in front of it, in turn causes the stopping and backward rotation of the winding bobbin and the operation of thread pick up and knotting devices. Without increasing the normal spacing of the spindles on the spindle frame, this arrangement is clearly visible and easily accessible. It has already become known, to employ a so-called travelling knotting device, in winding frames with star shaped supply bobbin carriers rotating in vertical planes. In such arrangements the replacement of the supply bobbins is effected, however, from a conveying band movable towards the rotary stars, so that the knotting device can operate only after the movements of the conveying band toward the frame and toward the pegs of the rotary stars have been terminated. The knotting at the individual winding unit when the yarn has broken, furthermore, requires a somewhat wider shape of the spinning frame in the practical construction, in order to prevent disturbance of the winding procedure at the other winding units.

In the known winding frames the knotting device operates whenever the yarn feeding is interrupted, whether it takes place because the thread breaks or because the bobbin becomes exhausted. According to the invention the mechanism for the supply bobbin change operates independently of the control procedure initiated by the thread feeler, only when the supply bobbin is exhausted; for instance, by means of two feeler levers which bear against the end of the supply bobbin and initiate the bobbin changing when the bobbin is exhausted, before the thread pick-up and knotting devices begin to operate, so that the picking-up device finds a reserve bobbin in the winding position.

In order to pick-up the end of the broken yarn on the winding bobbin, this bobbin is automatically turned back, as in the known pick-up arrangements, in order that the pick-up member can grip the end of the yarn. This is simplified, according to the invention, in that the friction roller which acts upon the thread guiding drum to turn back the collecting bobbin, for uncovering the end of the wound-on and broken yarn, after the winding bobbin has been disengaged from its drive and stopped, is locally eccentrically flattened on its surface, so that, when detached from its driving mechanism, it is no longer driven from the thread guiding drum.

According to the invention the suction arm of the pick-up device, which is pushed over the unexhausted supply bobbin when a yarn breaks, is constructed preferably so that it can be guided by a separate telescoping guide means parallel to the axis of the supply bobbin.

The invention is illustrated in the accompanying drawings somewhat diagrammatically, by way of example.

Fig. 1 shows in front elevation four winding units of a winding frame, illustrating two different arrangements.

Fig. 2 is a top plan view of the same winding units.

Fig. 3 is a plan view of the supply bobbin heads of the same winding units.

Figs. 4 and 5 are sections approximately on lines IV—IV and V—V, respectively, of Fig. 1.

Fig. 6 is a front elevation, partly in section, of the control mechanism for exchanging the supply bobbins.

Fig. 7 is a vertical section at right angles to Fig. 6, showing the same mechanism in side elevation.

Fig. 8 is a front elevation, partly in section, of the control mechanism of the knotting device.

Fig. 9 is a vertical section at right angles to Fig. 8, showing the same mechanism in side elevation.

Figs. 10 and 11 are vertical sections of parts of the winding and thread detector mechanisms, Fig. 10 being in normal running position and Fig. 11 in the position shortly after the thread breaks.

Fig. 12 is a horizontal section on the line XII—XII of Fig. 10.

The four winding units serving to illustrate the invention may be separated, for instance, by the frame walls 1*a* to 1*d*, in which the shafts 2, 3, 4, 5, 6 and 7, common to the winding units, are journalled, and on which the other individual elements are suitably supported. Part or all of the shafts 2 to 7 may be subdivided in spindle groups, or an individual motor drive may be provided for each shaft according to the subdivision of the winding frame, which depends, for instance, on the magazine arrangement and the winding of the supply bobbin heads. This is shown in Fig. 1 by the relative position of the supply bobbin magazines 24*a* and 24*b*, or 24*c* and 24*d*, respectively. To simplify the disclosure, however, the control means for the winding units adjacent the frame walls 1*c* and 1*d* are placed between these frame walls, whereas in the practical form of construction, the magazines 24*c* and 24*d* would be closer together, the partitions 1*c* and 1*d* would be omitted, and the control means would be located behind. Such an arrangement reduces the number of frame walls and offers, for instance, the possibility that a single suction arm is sufficient for catching the supply threads of adjacent winding units.

The chief elements of the machine constructed and controlled according to the invention (supply bobbin head, winding bobbin head, yarn knotting arrangement, and main control gear influenced by the yarn feeler) are arranged for instance as follows:

Every supply bobbin head is equipped, as shown in Fig. 4, with the usual star-shaped bobbin carrier 21, rotatably mounted on stationary shaft 3, the four pegs 22 of which bobbin carrier project at right angles. A running bobbin is shown at K_1 and a reserve bobbin at K_2. The latter is the lowermost bobbin of a series of bobbins held in the curved chute 24*s* of the magazine 24. This magazine is mounted to reciprocate horizontally on rails 24*r*, for the purpose of pegging a new reserve bobbin. The top plate of the curved chute 24*s* has an opening 24*e* above the reserve bobbin K_2, to allow the bobbin to be turned up into the running position K_1, by rotation of the bobbin carrier. Stripping cams 23 are mounted in fixed position on shaft 3 beside the bobbin carrier 21, their upper cam edges being adapted to engage the base of an exhausted bobbin tube H, as the bobbin carrier turns, and to push the tube off its peg 22, so that it falls down chute 25*a* onto the conveyor 25. For reciprocating the magazine 24 there is provided a crank mechanism, some of the details of which appear on a larger scale in Figs. 6 and 7. Rotatably mounted on shaft 26 is a gear 36 meshing with, and constantly driven by, a gear 37 clutched to constantly running shaft 2 by a spring actuated friction clutch 37*a*. Beside the gear 36 there is keyed to shaft 26 a bush 27, which has a sliding bolt 34 urged by a spring 34*a* toward a socket 36*a* in gear 36. The bolt 34 is shown engaged, in Fig. 6, but is normally withheld from the socket 36*a* by a detent 31 pivoted to the machine frame at 31*a* and having a wedge-shaped end 33 adapted to engage in a notch 35 of sliding bolt 34, to shift the latter to the right, in Fig. 6. This uncouples the bush 27 from gear 36 and leaves the bush stationary, until the detent 31 is rocked, by means to be described presently. Fixed to the end of shaft 26 is a crank 43, connected by a wrist pin 43*a* to a crank 42 fixed upon a shaft 26*a*. The wrist pin 43*a* is connected by a link 44 to a pin 44*a* on the magazine 24. Upon rotation of the crank mechanism 42, 43, 43*a*, the magazine is moved to the left in Fig. 4 and in this position the bobbin carrier 21 is free to turn. An angular movement of the bobbin carrier through 90° is effected by a pin 41 on crank arm 42, which engages the downwardly extending peg 22 of the bobbin carrier and turns the latter. The movement of the bobbin carrier is synchronized with the reciprocation of the magazine, so that the movement of the peg up toward horizontal position is not obstructed. Conventional spring detent means (not shown) may be provided to assist the movement of, and control the end position of, the bobbin carrier. The return movement of the magazine 24 to the position shown in Fig. 4 occurs when the downwardly extending empty peg 22 has moved up to horizontal position, so that the bobbin which has rolled down to the bottom position in the magazine chute, as the reserve bobbin K_2 is swung out, is skewered on the then horizontally extending peg 22.

Means are provided to release the detent 31 from the bolt 34 when a supply bobbin becomes exhausted. In the drawing this is shown as comprising a relay 38 having an armature 38*a* connected by a link 32 to the detent 31. The circuit of the armature is connected to an electric main 38*b* and includes a switch comprising two pivoted arms 39 and 40 bearing against the lower end of the running bobbin K_1. The tube H of the bobbin is of metal and when the yarn becomes exhausted a circuit is completed across the arms 39, 40 by the tube and the relay 38 is excited, retracting the detent 31 and initiating the supply bobbin change.

The yarn from each supply bobbin is collected in a cross wound package S, being wound upon a tube T rotatably supported at the ends of arms A rockably mounted on a stationary shaft 4. Beneath each tube T, or package S, is a helically grooved drum 61, mounted on constantly running shaft 7. At the end of the drum is a friction clutch 163 keyed to shaft 7 so as to slide axially thereon, but to be rotated thereby, and adapted to bear against a friction plate 163*a* on the end of the drum 61. To the right of clutch 163 on shaft 7 is rotatably mounted a thrust bearing 73 having inclined end surfaces coacting with complementarily inclined surfaces 73*a* on a bearing 73*b* in which shaft 7 is journalled. The bearing 73*b* is mounted on an arm 73*c* extending upward from a casing 73*d*, which encloses the main control mechanism, to be described in detail presently. The thrust bearing 73 has an arm 72, which can be rocked downward to thrust the clutch 163 against the friction plate 163*a*, by the cam action of the inclined end faces of the bearings 73 and 73*b*, thus coupling the driving drum 61 to the constantly running shaft 7. The thread F moves from the supply bobbin K_1 through a tensioner 60 and the cam drum 61 to the winding package S. The bobbin and tensioner are located under one end of the cam drum, so that

when the thread has travelled in the groove of the drum to the far end of the drum, it jumps out of the groove and travels back under the diagonal pull.

Means are provided to lift the arm 72 upon breakage of the thread, in order to uncouple the driving drum 61 from the shaft 7. An arm 126 (Figs. 10–12) is provided with a hub 126a extending in both directions from the arm, one end of the hub being journalled in a bearing 73e of the casing 73d, while the other end of the hub has rockably mounted upon it an arm 125, which extends out through a hole 125a of the casing 73d. The extending end of the arm 125 is connected by a link 71 to the arm 72. The arms 125 and 126 are interconnected by a lug and slot connection, as shown in Fig. 12, which permits the arm 125 to rock upward without influence on the arm 126, but downward movement of the arm 126 will rock upward the arm 125. A tension spring 160, connected at one end to arm 126 and at the other end to the casing 73d, normally pulls the arm 126 upward. The hub of arm 126 has a central hole in which is journalled the middle, horizontal arm of a thread detector 121, 122. The arm 121 of the thread detector is bent horizontally at its lower end to engage the thread F just above the tensioner 60. The arm 122 has a horizontally extending pin 123 normally positioned above the arm 126, when the thread is under tension, but adapted to drop into the notch 124 when the thread breaks or runs out. A constantly rotating shaft 131, journalled in the casing 73d, has fixed upon it a cam member 132, which normally revolves freely past the end of arm 126, but which engages the pin 123 when the latter drops into notch 124. In this case the arm 126 is rocked down by the cam 132 and rocks the arms 125 and 72 to release the drum 61 from shaft 7. At the same time a cam 125b on arm 125 lifts the stem 74a of a brake 74 and pressing the latter against the drum 61. The arm 126 is held down by the cam member 132 as long as the high part of the cam is travelling over pin 123, as shown in Fig. 11. As soon as the high part of the cam leaves the pin 123, a spring 200, against which the arm 122 bears, when held down by the cam 132, throws the released arm 122 upward and the pin 123 catches on a hook 144, holding the thread detector in the inoperative position shown in dot and dash lines. This allows the arms 126, 125 to rock far enough to release the brake 74, but other means, now to be described, prevent the arms from returning to normal position and reengaging the clutch 162, until a knotting operation has been completed. Rockably mounted in the casing 73d is a shaft 133a (see Figs. 4, 8 and 9) having fixed to it an arm 133. The end of the arm 133 is forked to engage a pin 126b on arm 126. Outside of the casing 73b the shaft 133a has fixed upon it an arm 134, the end 135 of which controls the coupling of a flange 139, fixed to a constantly rotating shaft 6, to the flanges 138 of a sprocket unit, comprising sprocket wheels 30a, 79a, 90a. A coupling bolt 136 is slidably mounted in a hole 136a of the sprocket unit hub and is urged by a compression spring 136b toward a socket 139a of flange 139. The end 135 of arm 134 engages in a notch 136c of coupling bolt 136 and is wedge-shaped to thrust the bolt to the left (Fig. 8), to uncouple the flanges 138 and 139. When the arm 126 is rocked downward, as previously described, the lever unit 133, 133a, 134, is rocked counterclockwise, and the bolt 136 is released to couple the flanges 138 and 139. During the rotation of the sprocket unit which then occurs, the arm 134 is held up by the portion of the hub between flanges 138 and this retains the coupling 163 between the cam drum 61 and shaft 7 in a disengaged condition. The condition is terminated at the end of one revolution of the sprocket unit, when the wedge end 135 of arm 134 drops again into the notch of the coupling bolt 136 and uncouples the flanges 138 and 139.

In the meantime, knotter mechanism becomes operative, in a manner to be described, to connect up the broken thread ends, or to connect the leading end of the thread of a new supply bobbin with the trailing end of the winding package. This mechanism includes means for finding the thread end of a partially exhausted supply bobbin, or of a new supply bobbin, and the thread end on the winding package, and carrying these ends to a knotter mechanism. The means for finding the thread end on the winding package is associated with means for rotating the winding package backward. For the latter purpose, there is rotatably mounted upon bearings of a bracket 75a fixed to the machine frame, a shaft 75b with a roller 75 fixedly mounted upon it, which is positioned close enough to engage the drum 61 when rotated, but has a flattened portion 75c, which allows the drum 61 normally to rotate without engaging the roller 75. The shaft 75b has fixed to it a gear 76 meshing with a gear 77, the latter being fixed upon a shaft 77a also journalled in the bracket 75a. The shaft 77a has fixed upon it a sprocket 77b over which is trained a chain 78, the lower end of which meshes with sprocket wheel 78a. Thus when the sprocket 78a is turned, upon the coupling of flanges 138 and 139, the roller 75 rotates and turns the drum 61 and the winding package S in the direction opposite to their normal winding direction.

A suction pipe 93, exhausted by a blower 93a, has a branch pipe 94, to which is articulated a curved pipe 98, which terminates in a nozzle 100 having a breadth equal to that of the winding package S. The tube 98 is normally in the position shown in full lines in Fig. 5, but is adapted to be rocked to the position shown in dash lines in that figure, in which position its nozzle 100 is close to the winding package S and is adapted to suck up the thread end as the package S is turned backward by the roller 75. The joint 98a of the pipe 98 has an arm 98b, to which is connected a link 96. The opposite end of this link is hooked over the hub of a heart cam 161 and has a pin 96a which rides upon the heart cam 161. The heart cam is fixed to a tube 161a revolubly mounted upon stationary shaft 5 and also journalled in the frame 1a, 1b, etc. The tube 161a has fixed upon it a sprocket 90b over which is trained a chain 90 meshing with sprocket 90a. The single revolution of the latter sprocket, when the flanges 138 and 139 are coupled, rotates heart cam 161 through one revolution and rocks the tube 98 to its dash line position, where it dwells briefly and is then rocked back to its full line position, carrying with it the thread end which has been picked up from the winding package S. To the lower end of pipe 93 is jointed a tube 97, which terminates in a funicular mouth 99. The tube 97 is adapted to swing from the full line position of Fig. 5 to the dash line position. It is composed of a flexible telescopic middle section 97a and two end sections 97b and 97c and is supported by an arm 97d fixed to the section 97b and terminating in a forked end engaging a pin 97e

on the section 97c. The pin 97e also has pivoted to it a tube 102 with a flared mouth adapted to pass over a fixed guide pin 103 as the tube 97 swings down to the dash line position. By this means the mouthpiece 99 is guided over the bobbin K_1 parallel to the axis of the bobbin tube H, which is of importance if the bobbin has been partially exhausted and its remaining thread is only upon its lower end. As the end 99 of the tube 97 executes this straight line movement, the middle section 97a is flexed to the position shown in dash lines in Fig. 5. The joint section 97b of the tube 97 has extending rigidly from it an arm 95a to which is articulated a link 95 extending upward and provided at its upper end with a fork embracing the hub of a heart cam 161b, which, like the heart cam 161, is fixed upon the tube 161a. A pin 95b on link 95 engages the heart cam 161b to reciprocate the link and thereby to swing the tube 97 from its full line position to its dash line position and back. In moving back, the mouthpiece 99 of the tube 97 carries with it a thread end picked up from the bobbin K_1. There is pivoted on the mouthpiece 99 an arm 101, on the journal of which is fixed a cam finger 101a adapted to engage a fixed pin 104 as the tube 97 swings up, and to be cammed thereby to throw the arm 101 up to the position shown in full lines in Fig. 5. In executing this movement the arm 101 engages the bights of the thread ends drawn over by the mouthpieces 99 and 100 and moves them up to the position shown in Fig. 5. In this position they are stretched across the bills 91a of a knotter 91. The construction of the knotter is not shown in detail, because it forms no part of the invention, but there are many knotters known, capable of knotting together two ends of thread laid together across the knotter bills. By way of example, reference is made to Peterson Patent No. 959,592. The knotter mechanism is operated by a pinion 164 (Fig. 8), which executes one revolution with the sprocket unit 30a, 78a, 90a, each time the knotting operation is initiated by the lifting of arm 134 from coupling bolt 136. When the knotting of the thread ends has been completed and they have been released from the knotter bills, the lever unit 134, 133a, 133 rocks clockwise, as the wedge end 135 drops into the notch 136c of the coupling bolt 136 and stops the sprocket unit. The lever unit 126, 125 rocks counterclockwise and the clutch 163 is reengaged. The thread is drawn taut and is guided by guide arms 60a into the tensioner 60. Within the casing 73d is rockably mounted a lever 142, 143. A spring 143a holds up the arm 143, the end of which overhangs the hook 144. The arm 142 of the lever stands over a cam 141 fixed to the hub of the sprocket unit. As the sprocket unit approaches the end of its revolution, the cam 141 rocks the lever 142, 143 and tilts the hook 144 to release the thread detector 121, 122, which swings down to the operative position shown in Figs. 4 and 10.

There has been described a mechanism for finding the thread ends of the winding bobbin and the supply bobbin and knotting them together, operated by a main control mechanism tripped by a thread detector. The thread detector will ordinarily operate at any time the thread breaks or becomes exhausted, but occasionally the thread end of an exhausted supply bobbin will become tangled with the thread detector and prevent it from being tripped in the normal manner. For this reason there is provided a secondary drive for the thread end finding and knotter mechanisms, operated each time the supply bobbin holder executes a 90° movement to bring the reserve bobbin into running position. For this purpose there is mounted on the shaft 26 beside the bush 27 a sprocket 29 having a hub 28 with ratchet teeth meshing with complementary ratchet teeth on the bush 27. The sprocket 29 is urged toward the bush 27 by a spring 29a. A chain 30 connects the sprocket 29 with sprocket 30a of the sprocket unit 30a, 78a, 90a. The bush 27 drives the sprocket unit in the same direction as it is driven by the shaft 26, when the flanges 138 and 139 are coupled. When the sprocket unit is driven by the flange 139 of shaft 6, the teeth of sprocket 29 ratchet over the teeth of bush 27 without moving the latter. Thus, the movement of a new supply bobbin to running position is always accompanied by a thread end finding and knotting operation, regardless of the operation of the thread detector, but a thread end finding and knotting operation can be initiated by the thread detector without moving the supply bobbin carrier, as required when the thread breaks.

Means are provided to interrupt the drive of the winding bobbin when it reaches a certain diameter. For this purpose an electromagnet 153 has an armature connected by a link 151 to the arm 125. The circuit of the electromagnet is connected to the main 39b and includes a switch comprising spring contacts 154 and 155, mounted on an arm 157, adjustably fixed, by a set screw 156, to the stationary shaft 4. The spring contacts extend over one of the arms A supporting the winding bobbin S and when the latter reaches a certain diameter the contacts are bridged by the arm A and the electromagnet 153 operates to throw up the clutch arm 72 and disengage the driving drum 61 from the shaft 7. This movement of the arm 125 by the electromagnet 153 operates the brake 74 by cam 125b to stop the driving roller 61, but, due to the connection between the arms 125 and 126, the latter is not moved.

The operation of the machine as a whole will now be briefly described. At each winding unit, supply bobbins are mounted on two pegs of the supply bobbin carrier 21 at K_1 and K_2 and the magazine 24 is filled. A tube T is mounted on the arms A and rests upon the driving drum 61. A thread is drawn up from the supply bobbin K_1, through the tensioner 60 and the groove of drum 61 and fixed to the tube T. The thread detector 121, 122 is released from the hook 144 and assumes the position shown in Fig. 10. When all the winding units are set up in this way the machine is started. The thread is cross wound upon the tube T and the supply bobbin K_1 becomes exhausted. The contact arms 39 and 40 move into contact with the metal tube H of the exhausted supply bobbin and close the circuit of the relay 38. The detent arm 31 is retracted and the coupling bolt 34 is engaged. During the first part of the revolution of the crank mechanism 42, 43, the connecting rod 44 moves the magazine outward and the pin 41 swings the bobbin carrier 21 through a quarter revolution. The exhausted bobbin tube H is stripped off by the strippers 23 and drops onto the conveyor 25. The bobbin K_2 is moved from reserve position to running position and the bobbins in the magazine shift down one step.

Meanwhile, the chain 30 has been driving the sprocket unit 30a, 78a, 90a. The chain 90 drives the heart cams 161 and 161b, which actuate the

links 96 and 95, throwing the suction arm 98 up and the suction arm 97 down to the dash line positions of Fig. 5. The mouthpiece 99 drops down over the end of the new supply bobbin, which has arrived in the running position K1. In this movement the mouthpiece 99 is guided by the tube 102 and pin 103. The suction arm 97 then rocks back to the full line position shown in Fig. 5, carrying with it the thread end picked up from the new supply bobbin. During the latter movement the crank mechanism 42, 43 is going through the second half of its revolution, drawing in the magazine 24 and skewering on the peg 22 which has moved up to horizontal position a new supply bobbin. At the end of the revolution of the crank 42, 43, the detent arm 31 disengages the coupling bolt 34 and stops the crank.

In the winding head there has been going on simultaneously the following series of operations:—The sprocket unit is being revolved by the chain 30, as previously described. This rocks the lever unit 134, 133a, 133 counterclockwise, releasing the coupling bolt 136 for engagement, and rocks the lever unit 126, 125, clockwise, throwing up the clutch arm 72 and disengaging the friction clutch 163, to release the drum 61 from its drive shaft 7. The chain 78, driven by the sprocket 78a, drives the roller 75, which engages the drum 61 and revolves the winding package S backward. The suction arm 98 is rocked up by the heart cam 161 and, after picking up the thread end from the backwardly rotating package S, returns to the full line position shown in Fig. 5, at the same time the suction arm 97 reaches the full line position. Near the end of the movement of the suction arm 97 the cam 101a of the arm 101 engages pin 104 and throws the arm 101 up to the full line position of Fig. 5. This lays the two thread ends in parallel position over the knotter bills 91a. The latter are then driven by the pinion 164 to execute a knotting operation. At about the time the knotted ends are released by the knotter, the sprocket unit has completed a revolution and the lever unit 133, 133a, 134 rocks clockwise into the notch of the coupling bolt 136 and releases it. This occurs at the same time the coupling bolt 34 is disengaged and the sprocket unit therefore stops. The lever unit 126, 125 is rocked counterclockwise by the lever arm 133 and engages the friction clutch 163, so that the package S begins to wind again. This draws the thread taut and the guide arms 165 guide it into the tensioner 60. The lever 142, 143 is operated by cam 141 just before the sprocket unit completes its revolution and the thread detector 121, 122 is released to follow the thread into the position shown in Fig. 10. The roller 75 stops in the position shown in Fig. 4, with its eccentric portion 75b opposite the winding drum 61, and therefore remains out of contact with the winding drum during the winding operation.

If the thread breaks, a thread finding and knotting operation is initiated by the thread detector, without effect upon the supply bobbin carrier. The thread detector 121, 122, released by the breakage of the thread, rocks clockwise, until the pin 123 drops into the notch 124 of arm 126. This is followed immediately by engagement of the continuously rotating cam member 132 with the pin 123 and the rocking of the lever unit 126, 125 to the position shown in Fig. 11. The clutch arm 72 is thrown up and disengages the friction clutch 163, uncoupling the driving drum 61 from the shaft 7. At the same time the cam 125b pushes up the brake 74 against the driving drum 61 and brings the latter to a stop. The high part of cam member 132 soon passes the pin 123 and the thread detector is thrown by the spring 200 into the dot and dash line position of Fig. 11, where it is held by the hook 144. The brake 74 is released, but the clutch 163 is held disengaged. The clockwise rocking of lever unit 125, 126 rocks the lever unit 133, 133a, 134 counterclockwise and releases the coupling bolt 136 for engagement. The sprocket unit 30a, 78a, 90a begins to revolve and the thread finding and knotting operations are executed in the manner previously described.

Ordinarily the exhaustion of a supply bobbin will result in the release of the thread detector and the energizing of the main control mechanism thereby. But in case the thread end becomes entangled so that it cannot release the thread detector, the main control mechanism will nevertheless be operated by the sprocket 29. The only difference is that in this case the brake 74 is not applied before the roller 75 moves into engagement with the driving drum 61. The whole thread finding and knotting operation, as well as the bobbin change, takes place in a few seconds.

What we claim as our invention and desire to secure by Letters Patent of the United States is:

1. In a machine of the class described, means for supporting a winding package, means for supporting a supply bobbin, means for rotating the winding package, knotter mechanism, thread catching means for drawing an end of thread from the winding package to said knotter mechanism, thread catching means for drawing an end of thread from the supply bobbin to said knotter mechanism, driving mechanism adapted to actuate said thread catching means and said knotter mechanism in succession, and control means for said driving mechanism comprising a thread detector normally resting against the thread being wound from the supply bobbin to the winding package and adapted to initiate an operation of said driving mechanism upon failure of tension of the thread.

2. A machine as described in claim 1, wherein said means for supporting a supply bobbin comprises a movable carrier device having means for holding a running bobbin and means for holding a reserve bobbin, a magazine, a second driving means adapted to move said supply bobbin carrier to advance the reserve bobbin to running position and to cause a new supply bobbin to be mounted upon said carrier, and driving connections between said two driving means, including a one-way clutch, whereby said second driving means can drive said first driving means, but said first driving means cannot drive said second driving means.

3. In a winding machine, means for supporting a winding package, a driving drum for the winding package, and means for rotating the winding package backward, comprising a friction drum the periphery of which is composed of a cylindrical part and an eccentric part nearer to the axis of the friction drum than said cylindrical part, said friction drum being mounted on an axis having a fixed parallel relation to the axis of said driving drum, so that said cylindrical part of the periphery of said friction drum can engage said driving drum, but said eccentric part cannot engage said driving drum.

4. In a winding machine, means for supporting a bobbin for axial unwinding, a thread finding member movable with respect to the bobbin and having a suction mouth adapted to pass over the end of the bobbin, and guide means to constrain said suction mouth to move in a straight line axially of the bobbin.

5. A winding machine as described in claim 4, wherein said thread finding member comprises a suction tube pivoted at one end remote from its mouth and having a telescopic middle section.

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